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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

US/RAB/93/096
Opportunity Study/Market Analysis and Conceptual Plan for Establishment of a Machine Tool Industry in the Gulf Cooperation Council Member Countries

Prepared for

The Gulf Cooperation Member Countries

by

Investment Service
Investment and Technology Promotion Division

Backstopped by: Koichi Hagiwara

Based on the work of the team of

NIS Invotec Ltd., UK.

March 1996

US/RAB/93/096
Opportunity Study/Market Analysis and Conceptual Plan for Establishment of a Machine Tool Industry in the Gulf Cooperation Council Member Countries

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CHAPTER ONE

EXECUTIVE SUMMARY

CHAPTER 1: EXECUTIVE SUMMARY

Project Title: UNIDO/GCC Opportunity Study/Market Analysis and Conceptual Plan for Establishment of a Machine Tool Industry (Plant to Establish Manufacture of Machine Tools) in the Gulf Co-operation Council Member Countries.

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Prepared for UNIDO/GCC by:-

NIS Invotec Ltd
5 Chorley West Business Park
Ackhurst Road
Chorley
Lancashire
Great Britain PR7 1NL

Tel: +44(0) 1257 266707 Fax: +44 (0) 1257 266687

Study Team Leader: Mr P J Robson

Conducted Between: August 1995 and January 1996

This study report follows the process and guidelines set out within the UNIDO 'Manual for the preparation of Industrial Feasibility Studies ID372 - 1991.

Since the project title and contracted works are for an 'opportunity study, market analysis and conceptual plan' and not for a fully fledged feasibility study the team have followed that route recommended in ID - 372 for "Pre-feasibility studies" Annex III page 352 - 354. We could have followed Annex II page 349 for general opportunity studies for this subsector, however the market analysis and conceptual plan elements of the UNIDO requirement more closely fit the process for Prefeasibility studies -hence our decision to follow that format for this report.

1.2. Market Analysis and Marketing Concept

The study team has examined the GCC machine tool market based upon the broad definition adopted by UNIDO.

This has enabled the team to conclude several important findings:-

a) **The GCC market for machine tools is dominated by a demand for metal cutting machines.**

b) **The GCC market for metal cutting machines is to be considered as the domestic market i.e. no trade barriers and an open market between the 6 member states.**

c) **The GCC domestic market is not large enough to sustain a competitive metal cutting machine tool plant without an export market.**

d) **Allied markets within the region and the Arab world have been shown to hold sufficient market potential to supplement domestic consumption and sustain development.**

1.2.1 The Basic Project Idea

Market analysis demonstrates that within the metal cutting machine tool sector priority demand is for types classified as:-

* **Turning Machines (i.e. lathes)**
* **Milling Machine (Prismatic parts)**

Since the study excluded analysis of 'Milling' machines for reasons of a parallel project study for the Syrian Arab Republic (with UNIDO and within the same time frame). The team concludes that the basic project idea should be:- "Development of a Machine Tool business within the GCC for the production of metal cutting lathes (turning machines).

Additionally the study concludes that these machines should be positioned at the 'current technology i.e. computer numerically controlled. (CNC) lathes better

known in the 1990's as CNC turning centres. The specifics of size range, range of technology, competitors etc., will be explored in the relevant chapter of this report.

Elaboration of the basic idea is required to demonstrate how the opportunity satisfies further down stream development of the GCC engineering sector whilst taking advantage of fulfilling market needs identified during the field work.

These can be summarised as follows:-

a) Development of high technology skills within the GCC engineering sector for local nationals, via this business having an extensive training element.

b) Machine tool manufacturing resources, including design and development. Taking advantage of relationships with existing GCC Universities and research organisations.

c) Development of precision cast iron products via adaptation of existing GCC steel making resources.

d) Development of a machine tool refurbishment and service centre to support the existing installed base of machine tools in the GCC and allied local markets.

e) To enable the development of further machine tool products outside of turning machines in future years by establishing a sound platform in Machine

4. **Technology partner must gain competitive advantage from project participation. Participation delivers a WIN - WIN situation for local investors (GCC) and technology partner.**

5. **GCC governments need to leverage GCC position with allied target export markets within the Middle East and those Arab League countries with whom trade relationships exist.**

6. **Additional to the core business idea - "Production of Turning Machines" - the project should also have the following business areas:-**

i **A precision toolmaking division providing competitive services to:- Aluminium extrusion manufacturers.**
:- Plastic moulding (injection, extrusion and blow moulding) companies.
:- precision machining services in support of the oil, petrochemical and gas industries.

ii **A general machine tool refurbishment,repair and retro fitting service for NC control and digital readouts.**

iii **A toolmaking training school providing services to the companies own staff development plus competitively priced training services for GCC companies in the following areas:-**

tool design/development.

Elements a - e can be achieved via a staged approach to the businesses development provided careful consideration is paid to the status of the World Machine Tool market and its future forcasted development.

The report demonstrates a way forward is possible and worthy of detailed business planning within a recommended follow up full blown feasibility study.

1.2.1.1. Key Success Factors

The basic PROJECT idea is sensitive to certain key factors, these are tabled and must form the basis of further implementation planning within the recommended feasibility study:-

1. Venture must be private sector driven initiative for competitiveness.

2. Business must have public sector support and a collective GCC response - finance, research, open markets, training and supportive raw material project. (precision iron castings)

3. Venture must have a technology partner who brings product design, production expertise, equity participation and enabling marketing position i.e. brand name, image and in depth support.

a - tool making

b - machine tool fitting

c - machine tool maintenance/repair

d - NC and CNC controls programming

The rationale for these 6 key success factors and in particular for the specific need for the additional business areas listed at 6 (i - iii) will be fully developed in later chapters. However in summary these represent the solutions to gaps identified after extensive field research within the GCC states. Demand exists for these additional business areas and they will provide enabling measures in support of getting the business off the ground whilst also satisfying the wider GCC requirement of stimulating self sufficiency in high skill areas of manufacturing engineering. They will also speed recognition of the new company across its broad GCC market whilst establishing the core business - "production of turning machines" - which by definition will take some time to fully establish.

1.2.2. OBJECTIVES

The project basic idea's outlined are designed to achieve the following objectives:-

:- establish a machine tool industry where non now exists.

:- provide machine tools of latest technology of competitive price and specification within a GCC market, and allied markets within the Arab league and to markets served by the businesses now technology partner.

:- provide a comprehensive service to GCC and allied markets for machine tool refurbishment and repair (machines within the existing installed based of the GCC i.e. not of the companies own manufacture).

:- provide precision toolmaking and precision machining service to GCC users in - aluminium extrusion plastic moulding and oil/gas down stream industries.

:- provide training to GCC nationals and others in toolmaking and machine tool fitting/repair etc., establish a private sector business with mixed shareholding i.e. private sector investors and public sector (i.e. GCC industrial development banks). Together with an established machine tool company also as a shareholder who provides not only essential technology linkages but also brings about 'best practice' in terms of business systems, market awareness and future development planning.

The scale of operation and its ability to influence the development of the GCC engineering industry will be further developed in later sections of this report.

:- a vital objective will also be to influence, in a beneficial manner, the further moves toward 'what is termed"

"Saudi-isation", similar terms are expressed for the same issue for each of the 6 states. The ability of nationals to take on private sector added value roles in industry whilst enabling each state to be in greater control of it industrial destiny. A common problem throughout the GCC is that of providing employment benefits packages in the private sector that equal the opportunities obtained from public

sector positions whilst maintaining a competitive position for the private sector employer.

It is essential that a formula is established to satisfy the unique requirements of this high technology sector. It may not be possible to deliver the same solution for all private sector companies but this is not the focus of our study. For this project we can see a solution based upon employment cost subsidy by GCC states for nationals engaged by the new business.

The details of the solution will be developed later in the study, however it will be a primary objective for the successful implementation of the project whilst satisfying the wider objectives of the GCC mission.

1.2.3. Strategy

The study proposes that a full blown feasibility study follows this opportunity study. This further detailed analysis should take the basic ideas set out in this report and fully develop them into a pre implementation proposal that is designed to provide targeted investors with all the necessary data required for a sound investment decision.

At this stage in the development of the project idea we can summarise the strategy at this stage to be as follows:-

1 **Attract shareholders from a mixed private and public sector community based upon the market research findings that conclude that a business in this sector in**

the GCC will be viable and generate acceptable rates of return. Create Investors Forum.

2 **Work to a 10 year plan that comprises the following basic elements.**

Year 1 - Feasibility Study

Year 2 - Establish enterprise with shareholders and technology partner. Recruit key management team.

Year 3 - 4 Establish plant - Phase 1 comprising

- **Toolmaking facilities**
- **Machine tool refurbishment facilities and marketing/sales activities.**
- **Develop manufacturing facilities**

Year 5 - 6 Develop market penetration within:-

- **Toolmaking**
- **Training Services**
- **Machine Tool refurbishment**
- **Turning machine sales**
- **New model development "Achieve 15-20% market share"**

Year 6 - 8 Achieve Steady State conditions and explore additional machine tool models - both turning machines and others of related technology for potential expansion.

Year 8 - 10 Included in strategy to enable turnover /return calculations to be made for IRR purposes etc.,

The strategy is designed to enable market entry for toolmaking services and general machine tool refurbishment to occur prior to and whilst the more substantive business of turning machine production and sales takes place.

Revenue growth from these early initiatives also dilutes exposure of the investors during the pre-production activities required to establish the core business. Additionally it enables the training activities for core business staff to be taking place in parallel with real marketing activities that will establish the whole businesses presence within the markets served. This strategy acknowledges the conservatism of the machine user market and will bring about market position and credibility as the business approaches the launch of its machine tool products.

1.2.4. The Market

The target markets fall into 4 categories:-

i GCC toolmaking market

ii GCC machine tool refurbishment market - service /repair /updating of control.

iii GCC market for trained toolmakers, machine tool

technicians and CNC literate engineers (CNC = Computer Numerical Control).

iv GCC market for turning machine (lathes) both CNC (computer numerical control) and centre lathes (conventional turning machines with all electric drives).
Additional markets for the same products to be regards as exports.

1.2.5. Size of Market and Achievable Market Share

i The study concludes that the toolmaking market size is US$10,854,250, which covers the tool requirements for aluminium extrusion and plastic moulding. It is realistic to assume from field research activities that the new business can secure the following market penetration:-

Years 2 - 4	13% rising to 15%
Years 4 - 8	15% rising to 19%
Years 8 - 10	Optimum share target 25%

ii The machine tool refurbishment market has been measured to be US$ 7,500,000 (750 machines) during 1995. The study concludes that market share can be taken to the following profile:-

Year 2 - 4	15% rising to 18%
Year 4 - 8	18% rising to 26%

Year 8 - 10 **Optimum market share target 32%**

iii **The training element of the business plan should yield the following profile for market share taken from an estimated market size in 1995 of US $ 6,000,000**

Year 2 - 4 **12% rising to 17%**

Year 4 - 8 **17% rising to 30%**

Year 8 - 10 **Optimum market share target 40%**

iv **The market for the companies turning machines comprises - GCC domestic sales and export sales.**
The study concludes that the GCC market in 2000 for the target range of products to be:- US$ 97,115,200
See Chapter 3.0. for 10 year market profile for penetration of the forecasted market size. In summary the company will achieve sales to the following profile:-

Year	Lathes Unit Sales
2000	255
2001	268
2002	283
2003	298

2004 Ref Yr	314
2005	331
2006	348
2007	367
2008	387
2009	407
2010	429

1.3. Raw Materials

Inputs are dominated by weight upon the cast iron bodies for the lathes.

Whilst the study concludes that initially these will be supplied by the technology partner it is desirable to develop a GCC supply partner.

QASCO in Qatar have shown great interest in becoming this partner but the level of technological change and capital costs must be further examined during the follow on feasibility study.

Other materials consist of readily available steels etc., from the open market and no special arrangement need to be made other than best practice purchasing methods.

High value precision parts will need to be bought from specialist supplies. However, this is common practice to the

world machine tool industry and GCC will not be disadvantaged. The most notable of these being CNC controllers, probably from FANUC, Japan.

1.4. Location

The study has pin pointed two preferred locations :- Jebel Ali Freezone in Dubai, UAE and the Damman area of Saudi Arabia.

Oman, the Muskat area is not dismissed but this would be a third choice at this stage.

Without exception all 6 states within the GCC expressed a desire to host the project. Both public and private sector organisations showed keen interest to secure the business in their area. The feasibility study will need to take wide ranging views to secure an even handed final selection.

Each state has broadly similar benefits packages, soft loans and low energy costs making it more difficult to choose location upon the usual determinants.

1.5. Project Engineering and Technology

The study concludes that a private sector technology partner is a pre requisite for success. Initial discussions with potential partners have taken place, without full disclosure, to determine reaction and interest.

The study concludes that the initiative is of interest to leading European lathe suppliers and during the follow on

feasibility study it will be possible to move to a more substantive discussion with interested parties.

Colchester Lathe of the UK, a member of the 600 Group plc has been used as a test bed for these issues and would be willing to compete with others for substantive dialogue.

Engineering in the region will benefit from the project and the study concludes that over 2000 local nationals could be trained by the new companies CNC machine tool Training Unit (6 month intensive CNC machine apprenticeship courses plus 1 month CNC programming courses).

Chapter 6.0. sets out the technical, capital and engineering needs of the business, non of which represent any significant problems. We recommend a working relationship between the business and GCC Universities. This would be at both the research level and for external commercial services such as calibration of metrology equipment. Supplies of graduates to fulfil the companies needs can be assured since the field mission noted high levels of competency in each University visited, within the facilities of engineering.

The plants own production facilities would be world class with some $US7,000,000 worth of machine tools and production faculities detailed at Chapter 6.0.

1.6. Organisation and Overhead Costs

The business would have a high percentage of overhead staff. With 82 out of some 200 employees being of managerial and senior technical level. This is common in high technology businesses and would not place the project at any disadvantage.

The technology partner would need to second staff to the business in early years (1-3) but the study sets out how to achieve a high degree of GCC nationals moving into these senior management and board of director roles.

1.6.1. **It will be vital to achieve parity between the GCC public sector reward regime and the benefits packages offered to the projects employees. The only mechanism for this, concluded during a parallel examination for UNIDO by the study team, is to provide public sector subsidy to the private sector business. The details of such a mechanism must be worked out during the feasibility study since the project model in COMFAR III at present utilises salaries and benefits packages available at competitive rates in the GCC. Whilst this enables the companies products/services to be sold competitively it would also mean utilising immigrant workers. The subsidy scheme would avoid this and make possible a GCC national workforce. By this means the GCC achieves maximum long term skill/technology benefits from the project - one of the principle objectives. Organisationally the rest of the proposals set out a 'western' model since the companies markets will recognise these as best practice in the world machine tool industry.**

Costs associated with delivering this 'best practice' organisation do not prejudice the business since all its competitors are in tune with the approach. The business is targeting 'state of the art' CNC lathes and will not compete with low technology, low cost economies.

1.7. Human Resources

The most fundamental human resource issue is that covered in 1.6.1.

Availability of graduates is not a problem in the GCC, sustaining their interest in engineering and industry is a problem.

The company will need to work hard at 'selling' the benefits of a high technology career rather than put across a " smoke stack" factory image. Field work confirms that as in the West, young people do not hold engineering or industry in high esteem.

GCC will benefit in bringing about cultural/attitudinal change in this regard by developing this Centre of Excellence project.

1.8. Implementation

We recommend an in depth feasibility study during 1996/97 (can be considered year 1 of a 10 year programme).

Followed by a pre investment phase to obtain partners and shareholders. During this phase the resolution of the subsidy issues must take place. Post incorporation of the company 1997/98, we see a project management phase delivering a working plant by the year 2000.

The study sets out the budget costs for all these steps and a viable project plan.

1.9. Financial Analysis and Investment

The study has attributed cost to the next steps and follow on pre investment phase. It has placed a draft estimate upon implementation costs both capital and revenue. Utilising the output of the market analysis it has been possible to examine potential revenues for all the activities tabled as "products and services".

These have been used to examine I.R.R. (internal rate of return) criteria using COMFAR III expert. (approx 20%)

The output shows the project to be viable. This has been an opportunity study, a full blown feasibility study will need to test this initial economic viability work. However the study has identified 3 new business areas not known at the beginning of the mission. These are so closely allied to the machine tool business to be considered as additional revenue streams supporting the creation of a profitable enterprise.

1.10. Synopsis of Conclusions

- **The machine tool which should be the central focus of the study should be the metal cutting lathe, which is also known as the turning centre.**

- **The market size within the GCC member states is too small to sustain a turning centre manufacturing plant alone. It must therefore be enlarged by the achievement of export (outside of GCC) sales within the other countries which comprise the Arab League.**

- **The proposed plant should deliver several other services to the marketplace in addition to the central manufacturing activity of turning centres:-**

* **Production of machine tool manufactured dies and moulds for the downstream petrochemical industries and the aluminium extrusion market.**

* **Deliver a retrofitting/refurbishment service for all machine tool types within the GCC member states.**

* **Provision of machine tool operator and CNC programmer courses from an in-house training centre, which delivers the courses at world class manufacturing standards.**

- **This multi-activity plant facility should be targeted as being the 'centre of excellence' within the GCC for machine tool manufacture and training.**

- **The plant should be a joint public and private sector venture, which would include a foreign technology partner, who in the initial stages of development would provide the business management expertise to support the successful implementation of the plant.**

- **The plant should adopt a target of employing 90% of its human resources as GCC nationals.**

- **Whilst many potential locations exist, the study team conclude that at this stage the preferred location would be within the Jebel Ali Freeport within Dubai, United Arab Emirates.**

- **During the construction and training stage of the implementation project, the study team concluded that a mobile machine tool 'Technology Roadshow' unit, which marketed the forthcoming GCC/Arab products and services should visit all industrial areas within the GCC. This would allow all potential customers, the opportunity to be aware of what is to come and to learn using their own factory examples, how CNC machine tool technology can assist their businesses.**

1.11. Recommendation

That this opportunity study, be followed by a full blown feasibility study to fully verify the conclusions reached within this study, and to enable a successful and long term sustainable implementation of a plant to manufacture machine tools within the GCC.

CHAPTER TWO

PROJECT BACKGROUND & HISTORY

CHAPTER 2 : PROJECT BACKGROUND & HISTORY

2.1. Project Background and History

The rationale for this study started as a result of discussions between the UNIDO GCC desk officer - Mr Yossef Sabri and an official of the Saudi Arabian Ministry of Industry during a meeting of GCC ministries of industries held in Fez, Morocco during 1993.

At this meeting it was established that the further development of the GCC engineering sector and manufacturing engineering in particular, would be hindered by the lack of certain enabling measures that a Machine Tool industry provides. No such machine tool plant or company existed, at that time, within the GCC member states and this is still the case in 1996.

To better understand the role of a machine tool industry within developed and developing economies it is first important to establish what is meant by 'Machine Tools'.

UNIDO has chosen to adopt a very broad definition within the contractual terms of this study means that all equipment used to change the form or add value to raw materials would be categorised as Machine Tools.

The study team believes that a more widely accepted definition is as follows:-

"Power driven machine, not hand held, that is used to cut, form or shape metal... typically installed as capital

equipment in a metal working industry". (the Association for Manufacturing Technology - USA).

However the team have used the UNIDO definition (some 3000 types) to confirm that the GCC and the studies target markets actually agree with the more widely accepted definition by virtue of historical consumption.

Market analysis has confirmed that "Metal cutting machine tools" occupy the priority position within the widely accepted definition - confirmed by historical consumption analysis. Subsidiary to metal cutting machine tools are:- metal forming machine tools, and woodworking machine tools.

It is also recognised that metal cutting machine tools are those which most importantly underpin all other manufacturing endeavours.

These machines and the human skills required to produce them can be found at the very roots of all subsequent industrialisation. Developing economies without a machine tool industry or its attendant supply and skills chain will always find themselves dependant upon imports, not only of machine tools but also many other goods and services closely linked to precision manufacturing engineering.

All developed industrial economics of the West and Far East have metal cutting machine tool industries. Many developing economies (i.e. India and China) have embarked

upon metal cutting machine tool industry development. These general indicators are tabled as a guide to the importance this sector has upon industrial economic development.

To sum up, machine tools for metal cutting are the Mother and Father of all machines.

Without a machine tool (metal cutting type) industry the GCC will not realise the full potential of its natural and human resources. Rather the member states will need to spend revenue earned from its natural resources upon imported machine tools together with a wide range of derivative products, services and technical skills. These issues will be dealt with in detail within the following chapters, particularly the effect upon the skills development of GCC nationals.

2.1.1. The Project Sponsors

This study has been commissioned by the GCC (Gulf Co-operation Council) Secretariat General based in Riyadh Saudi Arabia upon behalf of the six member states:-

- The Royal Kingdom of Saudi Arabia
- The United Arab Emirates
- Sultanate of Oman
- Kuwait

- Qatar
- Bahrain

Commissioned upon UNIDO by the GCC but wholly funded by the GCC whose decision to use UNIDO to manage the project has been based upon UNIDO's long experience in such pre-investment activities. UNIDO have supplemented its own 'in house' resources by contracting with NIS Invotec Ltd who have specific technical and business experience in these sectors of manufacturing industry.

2.1.2. The Project History

This study is the first activity since the discussions that took place in Fez and as such the project has a clean start. The team has conducted extensive research to establish if any parallel or past studies have taken place with respect to the GCC and machine tool industrial development. No such studies have been found with this precise field of analysis but a number of historical studies for the wider Arab world have been found. The team is confident that this piece of work is the first to examine the opportunity, a factor that will prove beneficial at the investment promotion phase.

2.1.3. Cost of Studies and Investigations already Performed.

In view of 2.1.2. the team concludes that no costs have been

expended prior to this study with respect to the project proposal. Earlier works with respect to the world machine tool industry have been used for the purposes of reference but these can not be considered as pre study investigations for this project nor their costs associated with this projects pre investments phase.

CHAPTER THREE

MARKET ANALYSIS
&
MARKETING CONCEPT

3.0 The Basic Project Idea

The basic idea underlying the project is to investigate the opportunity that may exist within the GCC, to establish a plant to manufacture machine tools.

This opportunity itself may only be viable if it is supported by other types of commercial activity that have a degree of synergy with the overall aim of the basic idea as expressed above.
To ensure that all of the potential areas of activity have been fully explored at the pre-feasibility study level, it has been necessary to take advantage of a range of market research analysis techniques.

The opportunity study team has taken advantage of classical market research techniques including:-

- **On site interviews with end users**
- **Telephone interviews with end users**
- **Collective responses from trade and industry associations within the**
  target markets of the GCC member states.
- **Analysis of published statistical information collected during the field mission from central statistical offices, covering:- imports, exports and re-exports and macro economic indicators etc.**
- **Analysis of United Nations statistical data for all world exporter data to the 22 Arab countries.**
- **Analysis of market growth rates, historical trends, utilising credible market research organisations (E.G.**

Economist Intelligence Unit, Frost & Sullivan, Key Note, The American Machinist and several others).

- The effecting of fieldwork within the GCC member states to corroborate statistical information gathered from several sources as described above.
- Analysis of questionnaires with regard to customer purchase attitudes.
- Analysis of competitor products/markets.
- Analysis of competitor pricing policies.
- Downstream analysis of potential customers supply chain (potential for growth etc.,).
- Overview of other potential opportunities that exist in downstream petrochemical and aluminium related industries within the GCC.
- Telephone and fax surveys.

Analysis of the appendix sections of the study will show the spectrum of end user visits and industry association meetings during the field mission.

Since machine tools as a category have a great number of machine types and potential end users ranging from small artisan shops to elaborate manufacturing conglomerates, the study team have adopted sampling techniques to ensure that it has examined market characteristics across the full spectrum of potential users.

Via local Chambers of Commerce and Ministries of Industry the study team has targeted key groups and individual companies in each of the following cities and countries for the purposes of conducting market research activity in the field.

Riyadh	Kingdom of Saudi Arabia
Dammam	Kingdom of Saudi Arabia
Dhahran	Kingdom of Saudi Arabia
Kuwait City	Kuwait
Al Manama	Bahrain
Doha	Qatar
Dubai	United Arab Emirates
Abu Dhabi	United Arab Emirates
Fujairah	United Arab Emirates
Sharjah	United Arab Emirates
Muscat	Sultanate of Oman
Ruwi	Sultanate of Oman
Rusayl	Sultanate of Oman

Additionally the study team have used statistical data published by the United Nations Central Statistical Office, based in New York, for the past 5 years, (where available) for the GCC countries (the domestic market) and the rest of the 22 Arab states in order to measure market demand patterns, they are as follows:-

Algeria	Bahrain	Comoro Islands
Djibouti	Egypt	Iraq
Jordan	Kuwait	Lebanon
Libya	Mauritania	Morocco
Oman	Palestine	Qatar
Saudi Arabia	Somalia	Sudan
Syria	Tunisia	United Arab Emirates
Yemen		

CHAPTER 3: MARKET ANALYSIS & MARKETING CONCEPT

3.1 Objectives of the Project

The project basic idea's outlined are designed to achieve the following objectives:-

- **Establish a machine tool industry where non now exists.**
- **Provide machine tools of latest technology of competitive price and specification within a GCC market, an allied market within the Arab league and to markets served by the businesses new technology partner.**
- **Provide a comprehensive service to GCC and allied markets for machine tool refurbishment and repair (machines within the existing installed based of the GCC i.e. not of the companies own manufacture).**
- **Provide precision toolmaking and precision machining service to GCC users in - aluminium extrusion plastic moulding and oil/gas down stream industries.**
- **Provide training to GCC nationals and others in toolmaking and machine tool fitting/repair etc., establish a private sector business with mixed shareholding i.e. private sector investors and public sector (i.e. GCC industrial development banks) Together with an established machine tool company also as a shareholder who provides not only essential technology linkages but also brings about 'best practice' in terms of business systems, market awareness and future development planning.**

  The scale of operation and its ability to influence the development of the GCC engineering industry will be further developed in latter sections of this report.

- **A vital objective will also be to influence, in a beneficial manner, the further moves toward 'what is termed" "Saudi-isation", similar terms are expressed for the same issue for each of the 6 states. The ability of nationals to take on private sector added value roles in industry whilst enabling each state to be in greater control of its industrial destiny. A common problem throughout the GCC is that of providing employment benefits packages in the private sector that equal the opportunities obtained from public sector positions whilst maintaining a competitive position for the private sector employer.**

3.2 Project Strategy

The strategy that has been adopted is a staged approach to measuring the market, leading to the answers to a number of fundamental questions, that are integral to the viability of the project, as follows:-

- **Which category of machine tool should be the major focus of the study?**
  - **Metal Cutting**
  - **Metal Forming**
  - **Metal Joining**
  - **Woodworking**
  - **Mineral Working**

- Which specific machine tool should be the major focus of the study?
- What is the consumption of the specific machine tool, within the GCC (domestic market) and within the other Arab League member states?
- What is the expected market penetration and resultant market for such a machine tool?
- What other complimentary commercial activities could be integrated into the proposed manufacturing plant that have the potential to generate other income streams for the business as a whole?
    - Precision Toolmaking
    - Machine Tool Refurbishment
    - Toolmaking Training Service Provision

3.3 The Measurement of Demand

3.3.1 Phase 1 : The analysis of the five Machine Tool Categories

The first phase undertaken in the measurement of the market was to consider the five machine tool groupings that constituted the whole of the machine tool sector, they are as follows:-

- Metal Cutting Machine Tools
- Metal Forming Machine Tools
- Metal Joining Machine Tools
- Woodworking Machine Tools
- Mineral Working Machine Tools

To ensure that this initial sector analysis was done as accurately as possible data was obtained from the United Nations Business

Statistical Database (UNBSD) which is based in New York in the USA.

Over 16,000 records were selected from the database using the Standard International Trade Classification Revision 3 coding system (SITC Rev 3) as the filtration tool.

The records selected were those which lay within the following SITC code range:-

728.11 to 737.49 inclusive

The resultant data gained was all world exporter data into the GCC member states over the 5 year period ending 1994 for the complete range of machine tools as covered within the headings above.

The analysis of this data produced results which clearly showed that the Metal Cutting Machine Tool Sector was by far the largest sector of consumption within the GCC.

Figure 3-1 Below demonstrates the findings of the initial data analysis:-

Figure 3-1

Consumption of All Machine Tool types within the GCC Member States by $US as reported to the UN Statistical Database by all World reporters (1990 - 1994)

Metal Cutting Machine Tools	70%
Metal Forming Machine Tools	11%
Woodworking Machine Tools	10%
Metal Joining Machine Tools	5%
Mineral Working Machine Tools	4%

Note : All figures are rounded Source : UN Statistical Database - New York

In addition to the above analysis a further source of information was sought to confirm whether the percentages arrived strictly by analysis of the world export statistics was in the right order.

To verify the data contained in figure 3-1 a report produced by Frost & Sullivan entitled "The World Market for Standard and Special Machine Tools" was referenced.

Frost & Sullivan was founded in 1961 in New York. Its mission statement was to prove the ability of market research to monitor and forecast emerging market trends.
It merged with Market Intelligence Research Corporation of California in the 1970s and is today the market leader in the world wide information and consulting industry.

Its reports carry high levels of credibility and span across a range of 300 key industries operating within the world economy currently.
They are acknowledged as having developed quality best practise methodologies in the field of world-wide market research and as such the report as specified overleaf, which is focused on machine tools is a bona-fide reference and cross reference for this opportunity study.

This report looks at the market from the point of the manufacturer of machine tools and considers the size of the world market by the analysis of revenue (US Dollars) and shipments (Machine Tool Units).

The figures below illustrate that the conclusions arrived at by the initial analysis of all world exporter details are correct and therefore encourages the study to focus solely into the area of Metal Cutting Machine Tools.

When analysing what percentage of the total world revenue, by product type, occurred between 1990 and 1994 the report states that Metal Cutting Machine Tools accounted for approximately 66%, Metal Forming Machines accounted for approximately 24% and others accounted for the final 10%.

When analysing what percentage of the total world shipments, by product type occurred between 1990 and 1994 the report states that Metal Cutting Machine Tools accounted for approximately 71%, Metal Forming Machine Tools accounted for approximately 24% and others accounted for the final 5%.

Whilst there is some disagreement between the figures on the make up of the final 35% of the world figures it is very clear that the Metal Cutting Machine Tool sector of the market is the largest.

Given that the above initial analysis and subsequent cross check support each other the study team concludes that:-

- **It is valid for the remaining part of the study programme only to consider those machine tools classified under the Standard International Trade Classification as Metal Cutting (i.e. those which appear within the SITC R3 code 731).**

3.3.2 Phase 2 - The Market for Metal Cutting Machine Tools

The primary objective for this phase of the market study is to arrive at the machine tool which will be the main focus of attention within the opportunity study.

The machine tool industry recognise that within the sector of machine tools that are defined as Metal Cutting machine tools, the following machines comprise the component parts:-

- **Non NC & NC Boring Machines**
- **Non NC & NC Drilling Machines**
- **Non NC & NC Gear Cutting Machines**
- **Non NC & NC Turning Machines**
- **Non NC & NC Milling Machines**
- **Non NC & NC Broaching Machines**
- **Non NC & NC Grinding Machines**
- **NC Machining Centres**

To fully research the market for Metal Cutting Machine Tools it has been necessary to use several prime sources of data:-

- **GCC member states import statistics gathered during the field mission.**
- **All world reporters export statistics to all of the 22 Arab states.**
- **UNIDO report entitled "The Machine Tool Industry in Algeria and Tunisia" - 1991**
- **The American Machinist Volume 137 Number 3 - March 1993 Pages 33-35 plus Volume 133 Number 2 - February 1989 Page 61**
- **Frost & Sullivan Market Intelligence report entitled "World Standard and Special Machine Tool Markets" - 1993.**
- **Economist Intelligence Unit Middle East and North Africa Market Atlas - 1995**
- **In depth personal and telephone interviews with public and private sector GCC based organisations, numbering over (120 site visits and over 150 telephone interviews).**

3.3.2.1 Which Metal Cutting Machine Tool?

The methodology used in Phase 1 of cross checking statistical import/export data of new and used machine tool units by value, with world market research forecasts and macro economic trends from credible sources has been used again in this section to arrive at the specific type of metal cutting machine tool that will constitute the focus of this study.

The statistical data to arrive at the appropriate machine tool, within which, the opportunity may lie, emanates from the United Nations Business Statistical Database in New York. This comprises all world exporters to the 22 Arab states. This data has also been compared to the import data collected from all the GCC member states countries during the field mission.

The SITC R3 classification system has been used to separate the relevant data from the database and the SITC codes used to make this filter are as follows:-

- 7311
- 7312
- 7313
- 7314
- 7315
- 7316
- 7317

The analysis of the data over a five year period shown in figure 3-2 illustrates the percentages of overall consumption by machine tool type, for the member states of the Arab league, from 1990 to 1994.

It is clear from Figure 3-2 that the Turning Machine Tool type (The Lathe) holds the largest percentage of the marketplace. As such the table indicates that when the total imports less re-exports of the Arab States are analysed by value ($US), it shows that the lathe accounts for 29.3% of overall consumption, in value terms, of new and used metal cutting machine tools.
It is normal for the two categories of Machining Centres and Milling Machines to be grouped together as they are of the same

family and if this was done then the total percentage share would be 30.1% of the total market consumption. However as a feasibility study into the building of a factory to produce milling machine in the Syrian Arab Republic is currently underway Milling Machines of this type are excluded from this study.

Figure 3-2

Consumption of All Metal Cutting Machine Tool types within the Arab League Member States by % as reported to the UN Statistical Database by all World reporters (1990 - 1994)

Boring Machine Tools	10.1%
Drilling Machine Tools	8.9%
Gear Cutting Machine Tools	3.9%
Turning Machine Tools	29.3%
Grinding Machine Tools	17.7%
Milling Machine Tools	18.3%
Machining Centres	11.8%

Note : All figures are rounded Source : UN Statistical Database - New York

To cross check that the ranking arrived at using purely import export statistics is correct the Frost & Sullivan report has been referenced.

Within the report an analysis of the percentage of World revenues by product type is available.
It concludes that when considering the range of metal cutting machine tools that are described overleaf and excludes the

category "other metal cutting machines", that the following percentages apply:-

- Boring Machines 3.9%
- Drilling Machines 3.4%
- Gear Cutting Machines 3.8%
- Turning Machines 31.0%
- Grinding Machines 17.4%
- Milling Machines 14.9%
- Machining Centres 25.5%

These figures (1989 - 1993) indicate that the Turning Machine Tool (the Lathe or Turning Centre) is the tool with the biggest propensity to generate sales revenue on a world-wide basis, claiming 31% of all world revenue for the sales of new turning machine tools.

Given the contents of the above study, as defined within Figure 3-2, and that the subsequent cross check support each other, the study team concludes that:-

- ♦ It is valid for the remaining part of the study programme only to consider those machine tools classified under the Standard International Trade Classification as Metal Cutting (i.e. those which appear within the SITC R3 code 731).

3.3.3 Phase 3 - The Market for Lathes/Turning Centres

The study team have analysed the potential market for the Turning Centre, taking advantage of data from a number of

sources, in an attempt to cross-check and verify the results that are arrived at.

Primary sources of data include the use of import, export and re-export statistics collected within the six GCC countries visited during the field mission.

Secondary sources of data include all world exporter data into all of the 22 Arab League states.

Frost and Sullivan market research data has also been accessed in conjunction with data supplied by the American Machinist focusing on the Middle East and North Africa Share of the world market for machine tools.
The Economist Intelligence Unit has also been used to consider the share of world GDP that the Middle East and North Africa take.

Finally an indicative statistical sampling technique was used during each visit to an industrial user of machine tools during the course of the field mission. The results of this survey have been used to assess the size of the market for re-furbishment of machine tools and also as a macro statistical check on the market consumption figures produced by the use of primary and secondary data sources.

3.3.3.1 Market Analysis - Import Statistics

The study team has collated import statistics from each of the six GCC countries visited during the mission. In addition in has used the United Nations statistical database

located in New York to provide all world exporter data to the 22 countries who constitute the Arab League.

Consequently data, either import or world exporter, has been collated to cover 20 of the 22 Arab League states. Generally this data covers the period 1991 - 1994, however in certain circumstances it has not been possible to get all five years for all countries. When this is the case time series analysis has been used to complete any absent data.

The forecasted data has been achieved by the use of time series or with the use of exponential smoothing where appropriate.

Additionally consumption figures have been increased in the case of Algeria as this country has its own machine tools native manufacturer.

The data that has been obtained covers all Metal Cutting Machine Tools, this is given in value terms (US$). Unfortunately the majority of countries are not reporting the amount of units that have been imported or exported, as the case may be, therefore it has been necessary to use a conversion model to equate total value of exports back to units of machines exported.

Figure 3-3 below illustrates how the demand data has been calculated by the use of a model of the natural distribution of Lathes/Turning Centres and also by the use of a model which converts value into units on an average price basis.

Figure 3-3

Market Demand Analysis for Turning Centres within the Arab League Member States - Based on Import/Export Statistics in conjunction with Frost & Sullivan Market Research Data 1991- 1994

Description	Source	1991	1992	1993	1994
Metal Cutting Machine Tool Consumption (US$ 000s)	GCC & UN Statistics	152150	155993	165075	149615
Natural Distribution of Lathes (%)	Frost & Sullivan	18.6%	18.5%	18.4%	18.4%
Resultant Consumption (US$000s)		28294	28859	30374	27529
Average Unit Price/Lathe (US$000s)	Frost & Sullivan	57.82	59.00	60.18	61.38
Resultant Lathe Unit Consumption (Machines)		489	489	505	448

The lathe unit consumption data has been forecasted forward to the year 2010. This will allow Year 1 of the project to commence in year 2000 and will serve as a good reference point for the start of the project, should it get to the implementation stage.

The total market therefore has now been forecasted and is illustrated below in figure 3.4 :-

Figure 3-4

Total Forecasted Market for Turning Centres within the Arab League Member States - Based on Import/Export Statistics in conjunction with Frost & Sullivan Market Research Data

2000 - 2010

Year	Market Size (Units)
2000	614
2001	647
2002	682
2003	719
2004	757
2005	797
2006	841
2007	885
2008	932
2009	982
2010	1035

3.3.3.2 Market Analysis - Market Research Data & American M/C

The first cross check that was carried out on this data was to use the world market research analysis data contained within the Frost & Sullivan study already mentioned earlier within this chapter.

The data offered by Frost & Sullivan is in terms of new units of machine tools, and the study reports the world market for metal cutting machine tools. The data used is based mainly on the sales results and projections by the worlds leading manufacturers of machine tools, after extensive interviews had been effected.

The data integrity within the study suggests that by using this methodology a more reliable result could be achieved than taking import and export statistical data, which can be unreliable. Additionally there would be no need to convert value into machines as the data offered is based on units sold and projections forward from this base data.

Figure 3.5 below illustrates how the demand data was arrived at using the Frost & Sullivan base data and applying a model which allows the Middle East and North Africa share of the world market to be arrived at. This model was supplied by the American Machinist journal, which is recognised as being a credible source of expertise and knowledge within the machine tool sector.

Figure 3-5

Market Demand Analysis for Turning Centres within the Arab League Member States - Based on Frost & Sullivan Market Research Data & The American Machinist

1991- 1994

Description	Source	1991	1992	1993	1994
World Metal Cutting Machine Tool Sales (Units)	Frost & Sullivan	400300	398900	421800	443000
Natural Distribution of Lathes (%)	Frost & Sullivan	18.6%	18.5%	18.4%	18.4%
Resultant World Sales (Units)		74456	73797	77611	81512
Middle East & N.Africa Share of World Sales (%)	American Machinist	1.10%	1.20%	1.20%	1.20%
Resultant Arab League Lathe Sales (Machines)		819	886	931	978

The resultant Arab League lathe sales data has been forecasted forward to the year 2010

The total market therefore has now been forecasted and is illustrated below in figure 3.6 :-

Figure 3-6

Total Forecasted Market for Turning Centres within the Arab League Member States - Based on Frost & Sullivan Market Research Data & The American Machinist 2000 - 2010

Year	Market Size (Units)
2000	1456
2001	1534
2002	1616
2003	1702
2004	1793
2005	1889
2006	1990
2007	2097
2008	2209
2009	2327
2010	2452

3.3.3.3 Market Analysis - Market Research Data & E.I.U.

The final cross check to verify the demand data for the potential market for lathes/turning centres has been constructed based on the previous analysis, but in this instance deriving the Middle East and North Africa share of world sales by the incorporation of the Economist Intelligence Unit estimates of the regions share by taking the Gross Domestic Product percentage.

The Economist Intelligence Unit projects that the percentage share of world GDP for the Middle East and North Africa is 3.10%. If this model is applied to the Frost & Sullivan base data then the total market forecast for lathes/turning centres from the year 2000 to 2010 is illustrated in figure 3.7 below:-

Figure 3-7

Total Forecasted Market for Turning Centres within the Arab League Member States - Based on Frost & Sullivan Market Research Data & The Economist Intelligence Unit 2000 - 2010

Year	Market Size (Units)
2000	3472
2001	3658
2002	3853
2003	4059
2004	4276
2005	4505
2006	4746
2007	5000
2008	5268
2009	5550
2010	5846

It is clear that this final estimate is far in excess of the previous two market sizings, and whilst the use of this cross check could be regarded as a good indicator the study team

feel that it is too optimistic to be used as the basis for calculation of the potential opportunity that exists for a machine tool manufacturing plant within the GCC.

3.4 Market Penetration and Final Demand Forecast

The study team have considered all three methods that have been used to arrive at the total market that exists within the Arab League for lathes/turning centres.

It concludes that whilst there are obviously imperfections, with regard to reliability, within the different data sources themselves, due to a series of unknowns and due to the notoriously cyclical nature of the machine tool market sector, *the more reliable market assessment would be the analysis that is based upon the projections of the worlds leading manufacturers of machine tools.*

The selection of the market forecast that is illustrated in figure 3-6 has been arrived at because of the following:-

- **The data is based on actual manufacturers sales performances over a five year period ending 1993.**
- **The data is already in the form of lathe units and does not have to be converted to units from a gross value.**
- **The data that is based on experience based projections which have been made by market research experts with a thorough working knowledge of the machine tools marketplace.**

- **The world share model has been supplied by a credible source of machine tool expertise - The American Machinist**
- **Sample based market research by the study team within industrial user segment of the manufacturing sector of the GCC states has more synergy with this data than that of the other two methods.**

Consequently, the study team will base all future calculations upon the potential market penetration that could be achieved within the total market for lathe/turning centres as illustrated in figure 3-6 previously.

Market penetration estimates are based upon the following assumptions:-

- **The manufactured product range complies with the latest technology standards.**
- **A credible and highly reputable technology partner is a major participant within the project.**
- **The product range is:**
  - **of high quality**
  - **easy to use**
  - **priced to be significantly less expensive than other competitive products which offer the similar features**
  - **Readily purchased on a relatively short lead time.**
  - **actively and aggressively marketed throughout the home markets (GCC) and**

throughout the other markets of the Arab League and near Rest of the World countries.

The study team have conducted one to one user/buyer interviews throughout its field mission within the GCC member states.
During this mission potential buyers of the end product, and other organisations who have a good local knowledge of the purchasers views were asked under what conditions would an Arab machine tool product hold a competitive advantage over other similar products.

Organisations visits have been grouped as follows:-

- Public & Private Sector Manufacturing 50
- Machine Tool Agents 6
- Chamber of Commerce & Industry 7
- Education & Training Establishments 10
- Investment Organisations 8

At all of the interviews that were carried out each organisation had generally the same initial response in that they believed that the purchase of such a capital item would be made based on primary purchasing criteria, and the fact that the product was of Arab manufacture would be a secondary consideration, and that only if the machine satisfied the initial purchase criteria would it have a competitive advantage.

In summary if the product did satisfy the following:-

- Product Specification & Capabilities
- Ease of use

- **Reliability**
- **Produced high quality products consistently**
- **Was at a competitive price relative to other similar products**
- **Availability of spares locally**
- **Availability of expert tuition**
- **Availability of expert service engineering support**

each purchaser interviewed stated that they would be very pleased to support the product range and would actively market its existence through their own networks.

Given that this is the case and that the product range as designed would comply with these customer requirements, the study team has concluded that the minimum market penetration that would be achieved *when the factory had achieved critical mass - Years 5 - 2004 onwards* would be as follows:-

Home Markets - GCC	**20%**
Arab Export Markets	**15%**

This estimate is based upon market research data accumulated within the GCC mission itself, supplemented by similar market research data obtained within the Syrian Arab Republic, Egypt, Tunisia and Morocco on previous studies carried out by the study team within the machine tools market sector.
Additionally Frost & Sullivan and the American Machinist have also been consulted concerning the subject of potential market penetration figures that could be achieved within the Middle East and North Africa.

The market penetration expectations now need to be applied to the demand data (figure 3-6) that has been generated to establish the normal feasible capacity of the plant so that a manufacturing unit can be designed to cater for the expected demand of the market and also to allow for expansion in future years. The results of the application of these market penetration figure to the demand data are illustrated below in figure 3-8:-

Figure 3-8

Total Forecasted Market Penetration (Sales) of Turning Centres within the Arab League Member States 2000 - 2010

Year	Market Size (Units)
2000	255
2001	268
2002	283
2003	298
2004	314
2005	331
2006	348
2007	367
2008	387
2009	407
2010	429

3.5 Related Support Functions of the Overall Business

It is unlikely that the forecasted sales contained within figure 3-8 will sustain the overall business in the longer term, due to sheer lack of volume, within the markets identified.

Whilst not within the initial brief of this study document, the study team have considered the potential that could be achieved from adding other business modules to the overall

enterprise, that have synergy with the core business of manufacturing lathe/turning centres.

This analysis cannot be considered as a comprehensive analysis and does require further work (potentially at the next stage of this project) to prove conclusively that the inclusion of such business units is practical given the culture and position of the marketplace.

The units that have been considered are as follows:-

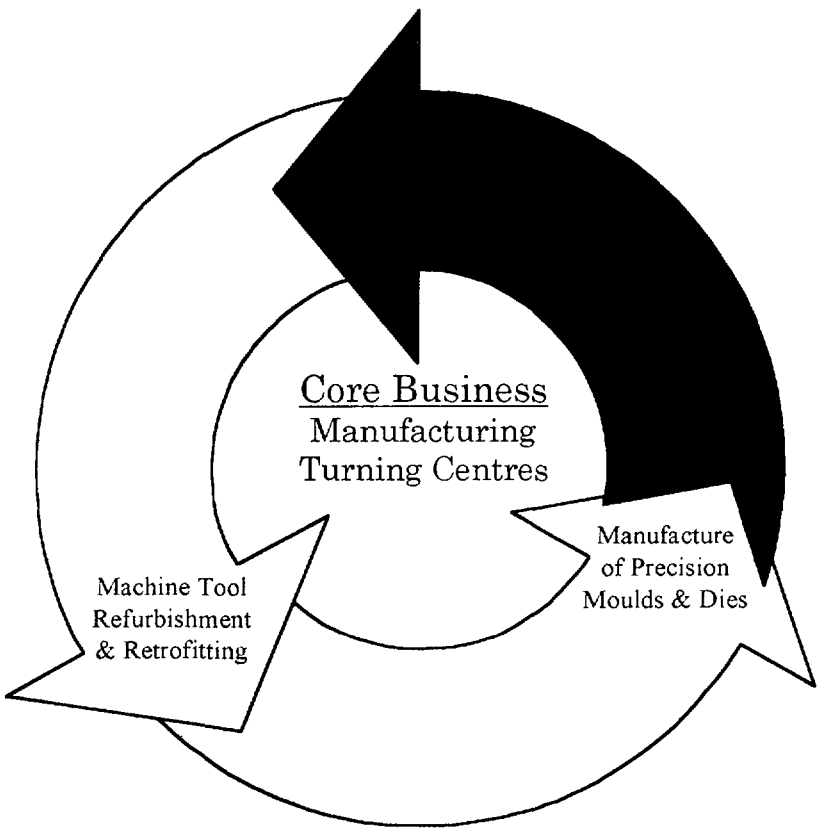
- **A Precision Dies and Moulds Operation**
- **A Machine Tool Refurbishment/Retrofitting Operation**
- **A Machine Tool User Training Facility**

Figure 3-9 below illustrates diagrammatically how the business functions are complementary to each, whilst not being totally dependant upon the existence of each other.

Essentially the basic premise of adding these other business units is that the assets of that are developed in each one of the new business functions can be used to deliver a unique selling point or "cachet" to the customers of the overall enterprise.

Figure 3-9

Diagrammatic Representation of the Functions of the Overall Enterprise



If the correct Technology Partner is selected, then he will be able to bring to the business a range of expert skills, which can be categorised as follows:-

- **Strategic Business Management Skills**
- **Expertise in "best practice manufacturing"**
- **Expertise in machine tool operation**
- **Expertise in all aspects of machine tool training**
- **Expertise in the understanding of Quality Standards**

Figure 3-10 below illustrates how by introducing a precision moulds and dies manufacturing facility a number of foundation stones are laid to support a machine tool refurbishment business such as :-

- **The moulds and dies manufacturing unit will have access to the latest technology in terms of**
  - **CNC Machining Centres**
  - **Grinding Machines**
  - **Spark Erosion Machines**
  - **Wire Erosion Machines**
  - **CNC Turning Centres**
- **It follows therefore that experienced operatives will initially be brought in by the Technology Partner, who will train successors to operate the machinery that will produce the moulds and dies.**
- **The existence of such a machine shop has implications for the core business as it can be used to produce component parts for the turning centres that are to become the product range, *increasing the potential for greater local product content*.**

The precision moulds and dies business facilitates easy entrance into the refurbishment and retrofitting of existing machine tools, as it can take advantage of the expert know-how, the ability to access the latest technology and the availability of capacity to refurbish and/or retrofit.

Additionally, the existence of such expertise across the range of machine tools that are firstly being sold within the product range and secondly being used in the moulds and

dies business, allows entry into the training of users in the art of using a full range of machine tools.

This service could be offered all around the GCC member states and during interviews within the industrial organisations visited it was warmly received.

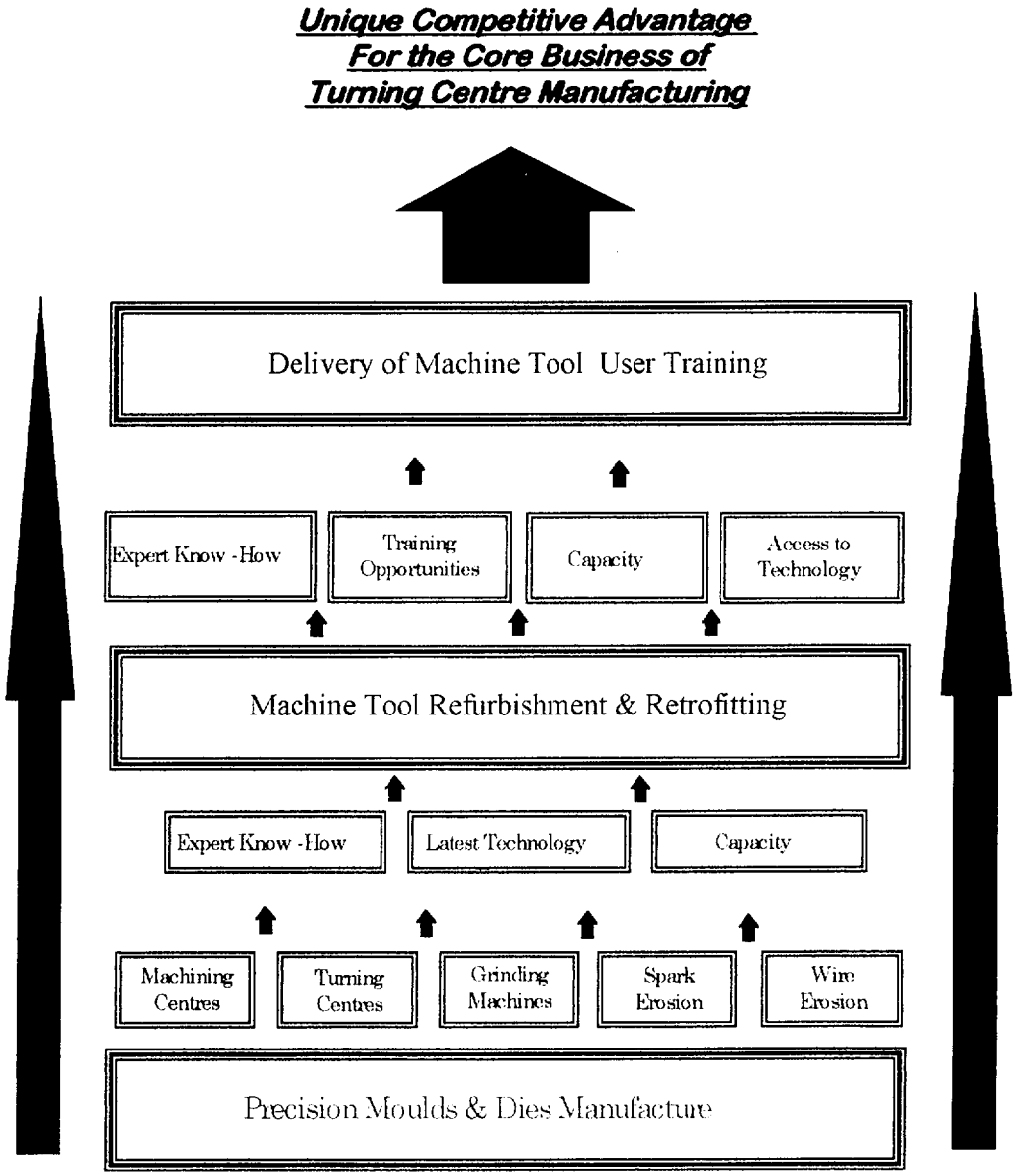
The range of training services offered could cover the following:-

- Operation of Machine Tools
  - Machining Centres
  - Turning Centres
  - Grinding Machines
  - Spark Erosion Machines
  - Wire Erosion Machines
- Programming of CNC controllers
- Use of Machine Tools to produce precision moulds and dies
- Use of CAD/CAM Technology

This unit could also liaise with GCC Universities to produce industry focused degree courses with a large practical component.

Figure 3-10

Delivery of the Unique Competitive Advantage Position



3.6 The Market for Precision Moulds & Dies

Precision moulds and dies are required chiefly within two industrial sectors in the Gulf, the downstream petrochemical industries of plastic injection and blow moulding, and the downstream aluminium related industries of extrusion and impact moulding.

In 1993 the Gulf Organisation for Industrial Consulting (GOIC) carried out a survey into the numbers of industrial operators carrying out business within 9 sectors of the marketplace.

It concluded that 933 companies were operating within the Plastic Products sector and that 1465 companies were operating within the Fabricated Metal Production sector.

Within these two sectors a wide range of products are produced that are precision moulded. During the field mission a number of companies were visited who bought in precision moulds and dies in order to produce their product range.

- **Steel Fabricators**
- **Lighting Fabricators**
- **Air Conditioning Fabricators**
- **Plastic Component Manufacturers**
- **Aluminium Can Manufacturers**
- **Fastener Manufacturers**
- **Wire Manufacturers**
- **Cable Manufacturers**
- **Aluminium Extrusion Manufacturers**
- **Spare parts manufacturers**

In general the companies visited bought in their moulds and dies on an import basis as the quality of local supply was currently unacceptable, in terms of initial product quality and in terms of short length of mould/die life.

In one instance a sizeable aluminium extrusion manufacturer (manufacturing 14,000 tonnes of finished product) informed the study team that he expended over one million $US on the purchase of 1100 dies per year plus incurred additional maintenance costs of up to 10% of this figure on existing moulds and dies per annum.

Taking this example as a typical demand synthetic then it can be assumed that:-

- ***For every tonne of finished product $US75 must be expended on moulds and dies.***

Given that the GCC produced in excess of 690,000 tonnes of primary aluminium and that approximately 7.1% of this production is used within the extrusion market segment the approximate market for moulds and dies within the GCC, given the above synthetic would be calculated as follows:-

- **690,000 tonnes of Primary Aluminium Production**
- **48,990 tonnes of Extrusion Aluminium Production**
- **Dies and moulds market = $US 3,674,250 per annum**

To establish a demand synthetic for the plastics industry the study team carried out a small study in consultation with NEPPCO, the North of England Plastic Producers Consortium, the results of which can be seen in Appendix I.

This study concludes that on average within the United Kingdom, a plastics moulding organisation spends approximately $US20,000 on tooling costs (new moulds and dies plus maintenance) for every $US1,000,000 worth of sales revenue.

Given that the production within the GCC of Polyethylene C is 1,197,000 tonnes and that by using an average price/tonne of $US780, the total sales revenue figure for sales of Polyethylene of $US 934 millions.
Using the assumption that approximately 30% of this product is used within the moulded plastics sector to arrive at an indicative market size, then the total market for moulds and dies would be as follows:-

- **Sales revenue attributable to Polyethylene which will be used for plastics moulding is $US359 Millions**
- **Spend on moulds and dies, using the synthetic above, will be $US7,180,000 per annum.**

It is clear therefore that there is a large enough market to sustain a small precision moulds and dies manufacturing unit running in parallel with the core business activity.

3.7 The Market for Machine Tool Refurbishment & Retrofitting

There is a large installed base of machine tools within the GCC but a comment often repeated during the field mission interviews with industrialists is that the support and servicing of the equipment is ranked very high in the buying process. It is likely therefore that any new venture will have to sell very aggressively it's ability to provide service support to overcome the perception that "foreign is best".

A service organisation will have to be better than the competition. It will have to have local service centres with

spares holdings and capable of offering fast, professional response.

The service organisation will provide valuable customer contact, with a chance to build a reputation for quality and service. Customers buying intentions can also be identified early by the service teams.

Maintenance and service support need not be limited to the company's own products.

Retrofitting/Refurbishment will also be a value added service with the additional advantage that it uses the same skills and disciplines that are required to build new machines.

Retrofitting/Refurbishment in the UK takes a number of forms:

- Replacement of old, tired and unreliable existing control systems (NC to modern CNC and relay panels to PLC).
- Replacement of motors and drives.
- Mechanical rebuild (survey followed by replacement of bearings, gears etc.).
- Regrinding or replacement of slideways. Old metal-metal ways can be improved by the addition of modern surfaces e.g. Turkite.

- **Upgrade of manual machines to add digital readouts or CNC systems.**

- **A combination of the above.**

The retrofitting/refurbishment services can also be located in the local service centres. As well as providing a local service this will offer excellent training opportunities.

During the field mission within the six GCC member states, the study team talked extensively with users of machine tools and in most factory visits , a tour of the workshops was given.
Generally within the workshops visited the machinery was over ten years old, much of it purchased as second hand and the majority of the machines were not of the latest technology. The composition of the workshops did vary dependant upon the type of business they were in, however within the 49 manufacturers visited an average of 3 to 5 machine tools could be found per workshop.

Using the work of GOIC, the number of industrial establishments operating in 1993 who would need a workshop to carry out their business operation was estimated to be approximately 2000. These are businesses within the following ISIC code categories:-

- **Base Metal Industries** **38**
- **Fabricated Metals Industries** **1465**
- **Other Manufacturing Industries** **430**

Using an average of 4 machine tools per workshop the approximate number of machines that are in operation and potentially requiring preventative maintenance, refurbishment or retrofitting is over 7500. Within this population it is forecasted that only 10% are of an age requiring refurbishment, consequently leaving a market for the new factory of 750 machines. Using US$10,000 per refurbishment job, a market value is revealed totalling US$7,500,00

3.8 The Market for User Training

Within the GCC member states there is widespread use of ex-patriot labour, mainly from the Philippines, India, Pakistan and Thailand.

This immigrant labour force is constantly changing as the two year standard contractual agreements come to a close and the labourer returns to his native homeland.

As such a large amount of time is spent by the factory management team in providing training development to the workforce, almost on a constant basis. Potential machine tool purchasers place "ease of use" high upon the priority list of buying criteria, precisely for this reason.
Using data from the Industrial Data Bank at GOIC it is clear that over 100,000 individuals were working within the machine tools related sector in 1993.

It is clear that there is a market for practical user training, that takes in a novice machine tool operator and delivers a

fully trained highly skilled individual back to his place of employment after having undergone a comprehensive course teaching the following skills:-

- Operation of Machine Tools
  - Machining Centres
  - Turning Centres
  - Grinding Machines
  - Spark Erosion Machines
  - Wire Erosion Machines
- Programming of CNC controllers
- Use of Machine Tools to produce precision moulds and dies
- Use of CAD/CAM Technology

At each industrial visit the host was asked whether he would consider using such a facility, and over 90% of the interviewees stated that they would.

3.9 The Use of the Mobile Marketing Roadshow

One of the major problems that contributed to the relative scarcity of CNC machine tools within the GCC member states was the lack of awareness of the latest technology advancements in the machine tool industry.
This translated into a reluctance on the part of the buyers of capital plant and equipment to purchase such a machines.

The study team have looked at this problem and are suggesting the use of a technique that is widely used within

the West to spread the awareness and to provide product knowledge when it does not exist.

Essentially a purpose build mobile roadshow will be operated by the new business. The roadshow will be staffed with expert machine operators, CAD/CAM specialists, Design experts and extremely experienced professional marketeers.

The GCC countries lend themselves to a mobile marketing exercise with their geographic nearness and (as a result of the existance of the Bahrain/Saudi-Arabia causeway) are without exception linked by land.

The mobile marketing unit will carry out its work within the factory build period and will visit each industrial area within the GCC, and remain there for a period of one month in each industrial area.

It will carry out the following activities:-

- Inform the industrial client base of the GCC of the existence of a machine tools "CENTRE OF EXCELLENCE" within the Gulf.
- Challenge industrial users of machine tools to bring a part that they are currently producing so that this part can be produced on the latest technology by their own operators.
- Allow novice users to be partially trained in the use of CNC machine tools, incorporating CAD/CAM and controller programming.

- **Inform the industrial base of the services that will be offered by the organisation when the build programme is completed.**

It is hoped that in this way the pre-marketing and the one to one training element will assist in the early market penetration into the machine tool marketplace.

Additionally, should there be any requirements prior to the commencement of factory operations, the Technology Provider, who would staff the mobile marketing unit would be able to deal with the requests for services or products from his home base.

Finally if the marketing case is properly thought through, this exercise will bring about the prestige that this centre will offer to GCC nationals and hopefully this will assist in the recruitment of GCC nationals to work in the "Centre of Excellence" machine tools facility.

3.10 The Sales Programme

The forecasted sales programme, unit selling prices and resultant generated revenues are illustrated in figures 3-11, 3-12 and 3-13 below:-

It has been assumed that in the first three years of operation a 15% - 10% and 5% price reduction has been offered as a market penetration tool.

Figure 3-11

Year	Lathes Unit Sales	Die/Mould Unit Sales	Retrofit Unit Sales	Courses Unit Sales	
				(a)	(b)
2000	255	1500	100	8	12
2001	268	1575	105	10	14
2002	283	1654	110	14	16
2003	298	1736	116	16	18
2004 Ref Yr	314	1823	122	18	22
2005	331	1914	128	20	24
2006	348	2010	134	22	28
2007	367	2110	141	26	28
2008	387	2216	148	28	30
2009	407	2327	155	30	30
2010	429	2443	162	34	38

Note: courses (a) & (b) as follows:-

(a) = 6 month intesive machine tool opportunity

(b) = 1 month CNC programming course

Figure 3-12

Year	Lathes Unit Price	Die/Mould Unit Price	Retrofit Unit Price	Courses Unit Price (a)	(b)
2000	$58,000	$900	$10,000	$50k	$10k
2001	$60,000	$900	$10,000	$50k	$10k
2002	$62,000	$900	$10,000	$50k	$10k
2003	$63,500	$950	$10,000	$50k	$10k
2004 Ref Yr	$65,000	$950	$10,000	$50k	$10k
2005	$67,500	$950	$10,000	$50k	$10k
2006	$70,000	$1000	$10,000	$50k	$10k
2007	$72,500	$1000	$10,000	$50k	$10k
2008	$75,000	$1050	$10,000	$50k	$10k
2009	$77500	$1100	$10,000	$50k	$10k
2010	$80,000	$1200	$10,000	$50k	$10k

Figure 3-13

Year	Lathes Sales Revenue	Die/Mould Sales Revenue	Retrofit Sales Revenue	Courses Sales Revenue
2000	$14,790,000	$1,350,000	$1,000,000	$520,000
2001	$16,080,000	$1,417,500	$1,050,000	$640,000
2002	$17,546,000	$1,488,600	$1,100,000	$860,000
2003	$18,923,000	$1,649,200	$1,116,000	$980,000
2004 Ref Year	$20,410,000	$1,731,850	$1,220,000	$1,120,000
2005	$22,342,500	$1,818,300	$1,280,000	$1,240,000
2006	$24,360,000	$2,010,000	$1,340,000	$1,380,000
2007	$26,607,500	$2,110,000	$1,410,000	$1,580,000
2008	$29,025,000	$2,326,800	$1,480,000	$1,700,000
2009	$31,542,500	$2,559,700	$1,550,000	$1,800,000
2010	$34,320,000	$2,931,600	$1,620,000	$2,080,000

3.11 The Production Programme

The forecasted production programme has been illustrated below in Figure 3-14

Figure 3-14

Year	Lathes Unit Production	Die/Mould Unit Production	Retrofit Unit Production	Courses Unit Production	
				(a)	(b)
2000	255	1500	100	8	12
2001	268	1575	105	10	14
2002	283	1654	110	14	16
2003	298	1736	116	16	18
2004	314	1823	122	18	22
2005	331	1914	128	20	24
2006	348	2010	134	22	28
2007	367	2110	141	26	28
2008	387	2216	148	28	30
2009	407	2327	155	30	30
2010	429	2443	162	34	38

Note: courses:- two types are

Sold:(a) = 6 month intensive CNC machine apprenticeship

(b) = 1 month CNC programming course

CHAPTER FOUR

MATERIALS INPUT

4.1 Raw Materials and Supplies

The following commentary summarises the nature of materials input required to support the proposed establishment of the facilities described below:-

Manufacturing plant for metal cutting lathes

Machine tool refurbishment/retrofit

Precision tool making

Training

Machine tool manufacture is considered to be the core competency from which will grow a high technology engineering based manufacturing industry within the GCC countries, coupled with an appropriate indigenous skills based workforce. Under normal circumstances it would be expected that the areas nominated for development in addition to machine tools, would emerge naturally from the growth of the machine tool sector. As the range of machine types expand and their populations increase more and more components for the machine tools would be sourced through GCC. Equally as awareness of the benefits of using the new technologies becomes more widespread, even those companies unable initially to invest in new equipment, could buy-in through the upgrading of their current machinery by retrofitting of more updated features, such as the addition of digital readout to a machines axis. Inevitably, demand will also increase for personnel with the appropriate skills and experience i.e. operators, programmers, installation and commissioning engineers, supervisors, etc., hence the need to expand training

capabilities to service the growing and diversifying market.

Whilst most of the recognised Industrialised nations have had the luxury of many years to develop their current levels of competence; in a "catch up" situation that is not the case. It will therefore probably be necessary to acquire the expertise in the additional areas in parallel with that of machine tool manufacture and by using a similar approach i.e. by working with a technology partner having acknowledged expertise in the designated areas. It will also ultimately be necessary to embrace all the auxiliary skills necessary to support a successful and thriving industry including such areas as design. In essence this implies the need to create a centre of excellence having the capability to encompass all of the identified business areas and skills requirements.

4.2 Machine Tools Manufacture

One of the key initial considerations will be to identify an appropriate "Technology partner" to effect the transfer of technology and "know how" at an early stage of the project. This will provide both the "Brand" and quality image the product will require to impact upon the market, and determine the fundamental design and elements of the product for which material sourcing will be required. For example, an indication of the critical nature of the decision on a suitable technology partner can be related to the basic design of a machine tool's structure. Many of the current

machines on the market have base structures that are produced using cast techniques (cast iron).
However, viable alternative techniques are also used e.g. Steel fabrication and a combination of steel fabrication and cast non-metallic dampening materials. Significantly differing manufacturing techniques are used to satisfy each type of design and therefore if self sufficiency of supply is to be ultimately achieved through one or more of the GCC countries, it is essential to establish at an early stage which process will be adopted for this key element of the machine tool's structure.

It is often the case in establishing a facility of this complexity to commence manufacture at the assembly end of the process, utilising all bought out finished components at the outset, sourced through the technology partner. And then to systematically work backwards through the manufacturing cycle acquiring the appropriate skills and commencing to source components and materials locally to build up the increasing level of local input to the product. This ramping up process obviously has a strong influence on the materials requirements and input levels at the start of the project, but provides a structured and manageable approach to the establishment of a complex manufacturing business.

In more general terms the materials to service the plant will fall into three main categories:-

Base metals

Semi-processed material

Manufactured parts

In addition there will be requirements for a range of auxiliary materials and utilities.

4.3 Base Metals

4.3.1 Steels

It is probable that even when the facility is fully operational that a number of the components will be sourced locally as opposed to investing in machinery to produce them on site . Typically, electrical control cabinets, machine guards etc, which are produced from sheet steel, and require comparatively large amounts of floor space for processing equipment and handling. However, should the decision be to manufacture them, then materials will be required in sheet form of various thicknesses, principally of the carbon steel variety in addition to bar of various sectional shapes and sizes. Steel bar in round and rectangular sections will be required in specifications ranging from plain carbon to heat treatable steels.

4.4 Non Ferrous Materials

Non ferrous materials such as Aluminium, Brass and Bronze will be required in relatively small quantities in sheet and bar form.

4.5 Other Materials

There may also be a requirement for other non-metallic materials in small quantities such as plastics, rubber, polycarbonate sheet and jointing materials.

The overall requirement for materials will be dependant upon the Technology partners product specification and design. The ultimate objective will be to satisfy the specification either by achieving manufacture on site, or by acquisition through a GCC supply chain source where appropriate.

4.6 Semi Processed Materials

As previously discussed, Cast Iron is the most commonly used material for the main structural elements of the machine and also constitutes the most significant material element in the machine. Typically it will represent 70/80% of a machine's weight and 50/70% of manufacturing material costs. Whether this, or alternative materials are selected to produce the machine's structure, it is most likely that initially they will be sourced through the Technology partner, until such time that a competent supplier(s) can be developed within one or more GCC country.

4.7 Other Cast Materials

Dependant upon the fundamental design of the product as specified by the Technology partner, there may also be requirements for small Alum castings/extrusions, Bronze castings and Plastic mouldings.

4.8 Manufactured Parts

It is inevitable as a consequence of the technology level of the product, that a number of the component parts will have to be sourced outside the GCC group of countries. Typically these would comprise of:-

Computer Numerical Control System

Main Spindle motor & Electronic Drives

Feed Drive Motors & Electronic drive Systems

Recirculating Linear Ways

Recirculating Ball Screws

The technologies associated with the above, and related devices are historically resident in Japan, USA and Europe and have taken a considerable number of years to progress to their current levels of sophistication. Given the many specialist techniques associated with their manufacture and the size of market available to support that development, it would be unrealistic and uneconomic to consider incorporating their manufacture into any proposed new facility within GCC at present.

4.9 Spindle Assembly

Again, because of the critical nature of this component and the extensive development it has undergone, to be capable of delivering the consistent level of performance demanded from modern machine tools, it is most likely that for the foreseeable future it will be sourced through the Technology partner.

4.10 Auxilliary Materials

Paints, primers and associated solvents

Lubricants and greases (for tools and equipment in plant)

Lubricants and greases (supplied with product)

Cutting fluids (for use within plant)

Cutting fluids (supplied with product)

Cutting tools (for use within plant)

Packaging materials (cases, pallets, sheeting, banding, etc.)

4.11 Refurbishment/Retrofit Facility

It is anticipated once again that the materials to service this facility will fall into the three main categories listed below:-

Base metals

Semi - processed materials

Manufactured parts

Essentially the requirements will be similar to those described for the machine tool plant, however, whilst volumes of specific components may be lower, given the existing population of machine tools, the variety will

inevitably be greater if the potential market is to be serviced. It is also unlikely that major cast components of machine tools will feature as a normal element of the work of this facility.

4.12 Precision Tool Making (Dies & Moulds Unit)

The nature of this work dictates that there will be essential differences in both the materials to be processed and in the type of machine tool used to carry out the manufacturing, in comparison to the machine tool and refurbishing/retrofit units.

Base metals will be a variety of hard and hardenable special tool steels whose specification will normally be controlled by the customer. These will be required to be worked in a variety of conditions, with in many cases tools being submitted for rework or reconditioning in their hardened state. The processing machines will, as a consequence of material, component design and required accuracy's be a mixture of NC controlled EDM, Spark erosion and multi axis cutting machines, the latter with 3 dimensional sculpting capability ultimately driven by computer aided design (CAD) data. Techniques have also been developed which allow moulds and dies etc., to be manufactured direct from CAD information, using fast free form fabrication methods. This technique utilises specialist equipment to build up the mould form in stages to create the desired shape, as opposed to conventional machining methods where material is removed from the parent metal.

4.13 Factory Utilities

4.13.1 Utilities

The principal utility will be electricity which will be required for :- Lighting, machine tool power, air conditioning, temperature control, and compressors etc. Consideration will have to be given to maximum power requirements, connected load, standby levels and daily and annual shift consumptions.

4.13.2 Liquid Propane Gas

It may be feasible to consider the use of LPG as an alternative fuel source for specific manufacturing processes, where both circumstances and economics prove beneficial.

4.13.3 Diesel Fuel

If standby generators are considered to be an essential aspect of the strategy to maintain continuity of production for the facility, it will be necessary to consider the fuel level requirements based on the minimum level of service that is to be tolerated once the plant is fully operational.

4.13.4 Water

Water will be required for a variety of services ranging through sanitation, canteen, production processes, coolant systems etc.

4.13.5 Compressed Air

Most modern manufacturing facilities require compressed air services to actuate work holding devices, drive assembly tooling and for other inter operational activities. The design capacity of the compressor(s) and associated receiver systems etc., require careful consideration.

4.13.6 Equipment Spares

A variety of spare parts will be required to service the range of machinery and equipment used through out the plant to ensure that no situation arises where vital equipment is out of commission leading to potential loss of revenue.

The range and quantities of each type of spare part will need to be carefully detailed on the basis of, discussion with the original equipment manufacturer (OEM), and the policy established for the optimum operation of the plant.

4.13.6 Personnel Facilities/Provisions

Provision will also be required to service the needs within the plant for Administrative, Technical and operational personnel. These would include canteen and social, protective clothing, washing and sanitary, transport, inter company transport personnel, training.

There will also be a need to provide facilities for visitors to the plant, for movement of product within the plant and for the garaging and maintenance of all company vehicles.

4.13.7 Estimated Materials Costs

The following information gives estimated materials requirements and costs based on first year forecasted output (year 2000). Where appropriate, figures are also given for year 5 and represent a 30% increase on year 1 in line with forecasted figures, these are shown in parenthesis ( ) following the year 1 values.

4.14 Base Metals

4.14.1 Steels

Sheet steel for the manufacture of small machine /splash guards, covers, etc. 1.5mm in thickness

Estimated requirement per machine - 4 square metres
Material weight per square metre - 13kg
Material requirement per machine - 52kg
Price per tonne - $ 1100
Annual requirement - 52kg x 255 (year 1 sales) = 13260 kg
13260 x 1100/1000 = $14586
($18962)

4.14.2 Non-Ferrous Bar & Section

A provision should be made for a small stock of bronze, brass, and aluminium to include sheet material. It is

estimated that 0.5 tonnes per month allowance should be made.

Price per tonne $2900

Annual cost - 0.5 x 12 x 2900 = $17400 **$17400**

($22620)

4.14.3 Other Non-Metallic Materials

Gaskets, sealants, polycarbonate sheet, etc. est. $24000

($31200)

4.14.4 Cast Iron

Machine base castings, headstocks, tailstocks, turrets

Estimated weight averaged over a range of machine sizes.

2 tonnes per machine

Annual usage - 2 x 255 = 510 tonnes

Cost per tonne $1400 + $1400/tonne Pattern Costs

Annual cost - 2 x 255 x 2800 = $1,428,000 **$1,428,000**

($1,856,400)

There may also be a requirement for a number of small aluminium castings to be produced for use on the machines. A provision should be made for an estimated 24 tonne per year usage. **estimated cost $100000**

($130000)

4.14.5 CNC Control Systems

4 axis systems at an estimated volume discounted price of $10,000 per system

Annual cost - 10,000 x 255 = $2,550,000 **$2,550,000**

($3,315,000)

4.14.6 Axis Drives & Motors

Typical estimated cost per axis $1650 including discounts

Annual cost - 255 x 2 x 1650 = $841500 **$841,500**

($1093950)

4.14.7 Spindle Motors & Drives

Estimated, discounted unit cost - $2350 per unit

Annual cost - 255 x 2350 = $599250 **$599,250**

($779,025)

4.14.8 Recirculating Ball Screws & Linear Slides

Estimated, discounted unit cost - $1200

Annual cost based on 2 units per machine - 2 x 255 x 1200

= $612,000

($795,600)

4.14.9 Electrical Control Cabinets

Electrical Control Cabinets - $350 per machine = $89250

($116,025)

4.14.10 Various Additional Components

A lump sum allowance should be made for the purchase of small standard items **$100,000**

($130,000)

4.15 Other Materials

Paints - assuming a requirement for primer, undercoat and finish coat (approx. 20sq m per machine)

Estimated cost per machine - $100

Annual cost **$25,500**

($33,150)

4.16 Consumable Cutting Tools - Production Machines

Annual cost **$120,000**

($156,000)

Support machines annual cost **$20,000**

($26,000)

4.17 Factory Supplies

Lubricants and greases, cutting fluids for machines

Estimated annual cost **$10,000**

($13000)

4.18 Machine Spares

The recommended requirements for spares for each type of machine will be determined through consultation with and reference to manufacturers listings. The range of spares identified will obviously vary dependant upon the size and complexity of the machine, but will be a mixture of bearings, fuses, switches, etc., and will need to be stored in a specific area so that they are readily available when required.

An estimated cost for establishing the stock of spares is

$60,000

4.19 Factory Utilities Costs

Water, electricity, fuel (gas/oil), air conditioning, consumable (heat treatment, water treatment, waste management (disposal)), etc., $160,000

($208,000)

CHAPTER FIVE

LOCATION, SITE & ENVIRONMENT

5.0 Location, site and environment

5.1. Location

Whilst the traditional approach to identifying a suitable location for an industrial site often focused only on the proximity of raw materials and markets, consideration now has to be given to a much broader range of factors that cover not only technical, commercial and financial issues but also social and environmental aspects as indicated below. However, access to a source for major cast components does influence the choice in this case.

- *** Communications/ transport**
- *** Access to appropriate human resource skills**
- *** Access to support infrastructure**
- *** Access to funding**
- *** Regulatory requirements**
- *** Cost/availability of land**
- *** Access to utilities**
- *** Climatic conditions**
- *** Political stability/national security**
- *** Currency stability**
- *** Level of industrialisation**

Consideration of the data available relative to key elements of the listing above would lead to an initial view that the broad choice of location would be between S. Arabia, UAE, and Kuwait, with a number factors also favouring Bahrain. Typical factors considered being, number of industrial operating establishments in a particular state, total

investment in industrial operating establishments, total manpower, manufacturing GDP as a share of total GDP, Land rent and charges for public services, and population.

Some reservations will inevitably remain about the longer term stability with regards to siting a facility of this significance in Kuwait, particularly as it will be seen as a showcase facility heralding the increasing industrial and technological development of the GCC states. Although the more obvious choice would appear to be between S. Arabia and UAE., the timescale to commence development of a suitable site is such, that it could provide an opportunity to one or more of the remaining GCC states, such as Oman to have progressed their industrial complexes and associated infrastructure to a satisfactory level to warrant strong consideration. In the case of Oman their geographic location obviously removes any of the potential constraints posed by the Straits of Hormuz or those related to the Red Sea.

During the field mission the team witnessed the same level of interest, commitment and strong desire from each of the 6 states for the business to be located in their respective country.

Without exception both the public sector and private sector organisations visited put forward strong supportive reasons and emotional commitment to their state being the ideal location.

All Governments and in the case of the UAE all Emirates wanted the project to be located within their borders.

Seldom can a project find such unanimous demand and offers of financial support to enable each state to put forward inward investment instruments to secure selection.

The feasibility study must take care to secure GCC wide respect for the shortlisted locations and the process via which final site selection arrives at conclusions.

5.2. Site

Consideration was given to specific sites within S. Arabia and UAE, with Riyadh, Jeddah and Dammam, along with Jebel-Ali seemingly offering the most likely overall solution. In further refining the choice, consideration was given to the logistical problems associated with transporting the major cast components to each of the short listed sites. To minimize the length of supply chain links and further guarantee security of supply, it would be more prudent to have the manufacturing facility and castings supplier as close together as circumstances permit.

Jeddah is physically more remote from the other GCC states and would therefore have the added constraint of transportation of finished product around the internal market. Whilst not as remote as Jeddah, Riyadh would have similar problems as a location, but does have the profile and importance necessary to promote the growth of the new machine tool industry. This therefore potentially leaves the consideration between the two remaining sites of Dammam in S.Arabia and Jebel-Ali in Dubai, UAE.

5.2.1. Dammam - Saudi Arabia

There are a number of organisations in S. Arabia to assist businesses to initially set up and to support on going development, amongst them are :- The Ministry of Electricity and Industry, The Saudi Consulting House, The Saudi Chambers of Commerce and Industry, The Saudi Exports Development Centre, The Saudi Arabian Standards Organisation, King Abdul-Aziz City for Science and Technology, The General Organisation for Technical Education and Vocational Training, The Meteorology and Environment Protection Department, The Industrial Investments Groups, The Saudi Industrial Development Fund.

Investors can obtain assistance in all aspects of establishing a presence through the Saudi Consulting House. They have the capability to carry out studies and research tasks on a variety of related issues and to evaluate feasibility work conducted by other organisations. There is a charge for the work carried out by the Consulting House.

Exporting is strongly supported, with export credit facilities being provided by a number of Institutions, preferential rates being given for port handling charges and storage. Reductions are also given on cargo costs for products air freighted out of the country. The Saudi Export Development Centre has been established at the initiative of the private sector with the support of Government. It is based in Riyadh and its services include:-

* data collection and dissemination on major markets
* market studies

* organising exhibitions and trade fairs
* provide technical advice and assistance
* training courses on related subjects

With regard to manpower, labour laws specify that 75 % of all workers employed and 51% of the wages paid should be to Saudi nationals, unless a special dispensation is granted by the Ministry of Labour.

All of the Industrial cities are well equipped and situated outside the residential areas. They are provided with all utilities e.g. roads, water and sewage, electricity and telephone networks, mosques, clinics, fire stations, police stations, posts, banks and public parks.

5.2.2. Jebel-Ali - Dubai, UAE

Again there are a number of organisations within the United Arab Emirates to assist with the creation and development of businesses. Amongst them The ministry of Finance and Industry, Chambers of Commerce and Industry, The Emirates Industrial Bank and the Jebel-Ali Free Zone Authority. The latter was established in 1985 to supervise the free zone and its responsibilities include the issue of licenses to companies wishing to operate in the zone, provision of technical, professional and administrative staff, and arrangement of immigration of company selected staff.

In addition to the sophisticated infrastructure at Jebel-Ali there are a number of incentives to encourage businesses to establish a prescence there i.e.

* **100% foreign ownership permitted**
* **100% repatriation of capital and profits allowed**
* **no currency restrictions**
* **15-year holiday from corporate taxes**
* **no restrictions on employment of expatriates**
* **duty-free import of machinery, parts and equipment**
* **duty-free import of raw materials, semi-finished goods and packaging**

More than 480 companies from all over the world have located at Jebel-Ali in the relatively short space of time from its inauguration. Built in the world's largest man-made port, it is both a local manufacturing and distribution base.

As referenced earlier another important factor supporting the growth of the machine tool industry will be the sourcing of key elements of the product from GCC countries. At present, no facility exists within GCC to supply the high integrity cast iron machine tool beds to the proposed factory. However, the Qatar Steel Company (QASCO) a joint venture company, have expressed a strong interest in developing the capability to produce cast iron in the appropriate grade and in the required configurations. QASCO have the capacity and technical expertise available to achieve these objectives and are prepared to invest capital to acquire the equipment necessary to accomodate the change in materials. The proximity of QASCO and ease of access into Jebel-Ali, coupled with the economics, are therefore important factors when considering the location of the manufacturing facility.

Both location options have the infrastucture in place to support the development of the proposed manfacturing facility, but given the added incentives offered by the free-port, Jebel-Ali may appear to be a more attractive financial option for the investors in the venture.

5.3. Site and Environment

5.3.1. Site Service Requirements

5.3.1.1. Water

In addition to the normal domestic requirements for water for washing, cooking, and sanitary purposes, there are a number of areas within the plant where equipment and operations will use substantial volumes of water. Where practical techniques will be employed that minimize waste by filteration, re-circulation and chilling. the equipment is as follows:-

Heating, ventilating, air conditioning
Induction hardening
Water based cutting fluids
Compressors

5.3.1.2. Electrical power

The main consumer of electrical power will obviously be the machine tools, however, air conditioning, ventilating and lighting requirements will also contribute a significant amount to usage levels. Precise requirements will be established at the facility design stage, and again every care should be taken to ensure that the most efficient power consumption techniques and equipment are employed.

5.3.1.3. Liquid Propane Gas

The level of requirement for LPG will be dependant upon a number of factors, amongst them the condition of materials supplied to the facility, and could for example increase, if cast machine beds are supplied needing heat treatment. Wherever possible and practical, it will be considered as a fuel source.

5.3.1.4. Sewerage and waste water

The facilities will be connected to the main sewerage system, detailed requirements will be established at the design stage of the project.

5.3.1.5 Materials waste

The waste materials from a manufacturing facility of this nature tend to have a minimal polutant effect, but those processes identified as potential problem areas, invariably have features designed into them, such that the effects are counteracted at source e.g. Paint spray facility. - Fumes extracted to atmosphere will have been filtered to meet the specified regulatory requirements.

Standby generator. - Suitable exhaust and noise control features are an integral part of these installation.

Heat treatment. - Again, fume and heat extraction equipment is incorporated into the overall system to reduce discharges to atmosphere to designated accceptable levels.

The metal cutting processes employed in the machine shop will generate swarf(the chips of material produced by the cutting processes). Through good house keeping and the use of appropriate swarf treatment equipment, it will be possible to consolidate this material for controlled disposal.

All machine tools have self contained coolant systems with the coolant usually being a specific mixture of water and soluble oils. The coolant does require both top up and replacement on a regular basis with waste residue capable of disposal by incineration.

Used oils from the sumps, gearboxes, etc., of machine tools and equipment can similarly be disposed of by incineration.

CHAPTER SIX

PROJECT ENGINEERING
&
TECHNOLOGY

CHAPTER 6:PROJECT ENGINEERING AND TECHNOLOGY

6.1. Overview

6.2. Machine Tool Global Trends and Technology Status

World market revenues for all machine tools peaked at $30.9 billion in 1989 and then decreased to $27.49 billion in 1992. This dip was due to the global economic recession that adversely affected both the US and European machine tool markets. Since 1993 the market has progressively recovered and a compound annual growth rate of 6.7 % is projected for the period up to 1999 when world market revenues are expected to reach $43.42 billion.

6.2.1. Metal Cutting Machine Tools

Metal cutting machines are the most important segment of the total machine tool market. They account for the most dominant portion of machine tool revenues. World wide revenues for metal cutting tools in 1995 are forecast to be $21.7 billion. This is expected to increase at a compound annual growth rate of 6.9% to $28.6 billion in 1999.

This recovery is based on improvements in the European and USA economies and the demand for modern manufacturing equipment from the emerging economies in the Pacific Rim countries.

The end users stimulating growth are in the automotive industrial and electrical sectors, augmenting existing facilities or building new plants in low labour cost economies.

The average price of metal cutting machine tools is expected to rise from $49,000 in 1995 to $51,900 in 1999 mainly due to increasing sales of NC and CNC machines.

6.2.2. Trends by Product Type

Segmentation of metal cutting machine tools in terms of product types shows turning machines and machining centres as the dominant product types. Turning machine revenue share will grow from 24.7% in 1995 to 25.8% in 1999. Turning machines are expected to remain the leading segment in this market.

Turning machines are still the most common machine in the world and there still exists a significant market for manual machines, however since the advent of microprocessor technology the market has been characterised by the increasing consumption of numerical control (NC) lathes and turning centres. The current trend is toward computer numerically controlled (CNC) machines that are capable of higher speeds and multi tasking operations that significantly reduce cycle times and lower overall machining costs.

NC and CNC turning machines are expected to account for an increasing revenue share of the total turning machine market. Their share will rise from 71% in 1995 to 73.9% in 1999 (Source: Frost & Sullivan)

6.2.3. Geographic Trends

The dominant markets for world-wide sales of turning machines are the European and Pacific Rim markets Europe is the largest market, with approximately 47%. The Pacific Rim market follows Europe with an estimated 25.6% of world market and this is expected to remain constant through to 1999.

The US with approximately 16% Latin America, Africa and China make up the rest of the world market.

6.2.4. Turning Machine Tool Revenues

6.2.4.1. Market Share

The world market for turning machines is intensely competitive there being approximately 90 machine tool vendors world-wide. Japanese companies dominate the market, however a few European companies are increasing their market share.

The Frost and Sullivan tabulation below (Figure 6-1) shows market share distribution across the major vendors in 1992.

Figure 6-1

Total Turning Machine Tool Market:

Vendor Market Shares by Revenues (World),

1992

Vendor	Market Share %
Okuma Machinery	16.1
Mazak	14.9
Mori Seiki	11.2
Gildermeister	9.1
Fuji Tool	8.3
Others	40.4
TOTAL	100.00

6.2.4.2. Europe

On account of the economic recovery and the anticipated industrial expansion in eastern Europe a compound annual growth rate of 7.3 % is forecast. Revenues are expected to reach $3.4 billion in 1999.

6.2.4.3. Pacific Rim

Because of the strengthening economies of many Pacific Rim countries and the competitiveness of their products on the global markets projections indicate a compound growth rate of 7.9 % for the period up to 1999 and revenues are expected to increase to about $1.9 billion.

6.3. Current Technology Status and Future Trends

Manufacturing technology is growing at a rapid rate, CNC machines tools are finding more applications to improve quality and increase production. Computer integrated manufacturing (CIM) and computer aided design and manufacture (CAD/CAM) are quickly become a reality in the work place . The machine tool industry is extremely competitive and manufacturers look to advances in technology to give them a competitive edge consequently there is ongoing emphasis on innovation in manufacturing technology and electronics in machine tool development

6.3.1. Machine Tool Structures

Many machine tool companies are using airframe design techniques including finite element analysis software to design machine tool beds. Such methods enable extremely rigid lightweight one piece castings or steel weldments to be produced that considerably reduce the weight and improve the accuracy of the finished machine.

For heavier duty machines the beds can be filled with composite materials to damp out vibrations. Reductions in amplitude and frequency up to 87% are achievable thus enabling fast metal removal rates to closer tolerances.

6.3.2. Transmissions

There have been significant development in the design of headstock transmission systems. Advances in synthetic materials have enabled multi vee belts to replace gear trains for the main spindle drives. The Vee belt combined with a DC drive provides improved power efficiency and a stepless speed range typically from 0-6000--- RPM.

6.3.3. Control Systems

The extremely high computing speed of 32 bit multi microprocessors is rapidly replacing 16 bit system technology.
With parallel developments in advanced CNC programming language and artificial intelligence (AI) modern machine tools are able to diagnose problems and process complex programmes.

These developments will lead to easier and more frequent communications and interactions between host computer and other NC machine tools.

Improvements in computing speeds and sensor technology have simplified and improved tool tip set-up and monitoring. Following a routine tool change the tool tip can be driven to a sensor where the tool configuration and condition is automatically read into the control software thus eliminating the need for tool tip calibration routines.

6.3.4. Tool Tip Technology

The proliferation of high productivity turning centres operating at higher speeds and greater accuracy's has provided the incentive for ongoing development in cutting edge technology and quick change tooling systems.

Carbide tipped tools and carbide inserts have displaced high speed steels for almost all turning operations. New material developments are now tending to the increased use of titanium nitride and titanium carbonitride to increase tool life.

There have been numerous development in quick change tooling systems with much improved tool tip positioning, greater rigidity and repeatability and extended edge life.

There have also been improvements in tool locking mechanisms. There are currently eight basic quick tool change systems available in the industry with six different locking methods. The Sandvik Coromant Company are a market leader in this field with a system based on a tapered polygon collet locking system that is capable of withstanding very high torsional and axial cutting forces. Because of its high rigidity the systems is well suited to multi tasking operations with passive or live tooling.

6.4. The Project

The market analysis detailed in chapter three concluded that the project focus should be on the establishment of a machine tool manufacturing facility dedicated to the production of 'state of the art' metal cutting lathes.

The analysis also concluded that the viability of the enterprise would be enhanced by the inclusion of revenue earning business modules that have some synergy with the core business but are not entirely dependant upon it. The business modules have been selected on the basis of existing needs in the GCC industrial and engineering sectors.

The project plan therefore comprises the following.

- **Manufacture of computer numerically controlled (CNC) turning centres.**

- **Precision toolmaking and machining services to aluminium extrusion and plastic moulding industries and to core business. (Further market opportunities also exist in precision components for the oil/gas and petrochemical sectors, these markets should be measured in a full blown feasibility study.)**

- **Machine tool refurbishment and repair service for machines supplied by others.**

- **A training establishment for GCC nationals and others engaged in toolmaking and machine tool technology.**

6.4.1. CNC Turning Centres - Production Facility

It is envisaged that the facility will produce CNC turning machines that will in the first instance satisfy the demand in the GCC home market and will also penetrate export markets. A range of machines will be produced incorporating state of the art CNC systems and cutting tool technology.

Initially the venture will be supported by a technology partner who will assist in setting up the facility and will subsequently supply the machine components in knock down kit form for assembly in the plant during the first 1 - 2 years of a 10 year project programme.

6.4.2. Product Range

Following field studies of manufacturing industries in GCC states a demand for metal cutting lathes has been identified. The study has also established:-

- **The potential market size in the region.**
- **The share of the potential market that the factory might achieve.**

In addition the study team analysed existing and potential machining operations in order to quantify CNC turning requirements in terms of scale and volume.

On the basis of this information Figure 6-2 illustrates the specifications for the range machines that are proposed.

Figure 6-2

Swing over carriage	**297 mm**	**330 mm**	**330 mm**
Max Machining Dia	**186 mm**	**250 mm**	**300 mm**
Max Turning Length	**350 mm**	**400 mm**	**500 mm**
Spindle Motor Power	**7.5 Kw**	**15 Kw**	**22 Kw**
No of Turret Tool Station	**12**	**12**	**12**

The product range is based on commercially available turning centres.

Type 1 in the smallest machine in the range and is ideally suited to small to medium enterprises as well training establishments. Types 2 and 3 are heavier duty machines capable of a wide range of turning operation in the industrial and manufacturing sectors.

6.4.3. Sizing the Production Facility

The market analysis carried out in Chapter 3 established that the forecast market demand for turning centres within the Arab League Member States was:- (Figure 3 - 6 refers).

1456 units in year 2000
rising to 2452 units in year 2010

Market analysis has indicated that the minimum market penetration that would be achieved by year 5 would be as follows:

GCC Homes markets 20% ,
Arab export markets 15%.

The market penetration expectation has been applied to the demand data to establish the normal feasible capacity of the plant.

The resultant production programme for the first 10 years operation has been established and this is tabulated in Figure 3 - 14. It shows that over the ten year period output will be as follows:-

	255 units in year 2000
rising to	**331 units in year 2005**
rising to	**429 units in year 2010**

6.4.4. The CNC Turning Centre Production Facility

Initially the plant will be designed and equipped to assemble CNC turning centres from component parts supplied by the technology partner. As the business develops some of the components will be sourced locally or manufactured in the plant itself.

The production philosophy will be based on current best practice incorporating just in time component availability and modular assembly techniques. A schematic of the production logistics is shown in Figure 6 - 3.

6.4.5. Production Facility Layout

A typical layout of the facility is shown in Figure 6-4 It comprises:-

- **Assembly Hall**
- **Pre-finished parts store**
- **Castings and material stores**
- **Machine shop**
- **Paint shop**
- **Packaging/crating facilities**
- **Warehousing and product despatch**
- **Heat Treatment shop and plant services (utilities)**

FIGURE 6.3 PRODUCTION LOGISTICS SCHEMATIC

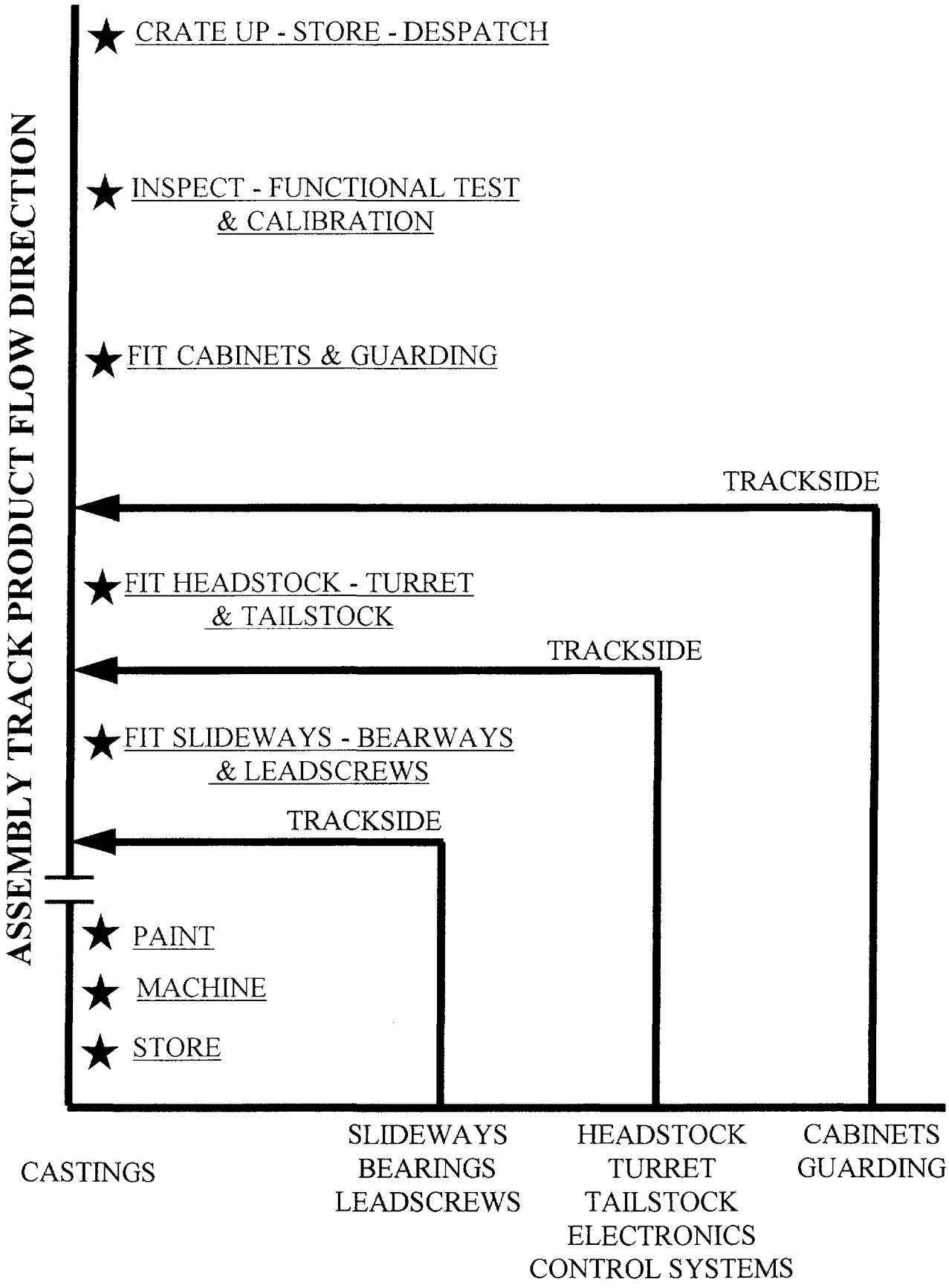
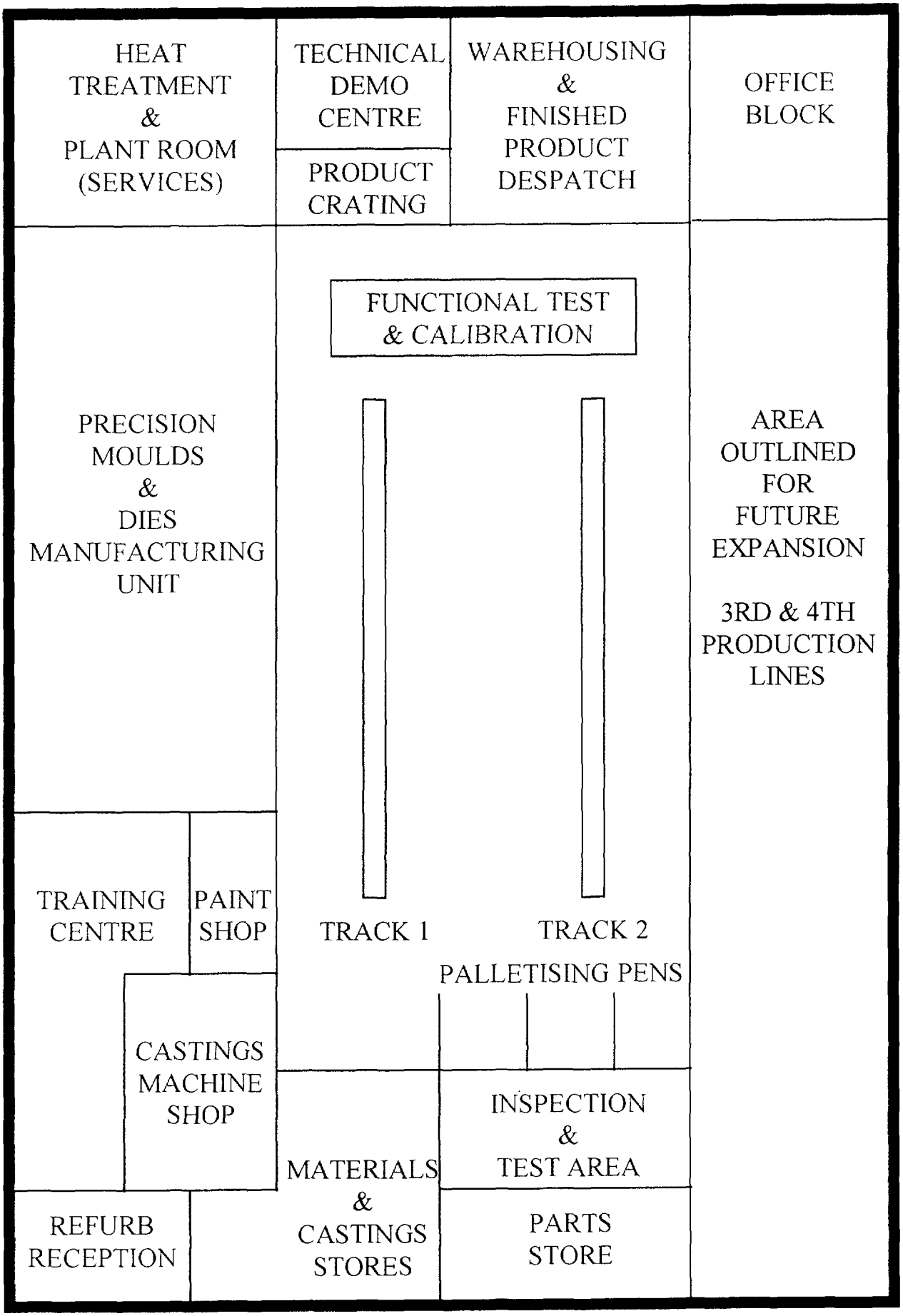


Figure 6.4 TYPICAL PRODUCTION FACILITY LAYOUT



(FOOTPRINT 9300m2)

LATHE PRODUCTION FACILITIES

At year 1 - 255 units by 2010 - 429 units
(Excludes components production unit which is built into the Precision moulds/die unit)

Category	Start Up Years 1 - 3			Additions Years 3 - 5 (Ref; Year 5)		
	Quantity	Unit Cost	Shift Pattern	Quantity	Unit Cost	Shift Pattern
Castings Machine Shop	-	-	-	4	$200K	2
Production Facility Layout						
Assembly Hall - Lines	1	$250K	1	2	$250K	1
Pre-finished Parts Stores	1	$50K	1	-	-	-
Material Stores	1	$100K		-	-	2
Paint Shop	1	$100K		2	-	1
Packing	1	$50K	1	-	-	1
Warehouse/Despatch	1	$100K	1	-	-	1
Offices + Mis/CAD/Cam	10	$50K	1	-	-	-
Total		$1150K			$1300K	

FIGURE 6 - 5
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Figure 6-5 details the machines, manning requirements and units costs of the proposed Lathe Production Facility (Turning Centre Manufacturing Unit).

6.4.5.1. Assembly Hall

The assembly hall is the principal production facility around which stores and service departments are strategically located.

The assembly hall comprises two 25 metre long powered assembly tracks that progress the cast machine beds through a number of works stations where components and controls are added to produce a fully assembled machine. The finished machines pass through a functional test and calibration facility before transfer out of the assembly hall to crating and despatch.

The assembly hall is also equipped with a 5 tonne overhead crane at least one fork lift truck and all appropriate track side tooling.

6.4.5.2. Pre Finished Parts Stores

Pre finished components are delivered to stores where they are inspected and where appropriate tested and calibrated

before being palletised for delivery to one of the trackside work cells.

The inspection and test areas will be equipped with powered test rigs, gauging and calibration equipment.

6.4.5.3. Materials and Casting Stores

This stores accommodates materials and consumables for the entire plant. Castings will normally be delivered to an external compound and are only pulled into this store for inspection and coding as required. This store will be equipped with a fork lift truck and lifting gear up to 3 tonne capacity.

6.4.5.4. Machine Shop

This facility will effect all the machining operations necessary on the machine bed castings. It will be equipped with:-

- **1 x (DNC-CNC) Planer Miller with 3 metre bed**
- **2 x (DNC) machining centres**
- **1 x (DNC-CNC) surface grinding machine.**

The machine shop will also be available to the other business groups within the plant.

6.4.5.5. Paint Shop

After machining casting will be painted (or other surface treatment) prior to transfer to the assembly track. The paint shop will be equipped with at least 2 wet back spray booths utilising state of the art paints and spray technology. This facility will also be equipped with a filtered ventilation system and a liquid effluent treatment system. This facility will also be shared with the other business groups within the plant.

6.4.5.6. Packaging - Crating

New product from the turning centre production line and product from the machine tool refurbishment group will be packaged and crated in this facility prior to despatch. The crating department will be equipped with all the requisite materials including timber and appropriate tooling including sawing, taping and nailing equipment. It will also be equipped with handling aids and a fork lift truck to enable packaged goods to be transferred to the warehouse.

6.4.5.7. Warehouse - Finished Product Despatch

Finished product is stored in the warehouse where all the relevant (machine specific) documentation is compiled and assigned to the product prior to despatch. The warehouse will be equipped with appropriate crate handling equipment including a heavy duty fork lift truck.

6.4.5.8. Offices and Technical Demonstration Centre

The plant will also include an administration office block and a technical demonstration centre where a range of machines produced in the plant will be available for demonstration and customer evaluation. Periodically these machines will be sold as 'used machines' and replaced by latest specification machines. The demonstration centre will also include examples of refurbished machines and control systems that are available for retrofit. The centre might also include sample product from the Tool and Die business centre.

6.4.5.9. Heat Treatment Shop and Plant Services (Utilities)

To service <u>both</u> die/mould and toolmaking requirements together with the "hardening and tempering" needs for lathe components. The business will need to provision itself with a modern heat treatment shop. Necessary for the through hardening of steels used in lathe components and the surface hardening of dies and moulds.

The precise nature of the processes will need careful consideration during the full blown feasibility study to ensure the latest developments are used from modern tool steels. Whilst some carborising of case hardening steels will be needed it is likely that novel processes such as Nitriding will also need to be accommodated.

Given the nature of these processes and the need for fume extraction, it is usual to combine, in this area of the plant the 'plant utilities' i.e. compressors etc.,

6.4.5.10. Future Expansion

It can be seen from the diagram that an area adjacent to the assembly hall has been set aside for future production lines 3 & 4. If forecast sales are achieved line 3 will be required by year 2003 and line 4 by year 2006.

The foregoing sections have described the basic requirements, follow on sections develop the requirements for the non core activities i.e. toolmaking (moulds/dies business, machine tool refurbishment business). Before looking at the capital and technical equipment needs in those areas it is important to summarise the capital equipment needs of the core lathe production facilities. See tabulation.

6.5. Precision moulds and dies facility

It is anticipated that initially, the facility will focus on the manufacture and refurbishment of plastic injection and blow moulding tooling, and extrusion dies and impact tooling for aluminium products. The physical size and applications of the tooling will be determined by the specific requirements of each of the industry sectors identified in SECTION 3 of the report, MARKET ANALYSIS & MARKETING CONCEPT.

For instance, it is unlikely in the early stages of development that the size of moulding tools associated with the automotive industry i.e. 1 piece moulds for car bumpers and dash boards etc., will be encountered. But processing of tooling on this scale should be considered as a part of the longer term strategy to ensure that a vital element of the market is not closed to the business at a future date.

The manufacturing capacity proposed for installation in the facility and listed in FIG 6 - 6, was determined on the basis of a short study conducted in conjunction with NEPPCO, the North of England Plastics Processing Consortium, and reflects "State of the Art" equipment currently in use in equivalent facilities in the UK. Details of the study are contained in APPENDIX 1. If required adjustments can be made to the numbers and types of equipment to reflect the needs of a developing market. Whilst it would require more detailed investigation and analysis to justify investment, there may also be some longer term opportunities to

PRECISION MOULDS AND DIES UNIT

1. 1500 units Year 1: 2443 Units Year 10 - Precision Moulds and Dies Targeted Output

NB: Incorporates machine tool requirements for production of lathe component parts for core business year 3 onward

Category	Start Up Year 1 to Year 3				As at Reference Year 5 (Additional costs to Start Up)			
	Qty	Unit Cost	Operators	Shift Pattern	Qty	Unit Cost	Operators	Shift Pattern
Machining Centres (DNC)	3	2 @ $100K 1 @ $120K	3	1 + O/T	2 Upgrade & Automation	$100K $200K	2 + (2)	2
Turning Centres (DNC CNC) 4 Axis	1	$60K	1	1 + O/T	2	$70K	2	2
Spark Eroders (DNC CNC)	3	1 @ $100K 2 @ $60K	1	2	3	1 @ $100K 2 @ $60K	1	2
Wire Eroders (DNC CNC)	4	4 @ $80K	2	2	4	4 @ 80K	2	2
Grinders (DNC CNC) Cylindrical Surface	6	2 @ $50K 4 @ $40K	6	1 + O/T	3	1 @ $60K 2 @ $60K	3	2
Planer Mill (DNC CNC) 3 Metre Bed	1	$100K	1	1 + O/T	-	-	-	-
RAPID Prototyping Facility (Fast Freeform Fabrication)	-	-	-	-	1	$200K	1	1 + O/T
Heat Treatment	1	$30K	1	1 + O/T	Upgrade	$200K	1	2

FIGURE 6 - 6
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improve operating effectiveness through the use of emerging technologies.

Appraisal and assessment of the relevance of ongoing developments should be undertaken, both in technology and in the levels of service provided by comparable types of organisations considered to be world class. This will be crucial if the facility is to capture a substantial share of the market and gradually eliminate the need for tooling to be sourced outside the GCC group of countries.

For instance, a growing number of companies now expect to receive tooling that has been proven before delivery. To achieve this without resorting to the use of production machinery, service companies are using mould spotting presses. They replicate in the service conditions of the tooling and are used for splitting, spotting and try-out of moulds and dies. They give significant reductions in commissioning and delivery times to user companies, which can be in the order of 20%. Even greater improvements can be achieved on repaired or refurbished moulds.

Laser scanning is also proving to be one of the most flexible, effective and accurate techniques for transition from part or prototype to model, mould or die. It is increasingly taking the place of mechanical touch probes and copy mills and is a fast, accurate and cost effective surface scanning and digitising system. It uses a laser beam to read and collect surface data, which, as it does not actually touch the material being scanned, allows surface digitising of soft or

flexible as well as hard materials without the need for clamping. In some cases materials with reflective surfaces do have to be treated with powder or a fine coating of non reflective spray paint. The technique can also be used for reverse engineering, with digitised information on a male form being transformed to facilitate production of data for a female form. It is possible to alter the resolution of the scanning phase to accommodate a variety of component surface shapes to optimise both the amount of data and the time taken to collect it.

6.6. Refurbishment/Retrofit Facility

It is the intention to offer the Refurbishment/ Retrofit service to include coverage of the broad base of machine tools already installed in GCC countries, in addition to those to be supplied through the new facility. A unit of work could vary from fitting a digital read out system to an existing machine tool, to carrying out a complete machine refurbishment. The targeted output for the facility is to complete 100 units of work in year 1, rising to approximately 162 in year 10.

Because both the nature of work to be carried out, and the type and make of machines to be serviced will vary greatly, the facility established to satisfy these conditions will need to be both highly reactive, and have sufficient flexibility in its installed capacity to cope with the wide ranging types of work. For these reasons it is proposed to incorporate a

mixture of CNC and conventional machine tools and equipment.

Again, as with the machine tool manufacture, it is anticipated that initially a significant proportion of component parts required to satisfy the refurbishment and retro fitting work, will be sourced through the original equipment manufacturers. There will be opportunities to progressively increase the proportion of locally manufactured and sourced components as partnerships are developed along with the necessary skills and expertise.

The service element of this facility will be critical to the overall success of the venture, as it is considered to be a key consideration for companies when choosing new equipment. It will have to be better than the competition, and ultimately require local service centres with spares holdings. It is likely that any new venture will have to sell its capability very aggressively to overcome organisations already in the market place with established reputations for providing fast reliable quality service.

FIG 6- 7, outlines the range of machine tools to be installed in the retro fitting / refurbishment facility

6.7. Project Implementation Costs

6.7.1. Feasibility Study

REFURBISHMENT/RETROFIT FACILITY

100 Refurbishments @ Year 1 Increasing to 162 @ Year 11 (2010) Targeted Output

Machine/Labour Requirements

Category			Operators		Shifts	
	Quantity	Unit Cost	Year 1	Year 10 Additional	Year 1	Year 10 Additional
Machining Centre (CNC)	1	$100K	} 1		1	1 + OT
Turning Machines (CNC)	2	1 @ $60K 1 @ $40K	} 2		1	1 + OT
Grinding Machine (Cylindrical)	1	1 @ $50K	}			
Grinding Machine (Surface)	1	1 @ $40K	}			
Drill and Tap (Conventional)	1	$15K	}			
Band Saw	1	$5K	} 4	2	1	1 + OT
Bar Saw	1	$10K	}			
Guillotine	1	$15K	}			
Bending	1	$10K	}			
Welding		$10K	}			
Strip/Assembly			4	2	1	1 + OT
Fitting Tools	6 sets	Total (6) $50K				
Field Service Staff	2 sets	Total (2) $10K		5		

FIGURE 6 -7
Page 1/1

A full industrial feasibility study must be undertaken in order to provide all the data necessary for an investment decision.

In general the study will include a critical analysis and costings for all relevant commercial, technical, financial economic and environmental issues.

In particular the study will address project specific issues including:-

6.7.1.1. Marketing

Marketing requirements for:-

- **CNC Turning Centre**
- **Tools and Dies**
- **Jigs and Fixtures**
- **Machine Tool Retro-Fit and Refurb services**
- **Training Services - Machine Tool Technology**

6.7.1.2. Plant Design

- **Optimum layouts of the plant for the individual business activities.**
- **Requisite number of machines by type and size.**
- **Quantify plant service requirements for water, electrical power and its distribution compressed air and industrial gases.**
- **Cranage and Transport**

- **Accommodation and welfare requirements for factory and office personnel.**

6.7.1.3. Factory - Capital

Determination of capital costs presented as estimates and as a percentage of the total investment cost including costs for:-

- **Land and Buildings**
- **Plant and machinery**
- **Tooling and utilities**

6.7.1.4. Production Costs

Estimates of all costs associated with production:-

- **Operating costs**
- **Depreciation charges**
- **Marketing Costs**
- **Finance Costs**

The estimated cost for the feasibility study compiled and presented to the UNIDO format.

$250,000

Turning Centre Manufacturing Plant in the GCC
Pre-Production Project Activities/Timescales/Costs

Task Name	Start	End
Pre-Production Project Activities/Timescales/Costs etc.	02/01/98	03/01/00
Identify & Secure Investors	02/01/98	30/06/98
Legal/Financial Expert	02/01/98	30/09/98
Project Management Expert (US$10,000/Month) Ongoing	02/01/98	30/12/99
Obtain Letters of Intent	02/02/98	30/04/98
Plant Design (US$500,000)	01/04/98	30/09/98
Site Preparation & Build Phase	01/10/98	31/03/99
Complete Incorporation of the Enterprise	01/06/98	30/09/98
Commence Mobile Sales & Marketing Activity Ongoing	01/05/98	30/12/99
Develop Supplier Partnerships - Ongoing	01/06/98	30/12/99
Commence Personnel Recruitment - Ongoing	01/06/98	30/12/99
Commence Personnel Training - Ongoing	01/09/98	30/12/99
Commence Production Equipment Capital Spend	02/11/98	30/04/99
Commence Installation & Commissioning Phase	03/05/99	30/12/99
Commence Production - ONGOING	03/01/00	03/01/00

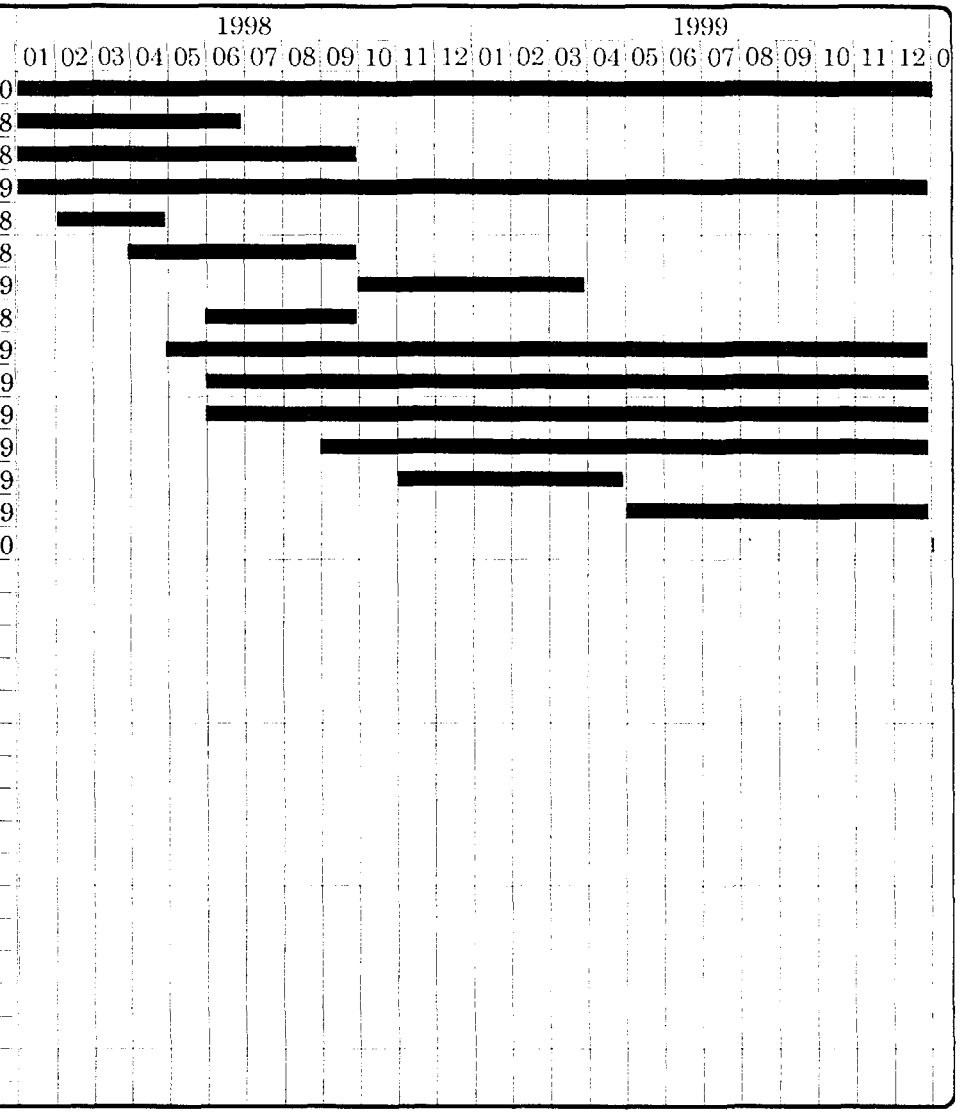


Figure 6-8

Author : D. Mc Cabe - GCC Project Engineer

6.7.2. Pre Production Costs

During the pre production phase costs will be incurred for the labour necessary to undertake the preparatory measures needed to start the operational phase.

A project plan will be established, that will identify all the commercial and technical activities, timescale and cost upto and including commissioning.

These activities are summarized graphically in Fig 6-8. This shows the estimated sequencing, time frames costs for each activity. They include, anticipated salary levels required to attract the calibre of personnel necessary to ensure the success of the project, the broad ranging commercial, technical and innovative activities and spend on capital equipment.

6.7.2.1. Investors/Technology partner

The initial work will be in identifying appropriate investors for the project with the vision, commitment and understanding of the longer term benefits to be gained from involvement. For these reasons it is anticipated that the majority of investors will emenate from the GCC countries. Whilst there may not necessarily be opportunities for some of the investors to replicate the facility in their own country, they will benefit from the growth that the successful embryonic enterprise will generate. The benefits will be in the form of new technologies, new materials, new

skills, training capabilities, supply chain opportunities etc., which in themselves will lead to the spawning of new enterprises, creating a support infrastructure where non previously existed.

6.7.2.2. Technology partner

A key figure in this identified group of investors will be the Technology partner. They will bring to the partnership a number of vital ingredients i.e. technological expertise related to the product through design, materials, markets. Process expertise in manufacturing the product, supply chain expertise in materials and component sourcing and also management expertise. All of their skills will have been accumulated and refined over many years of developing and selling product into a highly competitive market place. The application of these skills to the GCC project will have a positive impact upon the Learning Curve that all personnel new to the enterprise will have to move through, to reach the World Class levels that are aspired to.

It is unlikely that the prospect of just "x" % of additional sales into another market would be sufficient inducement to a Technology partner to go through the intensive knowledge and technology transfer exercise that the project demands. There will need to be an additional element to their involvement and will probably be in the form of a collaborative R&D project to develop either further

products to extend their existing range to satisfy a particular market requirement, or the enhancement or addition of features to the products that improve their market position.

Overall responsibilty for identifying the investors would fall to a suitably experienced and qualified legal/finacial expert with a proven track record in creating ventures of the proposed scale, who would also achieve incorporation of the business within an estimated 9 months timescale from commencement of the pre-production phase. He would be expected to work very closely and in cooperation with an appointed Project Manager on whom would fall the total responsibilty for progressing and achieving the objectives outlined in the Business plan.

6.7.2.3. Plant design

It is anticipated that the detailed design and specification of the plant will commence from a point where letters of intent have been lodged with the legal specialist, by all the committed investors, with the target notionally 3 months into the programme.

The design aspect of the work will also require input and support from acknowledged expertise working in conjunction with the various support agencies in the host country. The fundamental size of the facility will be determined by translating the market information into installed capacity requirements. From the descriptions of

the equipment identified to support the various business areas i.e. machine tool manufacture, precision tools and dies, machine refurbishment/retrofit and training, when combined with the requirements related to all utilities, auxiliary equipment, offices and welfare facilities etc., it will be possible to accurately arrive at floor space requirements. From this, consideration can be given to civil and structural design features including floor loadings, headroom, lifting capacity, drainage, sub-station (if req'd), security, parking, landscaping and easthetics.

It is expected that site preparation will commence within a period of 6 to 8 months from commencement of the design phase.

In addition to the above work, other vital elements of the programme will be initiated and running in parallel and will include sales and marketing activity, supplier/partnership identification, capital acquisitions and training.

6.7.2.4. Sales and Marketing

It will be essential to establish the focus for the sales and marketing activity at an early stage, to ensure that sufficient awareness and business opportunities are generated to coincide with the availability of product from the new venture. Given that the internal market is not of a sufficient size in its self to support the facility, then potential export capacity will have to feature in the Marketing Strategy from the outset. The diverse nature of

the 4 business areas will complicate this process, and whilst they are complimentary to each other, the target audience that might avail themselves of the services will vary greatly. For example someone using the tool, and die making capability may have little interest in the machine tool output and vice versa. Therefore the application of a number of alternative marketing techniques may be necessary to satisfy this scenario. A style that has been successful in the past is that of a high technology mobile road show. By moving around the markets it would demonstrate the range of capabilities of the business and provide an opportunity for potential customers to bring their problems to the road show for resolution. Suitably equiped, it would provide tangible evidence of the benefits to be gained in product quality and performance by accessing and utilizing new technology.

6.7.2.5. Supplier/Partners and Capital spend

Although many of the components and materials in the machine tools manufacture will initially be sourced and supplied through the Technology partner it will be important to quickly initiate a sourcing programme. This will afford an early opportunity to build up the proportion of local input to the product. A start well before the production stage of the facility is essential in view of the many difficulties that will inevitably be experienced. For instance, although it is anticipated that the cast beds for the turning machines will be sourced as a part of the knock down (KD) kit at the outset of production, there is currently

no known source for cast iron components of the quality and grade demanded in any GCC country. However, Qatar Steel Company (QASCO) who have sufficient spare capacity to satisfy the new plants requirements, have expressed a strong interest in modifying their plant to also produce the appropriate grade of cast iron, and to make any associated capital investment that may be necessary. The fact that the plant has limited pattern and core making capability means that substantial knowledge transfer, training and investment will be required to bring the plant to the expected level of competence. A further consideration for QASCO is that their installed melt capacity far exceeds that which is likely to be required to satisfy the machine tool plant. Therefore they will also need to seek out other markets for the cast iron product to absorb the spare capacity. All of these areas of activity will require significant time and effort to achieve success.

This limited, but key example of materials sourcing is indicative of the scale of work that is required to be completed by both the procurers and the suppliers in working towards a high level of GCC sourced input into the products.

Despite the strong competition within the machine tool market, the so called, conventional CNC machine tools that

are planned for incorporation into the manufacturing plant are not necessarily obtainable "off the shelf". Determination of each machines specification, confirmation of performance capabilities, specialist features, price negotiation, packaging, shipment and transportation will all add to the lead times for the machines. It is therefore entirely possible that the time scale for the process of specification, through order placement, build and onto delivery and installation could exceed the current predicted programme cycle and could be a key determinant of production start up dates. Equally, if in the interests of standardisation there is a policy to only purchase machines that are fitted with FANUC CNC control systems, this may limit who the machine may be purchased from and again impact upon delivery performance. Whilst it is also usually possible to purchase a machine of similar specification from more than one supplier, it is likely that in doing so, it will cause a proliferation in service, spares, back-up and training requirements.

6.7.2.6. Training

There is a need for a progressive training programme running through to, and beyond commencement of production, which will encompass the whole range of disciplines within the business and be required for all grades of personnel. Much of the training will revolve around the Technology partners products and processes and will build up the capability to ultimately service the market.

For Technicians in particular, who will be involved in the manufacture, assembly, testing, commissioning, and servicing of the range of products, the training will be a mixture of hands on and theoretical work. It is expected that the Technology partner will already have in place a suite of training programmes that have been developed to satisfy the support requirements of their markets.

A further group of technicians will be required to be trained to maintain the facility as a whole, covering certain aspects of the machine tool population, in addition to all of the auxiliary equipment e.g. air conditioning, compressors, generators, transport etc.

Management and supervisory training will obviously contain a strong element related to product and process knowledge, but will also contain all of the features associated with a modern, high technology manufacturing facility covering financial, purchasing, materials control/production control(MRP, MRP II, OPT), etc.

It is important to give process operators product knowledge training, to provide them with a greater understanding of the value and importance of their contribution to the manufacturing cycle and the implications for product quality. Familiarization with specific machines and processes and their controllers (CNC) where fitted, would be carried out on an as required basis.

The Training facility will have to be staffed with personnel already having the appropriate level of competence and skill relative to the Computer Aided Design (CAD) and Computer Numerical Control (CNC) systems and machinery installed. Their training would normally be related to upgrades to the current systems and equipment in use, new technology and new and existing company products.

The study further proposes that these training facilities be a marketable service. See Chapter 3.0.

6.7.3. Analysis of Activities and Cost

(Assumes completion of Feasibility Study proposed at 6.7.1.4.)

6.7.3.1. Identify and secure investors.

Investors are likely to be institutions or industrialists within the GCC states and a technology partner. Early commitment i.e letters of intent would be necessary to enable the project to proceed.

Maximum duration six months - cost $100K

6.7.3.2. Incorporation of business

Compliance with national and international regulations and procedures followed by formal application to relevant authorities and subsequent registration of the new company.

Duration four months - Cost $50K

6.7.3.3. Legal and Financial Expert Support

Legal expertise will be required to draft the articles of association, appoint a board of directors and senior managers post public notices and open bank accounts, organise supplier credits, loan financing and investor funds.

Duration nine months - Cost $150K

6.7.3.4. Project Management

Appointment of a qualified project manager or consultant who would ensure that the execution of all works complied with the implementation programme and budgets.

Duration - continuous through to commissioning
Budget Costs - $ 180K

6.7.3.5. Plant Design

Services of Architect Civils Engineers and Production engineers will be required for the preparation of design, layouts, detail drawing and specifications for the building and equipping of the plant.

Duration (Team) six months - costs $ 500 K

6.7.3.6. Site Preparation and Build

Site logistics subcontractors and deliveries from suppliers need to be carefully managed to ensure that the sequence of civil work and construction are executed according to plan. Expediting and the provision of technical assistance to avoid hold ups or deviations from specification and programme.

Duration six months - Cost $180K

6.7.3.7. Training

Pre production training for management and production staff will be undertaken in parallel with site construction and into commissioning. The training will be delivered by experts within the GCC states and the technology partner both at the home plant and the new site.

Duration seven months - cost $ 100 K

6.7.3.8. Plant Commissioning

This is the final and most critical pre production activity requiring inputs from project management, plant design and staff from capital equipment suppliers and the technology partner.

Commissioning will comprise the following activities.

- **Pre operational checks**
- **Trial runs**
- **Performance tests**
- **Acceptance and take over trials.**

Duration four months (average manning level 4 persons)
Cost $160K

6.7.3.9. Sales and Marketing Activities

Management and implementation of sales and marketing activities including advertising, training of salesmen and agents and the establishment of distribution networks and facilities including showrooms and road shows.

Duration twelve months - Cost $ 100K

6.7.4. Post Design Costs

6.7.4.1. Building Utilities and Plant

In order to establish the broad investment requirement for the project budget costs for the facility comprising the building, utilities and plant have been estimated:-

• Basic building 9300 m^2	$5.000 million
• Cranage: 2 x 5 tonne overhead	$0.050 million
• Air conditioning system	$0.150 million
• Standby generator and sub station	$0.050 million
• Air compressor and receivers	$0.100 million
• Water and effluent plant	$0.015 million
• Service Roads car parks gardens, perimeter fence and signage	$0.100 million
• M.I.S. & CAD/CAM Network	$0.500 million
• Casting compound and Fork Lift Truck	$0.060 million
• Swarf and Waste Storage and Removal	$0.015 million
• Capital Plant Years 1-3	$2.875 million
" " Yeas 3-5	$3.000 million
Total	$11.915 million

6.7.4.2. Post Design Costs Summary

Land Cost & Building Cost	**$5.000 million**
Cranes	**$0.050 million**
M.I.S. & CAD/CAM Network	**$0.500 Million**
Production Equipment:-	
Years 1-3 Lathe Unit	**$1.150 million**
Years 3-5 Lathe Unit	**$1.300 million**
Precision mould/die unit (Year 1- 3)	**$1.310 million**
Precision mould/die unit (Year 3 -5)	**$1.700 million**
Refurbishment Facility	**$0.415 million**
A/C	**$0.150 million**
Standby Generator	**$0.050 million**
Air Compressor System	**$0.100 million**
Water/Effluent Treatment	**$0.015 million**
Service Roads etc.,	**$0.100 million**
Casting Compound	**$0.060 million**
Swarf System	**$0.015 million**
TOTAL	**$11.915 million**

6.7.5. Human Resource Requirements

6.7.5.1. Turning Centre Production Facility (Year 1)

Factory Labour at Year 2000

(Commence Production)

Lathes Factory Output machines Year 1	**= 255 machines**
Assume 40 production weeks per year	
Factory Output machines per week	**= 6.4 machines**
Assume 2 assembly tracks	
Factory output per track per week	**= 3.2 machines**
Man hours required to assemble 1 machine	**= 300 hours**
Man hours required per track per week	**= 960 hours**
Assume one man week = 40 hours	
Therefore production workers required	**= 24 per track**
Total (two tracks)	**= 48**

Additional direct labour:-

Management	**1**
Casting Machine Shop	**4**
Paint Shop	**2**
Finished parts store and test	**4**
Castings Store	**2**
Palletising (assembly tracks)	**3**
Crating - Warehousing	**4**

Indirect labour:-

Production Control	**3**
Maintenance	**2**
W/Shop labour	**2**
Supervision	**3**
Technical Support	**3**

TOTAL	**81**

6.7.5.2. Tool and Die Shop

Direct labour:-

Machinists	**6**
Toolmakers	**4**
Inspectors	**1**

Indirect labour:-

Supervision	**2**
Management	**1**
Clerical	**2**
W/Shop labourer	**1**

TOTAL	**17**

6.7.5.3. Refurbishment - Retrofit Facility

Direct labour:-

Machinist	**9**
Fitter Mech.	**3**
Fitter Electrical	**3**

Indirect Labour:-

Supervision	**1**
Management	**1**
Clerical	**1**
Workshop Labourer	**1**

TOTAL	**19**

6.7.5.4. Training Group

Instructors	**5**
Management	**1**
Clerical	**1**

TOTAL	**7**

6.7.5.5 Turning Centre Production Facility (Year 5)

Lathes Factory Output machines Year 5	**= 314 machines**
Assume 40 production weeks per year	
Factory Output machines per week	**= 7.85 machines**
Assume 2 assembly tracks	
Factory output per track per week	**= 3.93 machines**
Man hours required to assemble 1 machine	**= 300 hours**
Man hours required per track per week	**= 1177.5 hours**
Assume one man week = 40 hours	
Therefore production workers required	**= 30 per track**
Total (two tracks)	**= 60**

Additional direct labour:-

Management	**1**
Casting Machine Shop	**5**
Paint Shop	**3**
Finished parts store and test	**5**
Castings Store	**3**
Palletising (assembly tracks)	**4**
Crating - Warehousing	**5**

Indirect labour:-

Production Control	**3**
Maintenance	**2**
W/Shop labour	**3**
Supervision	**4**

Technical Support	**4**

TOTAL	**102**

6.7.5.6. Tool and Die Shop

Direct labour:-

Machinists	**10**
Toolmakers	**6**
Inspectors	**2**

Indirect labour:-

Supervision	**3**
Management	**1**
Clerical	**3**
W/Shop labourer	**1**

TOTAL	**26**

6.7.5.7. Refurbishment - Retrofit Facility

Direct labour:-

Machinist	**9**
Fitter Mech.	**3**
Fitter Electrical	**3**

Indirect Labour:-

Supervision	**1**
Management	**1**
Clerical	**1**
Workshop Labourer	**1**

TOTAL	**19**

Assumes productivity improvements in line with 5 year experience (no labour growth)

6.7.5.8. Training Group

Instructors	**12**
Management	**1**
Clerical	**3**

TOTAL	**16**

CHAPTER SEVEN

ORGANISATION
&
OVERHEAD COSTS

CHAPTER 7: ORGANISATION AND OVERHEAD COSTS

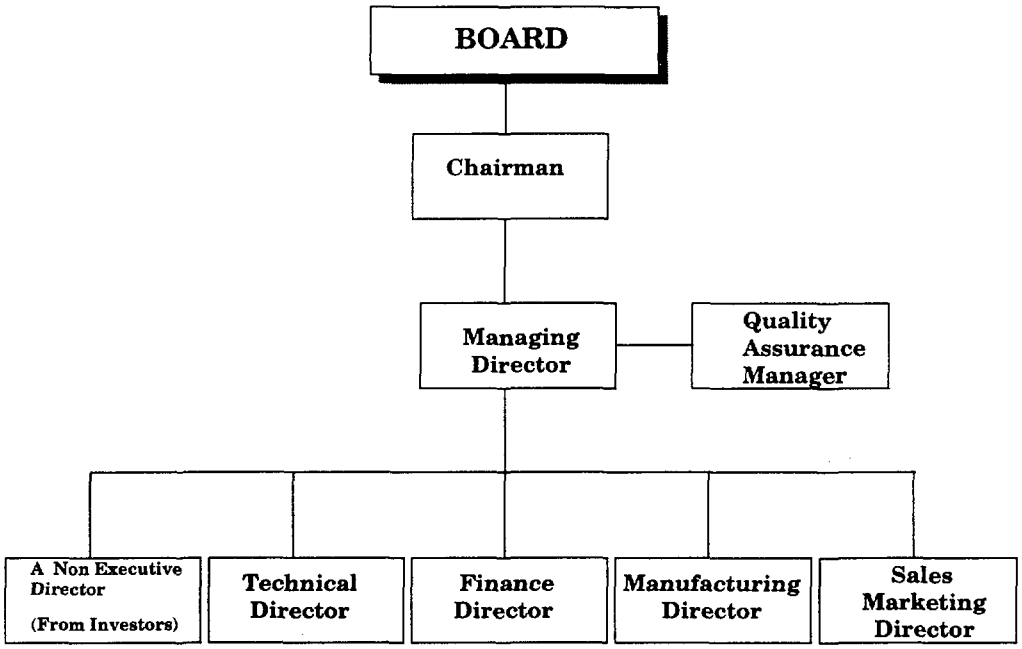
7.0 General Management

The business scenario that is being put forward has basically three investor categories that will join together to realise the objective of the project, i.e. to establish a turning centre manufacturing unit within the Gulf Co-operation member states.

Each investor category will need to understand that the overall business management of the enterprise is being satisfactorily handled by the Board of Directors and the Management Team, and that there is provision for each investor to have the opportunity to be able to input into the organisation at the highest level to influence its direction.

What follows is a diagrammatic indication of the organisational structure, illustrating its functional elements and the business units that exist within each aspect of the organisational hierarchy.

Figure 7-1



The proposed structure of the Board of Directors is as above, all of which will be drawn from the eventual investors of the company, recruited company executives from the GCC states, and from European and International countries dependant upon the Technology Provider.

There will be a balanced Board of Directors, comprising four non-executive positions and four executive positions, with the role of Company Secretary being provided by the Finance Director.

CHAPTER 7: ORGANISATION AND OVERHEAD COSTS

7.1 The Chairman

This post will be a non-executive position, and the individual will be drawn from a GCC Private Sector Investor in the Company.

The Chairman will need to be an individual possessing great influence and ideally will have a well established and successful background history of involvement in the development of new business ventures.

In case studies of similar enterprises within the Middle East analysed by the study team, a combination of visionary entrepreneurship on the parts of the Chairmen and Chief Executives and a highly innovative approach to the market place by the Management Team played an integral role in their success.

7.2 Executive Directors

7.3 The Chief Executive Officer

This role will be an executive post, again drawn from the participating investors, ideally from a GCC Private Sector organisation, and preferably a GCC National.

This position is recognised by the study team as the most strategic recruitment and the individual will need to be visionary in order that the organisation achieves over time a reputation for quality, excellence and innovation. The whole project will be driven by the Chief Executive and as such the individual will need to be exceptionally talented, in a broad range of management skill areas, and will be a charismatic high achiever.

These qualities are essential for a successful project to be achieved.

It is therefore necessary for the Chief Executive to have expertise in :-

Project Management

Marketing

Total Quality

Human Resource Management

This individual will need to have extensive experience in setting up assembly/manufacturing plants in the Middle East and ideally should have worked within an allied machine tool user industry sector for a minimum of five years.

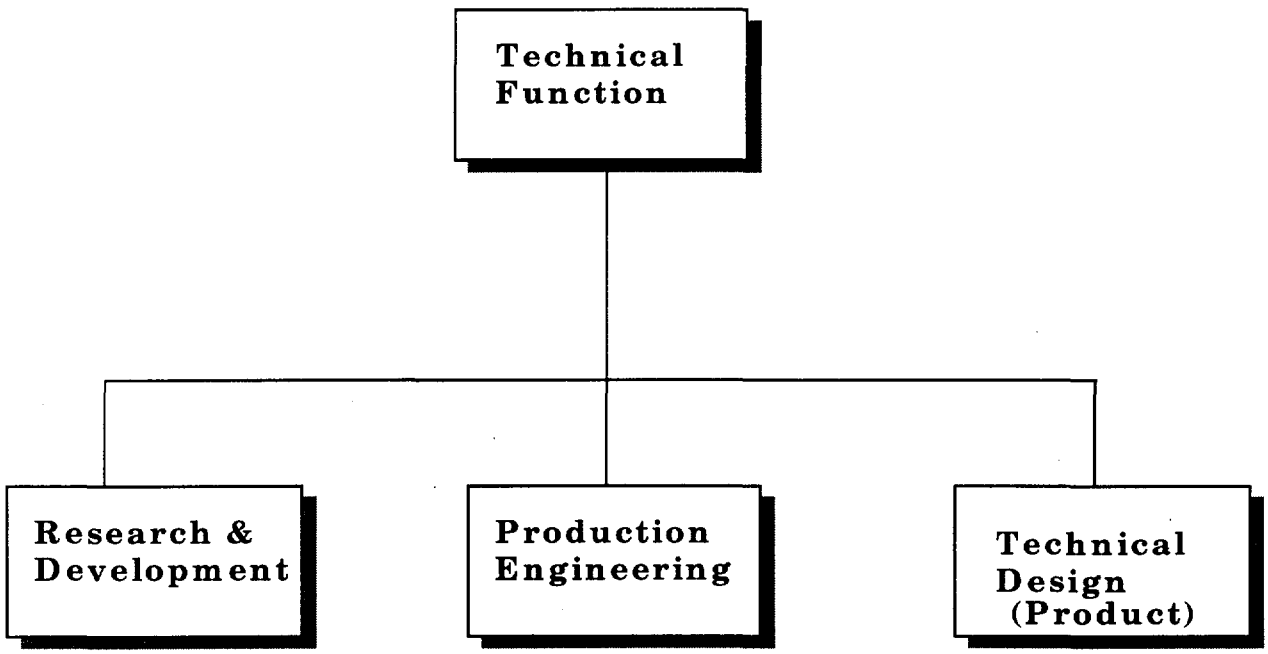
7.4 Technical Director

This post will be an executive position and the incumbent will be responsible for the overall production of the finished product and the technical design and engineering aspects of the current and future range of products offered by the organisation.

Additionally this individual will provide the liaison point back to the "Mother" investor, who will advise on technical problems and new technological advancements.

Ideally this individual will be recruited from the "Mother" investor and will have a proven track record at senior management level, responsible for the manufacturing, engineering and design activities of a major turning centre manufacturing plant. It is further proposed that the post be understudied by a GCC national within the management team for succession management. (see figure 7-2)

Figure 7-2

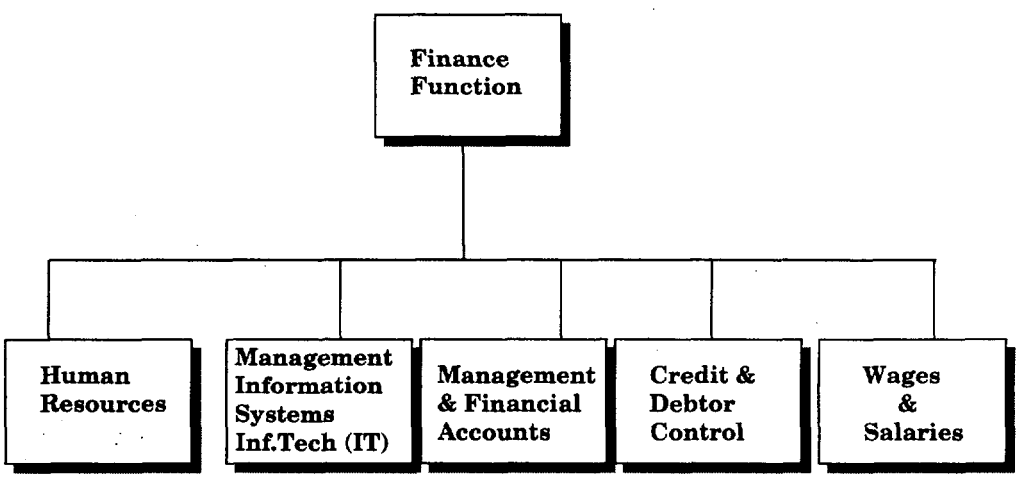


7.5 Financial Director & Company Secretary

This executive post will be filled, ideally by a GCC national from the Public Sector, with a proven track record in the successful implementation of new venture initiatives within the Middle East.

Additionally the individual will provide the role of Company Secretary to the Board of Directors as part of the responsibilities of the post. (See Fig 7-3)

Figure 7-3



7.6 Manufacturing Director

The Manufacturing Director should ideally be provided by the Technology Partner and bring with him expert

knowledge in all of the three manufacturing activities that are in operation within the enterprise:-

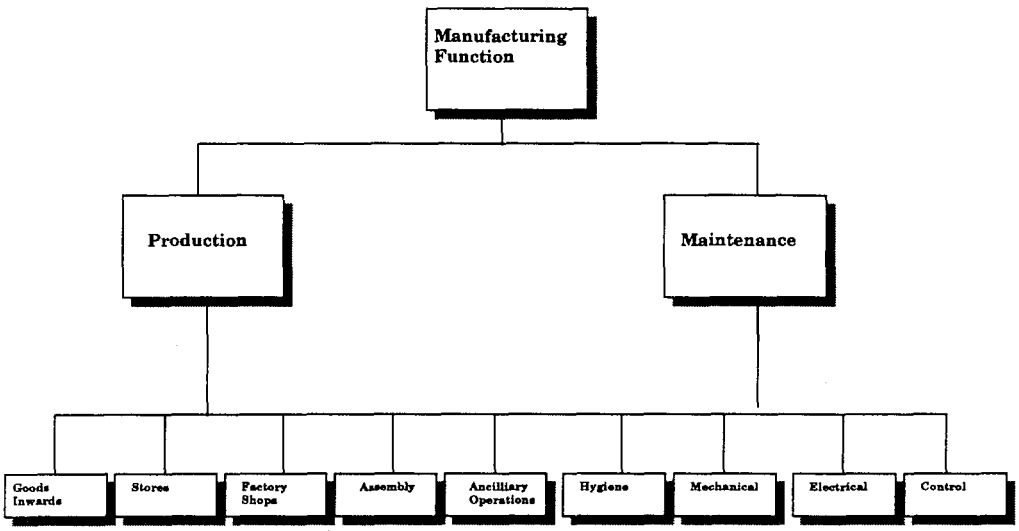
- Turning Centre Manufacture
- Precision Moulds and Dies Manufacture
- Refurbishment and Retrofitting Services

The individual will have overall responsibility for all areas of manufacturing and servicing, and will co-ordinate the integration of resources to ensure that all production machinery is used to deliver the required production programme for each of the operations. The post will be for a minimum of two years.

Throughout this period the role will have been understudied by a GCC national in readiness to assume responsibility at the end of the two years period. The role will also encompass the overall financial management and control for the enterprise. (An understudy within the management team being the preferred approach).

(See fig 7-4)

Figure 7-4



7.7 Sales & Marketing Director

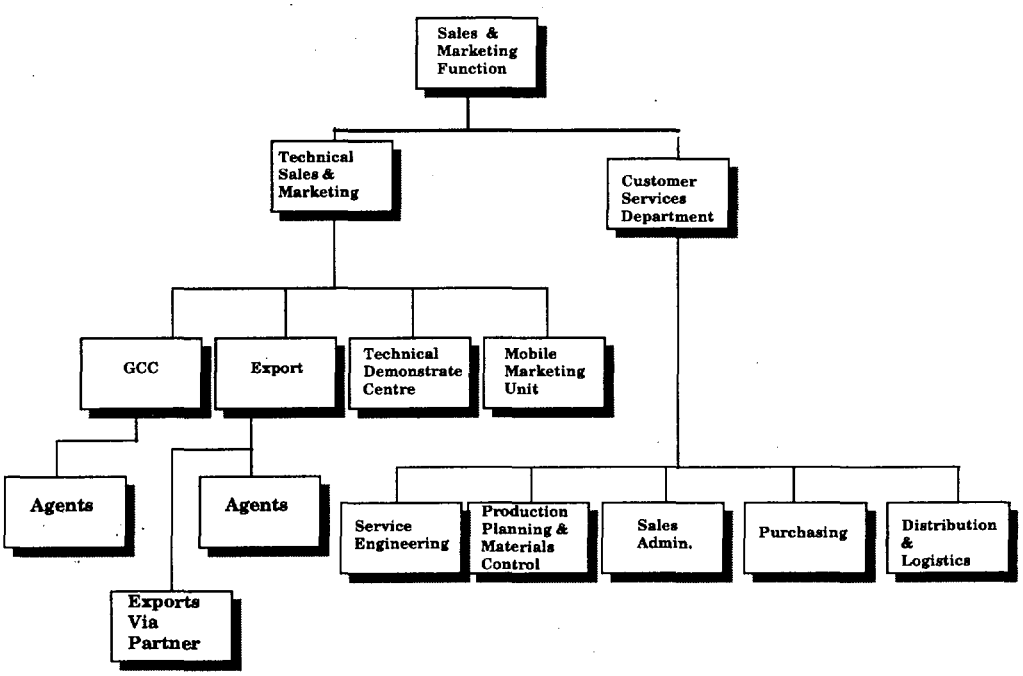
This post is the final executive position on the Board of Directors. It is strategically a key role, in that the penetration of markets and the achievement of significant market share across the identified target countries is central to the success or failure of the manufacturing plant.

The individual will have the key role of creating the infrastructure of a network of agents in of the GCC member states and in each of the targeted Arab League states, to facilitate the fast and effective capture of market share. Consequently the individual will ideally have access to such a network currently.

It is proposed that this individual will be recruited into the position, and will be an Arabic national with an extensive knowledge of the machine tool user market segment.

The post holder will have a proven track record in the creation and operational management of sales and marketing activity within the manufacturing sector as described within Chapter 3. (see Fig 7-5)

Figure 7-5



7.8 The Management Team

The second layer of the organisational hierarchy is the Management Team.

This will be composed of experienced individuals, who will have the overall responsibility for the delivery of the operational plan across all of the manufacturing and training business units and consequently the day to day running of the business.

It is essential that this group operate as an integrated unit, co-operating and collaborating with each other in a cross-functional manner, in order that a flexible, reactive and efficient approach to solving the needs of the business is achieved, in the short, medium and longer term.

The key roles that are required by the organisation are described below

7.9 Sales/Marketing Manager

The individual will have responsibility for the operational management of:-

Market Research -

Marketing

Home and Overseas Agency Network

The Sales Force

The Technical Demonstration Centre

Public Relations

Customer Service

Production Control

Procurement

Warehousing

Distribution Logistics

In addition to the above responsibilities, this post will need to deputise in a pro-active role for the Sales and Marketing Director as required.

The individual will ideally be recruited locally to the plant, (although this is not essential) and will be an experienced individual with a proven track record in a senior technical sales/marketing management role. He may currently work for a leading Gulf import agency.

7.10 Design/Engineering Manager

The individual will have responsibility for the operational management of:-

Production Design

Mould & Die Design

Product and Process Engineering

In addition to the above responsibilities, this post will need to deputise in a pro-active role for the Technical Director, on matters of a design nature as required. (understudy)

The individual will ideally be recruited locally to the plant, (although this is not essential) and will be an experienced design engineer with a proven track record in a senior design/engineering management role, preferably obtained within the private sector.

7.11 Manufacturing/Operations Manager

The individual will have responsibility for the operational management of:-

Manufacturing Operations

Plant and Services Engineering

Maintenance

Facilities Management

In addition to the above responsibilities, this post will need to deputise in a pro-active role for the Manufacturing Director, on matters pertaining to production as required. The individual will ideally be recruited locally to the plant, (although this is not essential) and will be an experienced production engineer with a proven track record in a senior manufacturing management role, preferably obtained within the private sector.

7.12 Management Accountant

The individual will have responsibility for the operational management of:-

Management and Financial Accounts

Internal & External Auditing

Job Costing/Marginal Costing

Creditor and Debtor Control

Wages & Salaries

Insurance

Legal Issues

Banking Relations

Management Information Systems & Information Technology

Administration

In addition to the above responsibilities, this post will need to deputise in a pro-active role, on financial matters, for the Financial Director as required.

The individual will ideally be recruited locally to the plant, (although this is not essential) and will be an experienced accountant with a proven track record in a senior financial management role.

7.13 Human Resource Manager

The individual will have responsibility for the operational management of:-

Contracts of Employment

Government Relations

Employee Relations

Public Relations

Industrial Relations

Employee Development

Human Resource Planning

Recruitment and Selection

Catering Facilities

Staff Records

Health and Safety Issues

Reward/Bonus Schemes

Welfare and Social Activities

Cascading Team Briefing System

In addition to the above responsibilities, this post will need to deputise in a pro-active role, on matters pertaining to human resource management, for the Financial Director as required. The post holder will be required to manage the relationship with Gulf public sector with respect to salary subsidy (See chapter 8).

The individual will ideally be recruited locally to the plant, (although this is not essential) and will be an experienced personnel manager with a proven track record in an industrial personnel management role.

7.14 Total Quality Manager

The individual will have responsibility for the operational management of:-

ISO 9000 Compliance

Quality Control

Quality Assurance

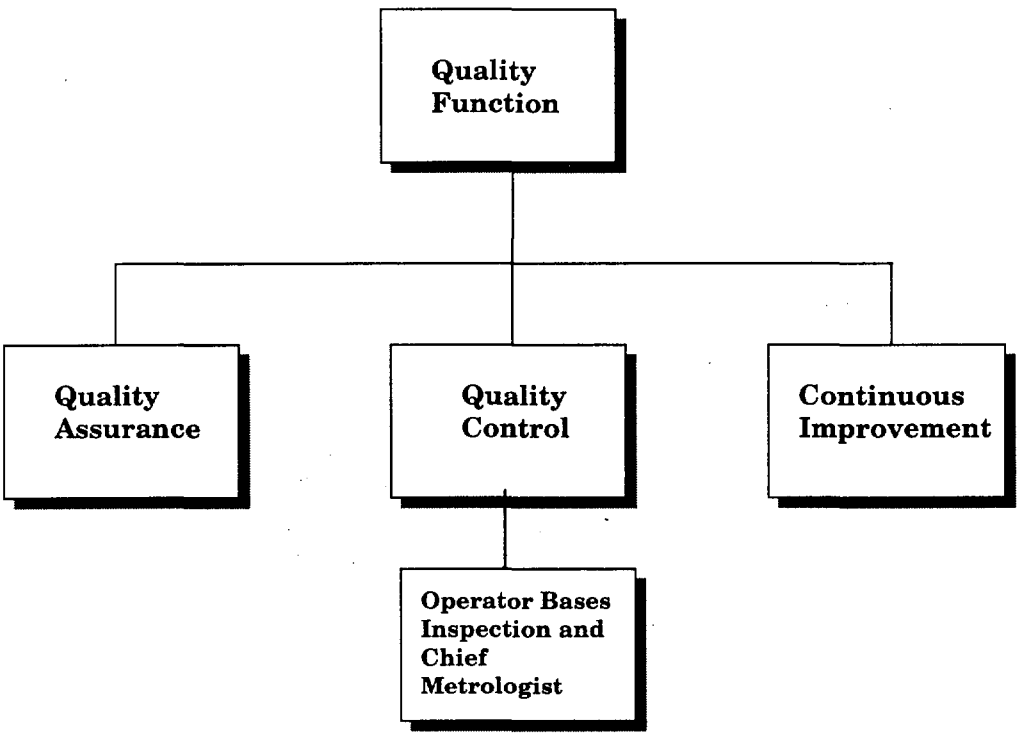
Continuous Improvement

This post will report directly to the Chief Executive Officer, in the classical style, on all matters relating to quality. This role is key to the penetration into the market place of the product range. The product will only become established if it achieves a reputation for quality, reliability and value for money. The role of this individual is to create a culture and philosophy of Total Quality throughout all levels of the organisation, with the goal of zero defects firmly in the minds of all involved in the creation of the end product.

The individual will be recruited ideally from the mother investor and will be a highly skilled individual in the quality discipline. He will possess good interpersonal skills and will be able to instruct the workforce on the fundamental philosophy that lies behind Total Quality.

In addition to the above requirements, this individual will deputise for the Chief Executive Officer on all matters relating to quality as required.
Driven by IS0 9000 expertise, the post should also be understudied by a GCC national in the junior management team for succession management. (see Fig 7-6)

Figure 7-6



7.15 Sales Distribution Agency Network

Figure 7-7 below illustrates how the market for the manufacturing plant will be divided into three areas:-

- **The Home Market - GCC States**
- **The Arab League Export Market**
- **The Rest of the World**

To deliver market penetration quickly in line with the forecast within Chapter 3, a network of specialised distribution agencies will be needed, working on a retainer basis, earning income from sales, based on commission.

The study team have concluded that it would be essential to have agency offices within each of the GCC countries, however area offices would be more desirable within the states of the Arab League and any future world markets that could be targeted on the achievement of organisational critical mass (i.e. in the reference year 5).

It is likely that in the Arab League export markets one distribution agent will be set up to cover sales in a number of countries, and this is likely to take the following format:-

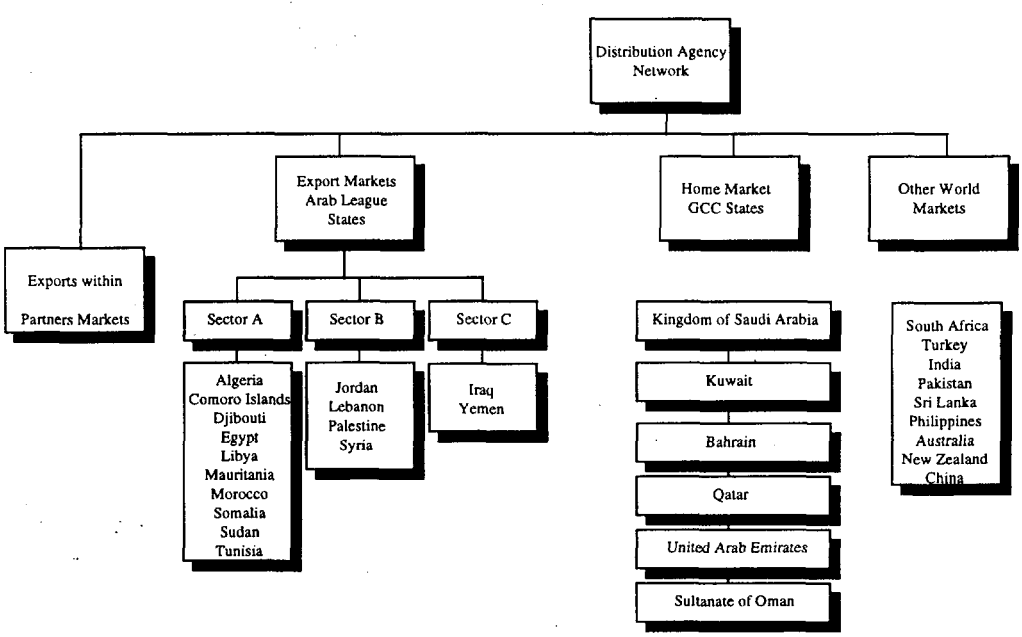
- **Africa Office - Covering Sector A**

- **Middle East Office - Covering Sector B**
- **Gulf Office - Covering Sector C**

Rest of the World agency agreements will be arrived at dependant on the existing coverage of the Technology Partner and this part of the market strategy will only be activated based upon the successful progress of the manufacturing unit as it matures.

Figure 7-7 diagrammatically illustrates how the eventual distribution agency network will look.

Figure 7-7



7.16 Estimated Overhead Numbers & Costs

7.17 Employee Numbers within the overhead

Figure 7-8 below illustrates the numbers of personnel that make up the Factory, Administrative and Financial overhead for the entire business. The numbers that are shown are as they are expected to be by the reference year 6 and the total employment numbers will be built up over the first five years of production until the critical mass is achieved.

Figure 7-8

Category	Directors	Managers	Supervisory/ Skilled	Clerical/ Labourer	Secretarial
Factory	2	4	13	15	4
Administrative	2	2	15	7	5
Financial	1	1	5	5	1

Figure 3-9 below converts the employee numbers into overhead costs and assumes the following salary levels, which were arrived at through interviews carried out within the field mission (over 100 organisations visited). These figures have been cross-checked against the estimates of the Gulf Organisation for Industrial Consulting.

- **Managing Director** **US$150,000/Annum**
- **Technical & Sales Directors** **US$120,000/Annum**

- **Manufacturing & Finance Directors** **US$100,000/Annum**
- **QA Manager** **US$85,000/Annum**
- **Management** **US$80,000/Annum**
- **Supervisory/Skilled** **US$30,000/Annum**
- **Clerical/Labourer** **US$12,000/Annum**
- **Secretarial** **US$10,000/Annum**

Figure 7-9

Category	Directors	Managers	Supervisory/ Skilled	Clerical/ Labourer	Secretarial
Factory	US$220,000	US$320,000	US$390,000	US$180,000	US$40,000
Administrative	US$270,000	US$165,000	US$450,000	US$84,000	US$50,000
Financial	US$100,000	US$80,000	US$150,000	US$60,000	US$10,000

- **Total employee overhead by category is as follows:-**
  - **Factory** 38
  - **Administrative** 31
  - **Financial** 13
  - **Grand Total** 82

- **Total overhead cost by category is as follows:-**

• **Factory**	**$US**	**699,000**
• **Administrative**	**$US**	**598,000**
• **Financial**	**$US**	**242,000**
• **Grand Total**	**$US**	**1,539,000**

CHAPTER EIGHT

HUMAN RESOURCES

8.0 The Background

This project has been conceived by the study team on one basic premise, which is that on completion this manufacturing unit will be known throughout the member states of the Arab League as "THE CENTRE OF EXCELLENCE FOR TURNING CENTRE MANUFACTURING & TRAINING".

Additionally it will have the reputation for having the finest "quality oriented workforce to World Class Standards", and as a consequence of this notoriety, all who are part of the Centre of Excellence will consider themselves privileged individuals who are an integral part of an Arab National team of experts within their field.

The target will be to achieve a 100% Arab National workforce by the reference year, i.e. the sixth year of production.

To facilitate this, it will need to overcome a number of barriers that currently exist within the GCC countries. All of these barriers are largely related to the inability to attract GCC Nationals into industrial engineering posts throughout the Gulf.

When the study team visited the six countries that comprise the GCC, they were confronted with an overwhelming passion, throughout the Public and Private sector, to see the growth in the employment of Nationals into industry.

Regardless of the term that is used -

- Saudi-isation
- Kuwaiti -isation
- Bahraini-isation
- Qatari -isation
- Emirati-isation
- Omani -isation

the problem remains the same namely -

8.1 "How can we increase the numbers of actively employed GCC nationals within GCC private sector industrial companies?"

The study team has researched this Human Resource issue and has concluded that for an industrial establishment to attract and sustain more GCC Nationals as employees, it must grasp the following issues and provide a resolution that suits the three key players involved in the debate:-

- The GCC Nationals
- The Industrialist/Shareholders
- The Governments

8.2 Issue 1 - The Status & Prestige of the Manufacturing Engineer in the GCC as perceived by the National

The study team interviewed approximately 50 industrial organisations throughout the field mission within the GCC member states. Additionally it visited several Higher Education Institutes whose business it was to supply

academic and practical training courses for the nationals of the GCC member states.

It was evident that there was a general lack of respect for the position of engineer, indeed in one higher educational institute within the Dubai area, an instance was cited by the head of the institute where he personally had witnessed a National who was in the process of completing a course in engineering, being belittled by his fellow countrymen, because he was wearing his engineers uniform. The study team were told that this was not an exceptional case, indeed it was the norm that it was the perception of the Nationals attending the college that any of their countrymen attending engineering courses were of low intellect and destined to become low achievers.

After further questioning it was revealed that the problem had become so extreme that the Dubai Quality Forum, the Chamber of Commerce and several other proactive organisations had developed a series of seminars and lectures where the prestige of the engineer as perceived in the West and in Japan was impressed upon the delegates.

As a part of the drive to reverse this situation and secure the "reach" or "penetration" of new technologies, amongst them:

- NC & CNC Programming
- Machine Tool Repair/Maintenance
- CNC Machine Tool Repair/Maintenance
- CNC Machine Tool Operation
- Machine Shop Best Practice

It is proposed that the business utilises its "Centre of Excellence" status to provide a GCC training establishment of exceptional performance.
We have allocated scale of training facilities and instructors to enable the plant to both cover its own needs and those of a wide cross section of GCC companies.

The following tabulation Figure 8-1, shows that in year one of production (Year 2000), 100 external students (mature) will have been trained, at commercial rates, by the business.

By year 5, the reference year (Year 2004) of production 200 students will be trained and by year 11 (Year 2010) 360 students per annum will be trained.
This represents a significant impact upon the GCC's engineering development strategy and also a substantial profit contribution to the enterprise as a whole.

Over the project timescale of Comfar III (1998-2010), this means that the business will have trained not only up to 200 of its own highly skilled machine tool technologists, but also will have trained in excess of 2400 GCC Nationals in CNC Machine Tool Operation, Maintenance and Programming.

The business will have delivered 486 training courses and have added US$1,620,000 of revenue in year 2010 alone, to the business turnover at good profit margins.

Figure 8-1

Year	Project Year No.	Students Trained	Course Type	Courses Delivered
2000	1	40	6 Month Apprenticeship	8
		60	1 Month NC Programming	12
2001	2	50	6 Month Apprenticeship	10
		70	1 Month NC Programming	14
2002	3	70	6 Month Apprenticeship	14
		80	1 Month NC Programming	16
2003	4	80	6 Month Apprenticeship	16
		90	1 Month NC Programming	18
2004	5	90	6 Month Apprenticeship	18
		110	1 Month NC Programming	22
2005	6	100	6 Month Apprenticeship	20
		120	1 Month NC Programming	24
2006	7	110	6 Month Apprenticeship	22
		140	1 Month NC Programming	28
2007	8	130	6 Month Apprenticeship	26
		140	1 Month NC Programming	28
2008	9	140	6 Month Apprenticeship	28
		150	1 Month NC Programming	30
2009	10	150	6 Month Apprenticeship	30
		150	1 Month NC Programming	30
2010	11	170	6 Month Apprenticeship	34
		190	1 Month NC Programming	38
Total		2430		486

8.3 Issue 2 - The Awareness of the Strategic Nature of the Industrial Innovator within National Wealth Creation

In addition to the first issue, it was also recognised that the awareness of the status of the Innovator and his importance to the realisation of the National potential was not very prevalent in any of the GCC states generally.

The innovator, whose job it is to successfully exploit new ideas, not simply invent new products or processes was the unsung hero.

Again a basic lack of understanding of the value of such an individual was the main cause. There seemed to be limited mechanisms available within GCC countries to explain how innovators in other parts of the world had significantly affected the prosperity of their organisations by the successful exploitation of a new product or process.

The study team questioned several students within the study mission over famous innovations that have occurred in the recent past.

Examples such as the Sony Walkman, VHS Video and the 3M Post-it Notes were presented to students. A brief description of the work of Akio Morita was given, and in all cases the students were not aware of the strategic importance that the innovator played in bringing these products, processes and theories to market.

8.4 Issue 3 - The Financial Reward Gap

A more tangible issue is that of financial reward, or put more simply, the salary that the National is able to earn within a Public Sector position relative to that which can be earned within a similar position in the Private Sector.

Without exception the Study Team were informed of the difficulty that manufacturers where having in employing Nationals as they were not able to pay an equivalent salary within their own operation without significantly affecting profitability.

In some cases the rates of pay within the private sector where half that being offered to Nationals within the public sector. In one instance the ratio of public sector pay to Private sector was 3:1.

Although the problem was well known within the GCC government departments visited, it still remains without solution. The problem is a far reaching complex issue that has ramifications across the private and public sectors within all the GCC countries.

8.5 How could this GCC Turning Centre Manufacturing Plant help to solve all three issues, in the medium term?

At the beginning of this chapter it has been clearly stated that this manufacturing plant will not be "just another industrial organisation" within the GCC.
It must be a focal point, a statement, a Centre of Excellence with a World Class Reputation for Quality and Prestige.

The study team have witnessed throughout the GCC member states that there is the potential to deliver such a Centre of Excellence, the individuals exist, the technology exists and the motivation exists, therefore there is no technical reason why this cannot be achieved.

Once achieved, in conjunction with the Technology Partner, who in himself should have a reputation for excellence, the Nationals will want to be part of such a venture, and the Centre will begin to develop its own unique cachet.

The existence of the Training Centre and the Mobile Marketing Unit will in their own right be mechanisms for awareness of the importance and strategic nature of the Engineering Innovator.

It will however be essential that the Public Sector shareholder will bring with him the ability to "top-up" the salary levels at the lower end of the organisation, effectively filling the reward gap.
This can be done via the implementation of a subsidy, the reduction of taxation or even an initial cash injection into the enterprise to assist in the form of "pump priming", so that the organisation can be assisted in overcoming the difficulties of the start-up phase.

It is the intention to establish this plant based on a workforce consisting entirely of GCC nationals by the reference year, so that it becomes the model for future industrial investments, a testimony to the ingenuity of the GCC member states, and a World Class Manufacturing Organisation.

8.6 Estimated Human Resource Requirements

Figure 8-2 below illustrates the estimated human resource requirements for the entire manufacturing plant. This includes employees at all levels, (Directors - Management - Supervisory - Clerical - Operatives - Secretarial).

Where applicable skill requirements are shown by job titles, especially within the manufacturing units that comprise the entire manufacturing facility of the plant. All costs shown are inclusive of overheads on wages and salaries.

8.7 Subsidy

The costings tabled and the COMFAR III computer business model are based upon "current" labour costs within the GCC (utilising immigrant workers). This provides a competitive wage bill for the companies products and services, i.e. viability.

To secure GCC nationals into these roles (below senior manager grade), we need to secure a salary subsidy via a variety of optional techniques.

Whichever solution is pursued an additional Public Sector cost for this subsidy must be carried forward in the GCC's thinking. Using field mission data the sum in addition to the current wage bill in the reference year would need to be US$7,815,000 (US$5,210,000 X 1.5).

Figure 8-2

Function Department	Employee Category	Employee Quantity	Cost (US$)
Managing Director	Directors	1	150,000
(This function includes	Managers	1	85,000
the Quality Assurance	Supervisory/Skilled	3	90,000
Function)	Clerical/Labourer	1	12,000
	Secretarial	2	20,000
Technical Function	Directors	1	120,000
	Managers	1	80,000
	Supervisory/Skilled	6	180,000
	Clerical/Labourer	2	24,000
	Secretarial	1	10,000
Financial Function	Directors	1	100,000
	Managers	1	80,000
	Supervisory/Skilled	5	150,000
	Clerical/Labourer	5	60,000
	Secretarial	1	10,000
Sales Marketing Unit	Directors	1	120,000
	Managers	1	80,000
	Supervisory/Skilled	12	360,000
	Clerical/Labourer	6	72,000
	Secretarial	3	30,000
Manufacturing Units			
Overhead	Directors	1	100,000
	Managers	1	80,000
	Supervisory/Skilled	2	60,000
	Clerical/Labourer	2	24,000
	Secretarial	1	10,000
Turning Centre Unit			
Directs	Machine Tool Fitters	60	1,800,000
	Casting Machine Shop	5	150,000

	Paint Shop	3	90,000
	Finished Parts Store	5	60,000
	Castings Store	3	36,000
	Palletising	4	48,000
	Crating - Warehousing	5	60,000
Indirects	Managers	1	80,000
	Supervisory/Skilled	6	180,000
	Clerical/Labourer	10	120,000
<u>Tool & Die Unit</u>			
Directs	Machinists	10	300,000
	Toolmakers	6	180,000
	Inspectors	2	60,000
Indirects	Managers	1	80,000
	Supervisory/Skilled	3	90,000
	Clerical/Labourer	4	48,000
<u>Refurbishment & Retrofitting</u>			
Directs	Machinists	9	270,000
	Mechanical Fitters	3	90,000
	Electrical Fitters	3	90,000
Indirects	Management	1	80,000
	Supervision	1	30,000
	Clerical	1	12,000
	Labourer	1	12,000
<u>Training Unit</u>			
Indirects	Managers	1	80,000
	Instructors	12	360,000
	Clerical	3	12,000
Grand Total		273	6,165,000

Note :

The Refurbishment - Retrofit Facility will not increase in size from year 1 as it has been assumed that productivity improvements will occur in line with growth in demand as the newly trained workforce in year one goes through the learning curve over the first five years of the project.

As can be seen the total workforce numbers 273 individuals with a total annual wage bill of US$ 6,165,000 as at the reference year, which is year six of the production cycle, at which time it is envisaged that the plant will have achieved its critical mass.

The recruitment build to the full complement of staff is envisaged to be as follows up to the reference year:-

• **Year 1**	**2000**	**200**	**73%**
• **Year 2**	**2001**	**220**	**80%**
• **Year 3**	**2002**	**232**	**85%**
• **Year 4**	**2003**	**246**	**90%**
• **Year 5**	**2004**	**273**	**100%**

CHAPTER NINE

IMPLEMENTATION SCHEDULING

CHAPTER 9 : IMPLEMENTATION SCHEDULING

9.1 Proposed approximate implementation time schedule

A schedule of activities has been developed which covers the implemetation of the proposed facility (Fig. 6-8), from the earliest stages through to start-up of production 03 January 2000. The calibre of Project Manager and Legal/Financial expert retained, will be central in achieving the designated programme targets.

9.1.1 Identify and secure Investors

It is anticipated that the work of identifying and securing suitable investors will be completed within a period of 6 months from commencement of the programme in January 1998. One of the key figures in this group will be the Technology partner. They will bring to the partnership Technological, Process and Managerial expertise, already attuned to the competitive requirements of the global machine tool market.

It is also expected during this period that Letters of Intent will have been lodged by all of the Investors, enabling subsequent stages of the work to be initiated.

Incorporation of the Enterprise is scheduled to be completed by month 9 of 1998, and would effectively signal the completion of the work by the Legal/Financial expert.

9.1.2 Plant design

The fundamental size of the plant will be determined by the translation of the market information into installed capacity requirements for each of the 4 business areas. This will be coupled with requirements for utilities, auxiliary equipment, offices and welfare facilities etc., to arrive at an overall figure. Civil and architectural experts will be engaged to establish all the civil and structural parameters to satisfy all the functional and aesthetic design constraints. The work to produce an acceptable plant design is planned to be completed over a 6 month period ending in month 9 1998.

9.1.3 Site preparation and build phase

All of the analysis regarding the most suitable physical location for the proposed manufacturing facility will have been completed prior to commencement of the design phase. This will enable all of the local conditions to be taken into consideration during design and ensure the optimum result.

Site preperation and build is expected to commence towards the end of 1998 and be completd by month 3 1999.

Production equipment capital spend

Production equipment capital spend is projected to commence during month 11 1998 and take approximately 6 months to complete. However, due to the potential leadtimes that can be encountered when purchasing high

technology machine tools, it is entirely possible that some form of commitment to specific pieces of equipment will have to be made prior to commencement of the proposed purchase period currently envisaged.

9.1.4 Develop supplier partnerships

Equally, whilst it is expected that most of the materials and components will initially be sourced through the Technology partner. A concerted sourcing programme will be inaugurated at the end of month 5 1998, to build up the level of materials and components of GCC origin. This work will continue throughout the life of the venture. This early start well, before the production stage is essential in view of the many difficulties that will be encountered in identifying suppliers with the required capabilities.

9.1.5 Installation and commissioning

Installation and commissioning of plant and equipment is scheduled to commence in month 5 1999 and then run through to the end of 1999. During this period it is expected that all of the facilities equipment i.e. power, light, air conditioning, compressors, etc., along with the first phase of designated production machines will be fully operational in readiness for commencement of production 03 January 2000.

In parallel with all this direct facilities preperation work, the Human resouce, Sales and Marketing and Training will have been initiated. Personnel recruitment will commence in month 6 1998 and progress until the full compliment of

work force is in place, in line with the specified manning requirements detailed in Chapter 8 Fig 8-2.

Sales and marketing activity will have commenced in the 5 month of 1998 with the introduction of the high technology Roadshow touring around all of the GCC countries in turn, demonstrating the benefits to be gained from investment in the new technologies. The potential generated by this activity will be supplemented on an ongoing basis by other recognised sales and marketing techniques.

The Training Programme will be an ongoing requirement for the venture and will initially encompass the whole range of management and manufacturing disciplines within the business and for all grades of personnel. Much of the training will revolve around the Technology partners products and processes and will build up the capabilities of the personnel to service the market. For Technicians in particular it is expected that the Technology partner will already have in place a suite of training programmes.

9.2 Estimated implementation costs

(Assumes completion of Feasibility Study proposed at 6.7.1.4)

9.2.1 Identify and secure investors

Investors are likely to be institutions or industrialists from within the GCC states, with the Technology partner being one of the acknowledged machine tool manufacturing companies having the range of products and expertise to satisfy the requirements of the project.

Maximum duration six months - cost $ 100K

9.2.2 Incorporation of the business

Secure incorporation of the new venture through compliance with national and international regulations and procedures, followed by formal application to the relevant authorities and subsequent registration

Duration four months - Cost $50K

9.2.3 Legal and Financial Expert Support

Legal and financial support will be required to identify suitable investors and secure their participation. Draft Articles of Association, support the establishment of all financial requirements e.g. bank accounts, loan financing,

Duration nine months - Cost $150K

9.2.4 Project Management

Essential to appoint a suitably qualified and experienced Project Manager to ensure that all the targets of the implementation programme are achieved i.e. dates and costs.

Duration - continuous through to commissioning estimated period 24 months - Cost $180K

9.2.5 Plant Design

Services of Architects, Civil and Production Engineers will be required for the preperation of designs to satisfy building configuration, equipment layout, and all other utilities and services.

Duration (team) six months - Cost $500K

9.2.6 Site Preparation and Build

Site logistics, subcontractors and deliveries from suppliers need to be carefully managed to ensure that the sequence of civil work and construction are executed according to plan. Expediting and the provision of technical assistance to avoid delays or deviations from specification and programme.

Duration six months - Cost $180K

9.2.7 Training

Pre production training for management and production personnel will be undertaken in parallel with site construction and into commissioning. The training will be delivered by experts from both GCC states and the Technology partner

9.2.8 Plant Commissioning

This is the final and most critical pre production activity requiring inputs from project management, plant design and staff from capital equipment suppliers and the technology partner.

Commisioning will comprise the following activities

* **Pre operational checks**
* **Trial runs**
* **Performance tests**
* **Acceptance trials**

Duration four months (average manning level 4 persons)
Cost $160K

CHAPTER TEN

FINANCIAL ANALYSIS
&
INVESTMENT

CHAPTER 10 : FINANCIAL ANALYSIS & INVESTMENT

10.1 Basic Assumptions

10.1.0 Software

The results from the field survey, other investigations and model assumptions have been input into the COMFAR III Expert Software for financial evaluation. The output from this software has been reproduced in part in this chapter where appropriate.

10.1.1 Project Classification & Planning Horizon

The project classification for this project has been assumed for evaluation purposes to be a new feasibility study project with the construction phase commencing 1/1/98 and the production phase ending 31/12/2010. The reference year is set at 2004.

10.1.2 Currency

The currency used in the evaluation is US Dollars throughout as the expected country of location has not been finalised. Local currency is only used to pay corporate taxes and dividends.

10.1.3 Taxes & Duties

It is assumed that there are no sales taxes and export duties applicable. Similarly it is also assumed that because the majority of the project output is exported from the host country, no import taxes are payable on components for re-export.

Corporate taxes of 25% have been levied, which is the most conservative view as this is the maximum amount the organisation will experience given current legislation within the GCC. The model will need further refinement when the location of the plant is agreed to take account of local conditions.

10.1.4 Discounting

The discount rate for Net Present Value (NPV) calculations has been set at 12%. This represent a moderate long-term rate for a project with average risk. The risk perception by each investor will need to be taken into account at a later stage potentially when a full feasibility study is completed.

10.1.5 Depreciation

Depreciation has been calculated on a "linear to scrap" basis at the following rates:-

Category	Depreciation Rate (%)	Period (Years)	Residual Value (%)
Land Purchase	0	100	100
Site Preparation	10	10	0
Civil Works	2	50	10
Plant & Machinery	12.5	8	10
Auxiliary Plant	12.5	8	10
Environmental Protection	12.5	8	10
Pre-production Expenditure	12.5	8	0

10.1.6 Production Cost Data

Production cost data has been input wherever possible on a product by product basis per unit of output as a variable cost. It has been assumed that the labour value content of the project involved in direct production can be maintained in proportion to the output, and that there is a ready market to obtain additional labour or dispose of surplus labour.

10.1.7 Sales Programme Data

The sales programme is based on the number of units of each type of product to be sold over the period. Sales of product have been assumed to be non-seasonal.

10.1.8 Working Capital

The minimum days of coverage (Mdc) used for working capital items is as follows:-

Category	Mdc
Indirect Costs	45
Inventory - WIP	45
Inventory - Spare Parts Consumed	1
Inventory - Finished Product	75
Accounts Receivable - Non-Training	12
Accounts Receivable - Training	1
Cash in Hand	30
Accounts Payable (Labour/Spares/Direct Marketing)	1
Accounts Payable - Other	30

10.1.9 Equity Capital

Equity Capital at this stage has only been classified as ordinary capital. The final equity participation and preference rights of each member will have to be determined by negotiation. No capital subsidies or grants

have been assumed, these may be available dependant on the country selected as the location of the plant.

The investment is put into the project in two tranches of US$7 million at the beginning of the project and a further US$7 million after one year.

10.1.10 Profit Distribution

It is assumed that profits are retained in the project until 2002 when 70% are retained, and until 2005 when 50% are retained which reduce to 20% after year 2007. This is to allow for working capital financing in the early stages.

10.1.11 Long Term Loans

It is recognised that it would be beneficial to have some limited gearing and support from a major financial institution. The advantages of having this in place at the beginning areas follows:-

- The gearing effect reduces the amount of initial capital required to fund the project.
- Any return on the project in excess of the cost of borrowing is for the benefit of the equity shareholders.
- Support from a major financial institution enhances the profile and prestige of the project.
- Access to an opportunity for cheaper banking transactions and temporary finance.

- **Should it be necessary to obtain additional finance quickly, there is an institution already involved to negotiate with.**

It is assumed that a long term loan over 10 years is obtained with interest paid monthly at 10% per annum.
There is a 1% commitment fee and a 0.5% guarantee fee. It is assumed that suitable guarantees could be negotiated at no further cost. The disbursement is in two tranches with interest being capitalised during the construction phase.

10.1.12 Inflation and Escalation

As the host country has yet to be decided, no inflation factor for currency has been assumed at this preliminary stage. As the values are likely to be all in US Dollars with a percentage of production costs in local currency, it would be expected that the return on investment would improve because of the strength of the US Dollar to the GCC currencies.

10.2 Summary of Results

TOTAL INVESTMENT COSTS

Category	Construction Phase US$	Production Phase US$	Total
Fixed Investment Costs	8,915,000	4,300,000	13,215,000
Pre-Production Costs	2,560,000	NIL	2,560,000
Increase in Working Capital	24,690	8,573,335	8,598,295
Totals	11,499,960	12,873,335	24,373,295

The total investment costs over the project life of US$24,373,295 includes US$8,598,295 of increased working capital. This increase in working capital is as a result of the dividend policy to leave sufficient funds in the project to cover expected growth.

PROJECT FINANCING

Equity Capital	US$14,000,000
Long Term Loans	US$4,000,000
Short Term Loans	US$2,240,436
Total Sources of Finance	US$20,240,436

OPERATING RESULTS

Category	First Year 2000	Reference Year 2004	Final Year 2010
Sales Revenue	16,940,000	23,523,850	39,757,600
Operating Costs	13,763,299	17,022,428	23,040,699
Depreciation	760,426	1,097,926	346,239
Financial Costs	450,250	511,477	75,135
Marketing Costs	2,142,500	2,602,385	3,484,785
Production Costs	14,973,976	18,631,831	23,462,072
Gross Profit (Loss)	(176,476)	2,289,633	12,810,742
Tax	NIL	572,408	3,202,685
Net Profit (Loss)	(176,476)	1,717,225	9,608,057

FINANCIAL EVALUATION

The overall project results show the following indicators:-

- **Payback Period** — **10 Years**
- **Break Even Point** — **Sales of US$14,962,362**
- **Internal Rate of Return** — **15.98% on Investment**
- **Internal Rate of Return** — **15.72% on Equity**
- **Net Present Value @ 12%** — **US$4,972,056**

Whilst this is a modest return on Capital on the project in its simplest form, the potential for increased gains by extending the life of the project, having a trained, efficient workforce receiving investment subsidies, grants, taxation privileges etc., would significantly increase the value of financial return.

The sensitivity analysis of the IRR shows the following in the reference year,

1) Sales - This measures sensitivity to sales price

Sales Revenue would have to reduce by 5.56% before the IRR would reduce to 12%.

Sales Revenue would have to reduce by 18% before the IRR went below 0%

2) Operating Costs - This measures sensitivity to rising operating costs.

Operating Costs would have to increase by 5.2% before the IRR would reduce to 12%

Operating Costs would have to increase by 20% before IRR went below 0%

3) Fixed Assets - This measures sensitivity to the accuracy of the initial investment.

The investment in fixed assets would have to be 12.67% below actual to bring the IRR down to 12%.

The Overall sensitivities suggest a moderate sensitivity to sales price fluctuations and as long as any sales price discounts are held within 5%, the project will sustain its return.

NATIONAL ECONOMIC EVALUATION

Foreign Economic Evaluation

As the host country has not yet been decided upon, no foreign exchange effect can be calculated. It can be noted however that whatever country is chosen there would be a positive export and currency effect as these products are normally sold in US Dollars.

Employment

The project is expected to employ 225 within the project itself. It is estimated that this would create local employment in support activities of 115 additional posts, 38 skilled posts and 77 unskilled posts.

Distortion

It is not envisaged that a project of this size and nature would significantly distort market prices of foreign exchange, labour and capital.

10.3 COMFAR III Results

The following COMFAR III schedules are included in this Chapter. This is not a comprehensive list of all of the schedules available from the model, but an illustration of the main features of the economic appraisal of the project.

SUMMARY SHEET

Project title: UNIDO Project No. US/RAB/93/096
Project description: UNIDO/GCC Opportunity Study/Market Analysis and Conceptual Plan for the establishment of a Machine Tool Industry (Plant to est Manufacture of Machine Tools) In the Gulf Co-operation Council Member Countries
Date and time: Conducted between August 1995 and February 1996

Project classification: New project

Construction phase: 1/1998 - 12/1999
Length: 2 years
Production phase: 1/2000 - 12/2010
Length: 11 periods

Accounting currency: US Dollars
Units: Absolute
Reference currency:
Exchange rate:

INVESTMENT COSTS

	Total construction	Total production	Total investment
Total fixed investment costs	8,915,000.00	4,300,000.00	13,215,000.00
Total pre-production expenditures	2,560,000.00	0.00	2,560,000.00
Increase in net working capital	24,960.00	8,573,335.34	8,598,295.34
TOTAL INVESTMENT COSTS	11,499,960.00	12,873,335.34	24,373,295.34

SOURCES OF FINANCE

	Total inflow

SUMMARY SHEET

Equity capital	4,000,000.00
Long-term loans	4,000,000.00
Total short-term loans	2,240,436.18
TOTAL SOURCES OF FINANCE	10,240,436.18

INCOME AND COSTS, OPERATIONS

	First year 2000	reference year 2004	Last year 2010
SALES REVENUE	16,940,000.00	23,523,850.00	39,757,600.00
Factory costs	13,733,026.09	16,989,178.00	23,001,811.54
Administrative overhead costs	30,273.78	33,250.00	38,887.30
OPERATING COSTS	13,763,299.87	17,022,428.00	23,040,698.83
Depreciation	760,426.50	1,097,926.50	346,239.00
Financial costs	450,250.00	511,477.28	75,135.07
TOTAL PRODUCTION COSTS	14,973,976.37	18,631,831.78	23,462,072.91
Marketing costs	2,142,500.00	2,602,385.00	3,484,785.00
COSTS OF PRODUCTS	17,116,476.37	21,234,216.78	26,946,857.91
Interest on short-term deposits	0.00	0.00	0.00
GROSS PROFIT FROM OPERATI	-176,476.37	2,289,633.22	12,810,742.09
Extraordinary income	0.00	0.00	0.00
Extraordinary loss	0.00	0.00	0.00
Depreciation allowances	0.00	0.00	0.00
GROSS PROFIT	-176,476.37	2,289,633.22	12,810,742.09
Investment allowances	0.00	0.00	0.00
TAXABLE PROFIT	0.00	2,289,633.22	2,810,742.09
Income (corporate) tax	0.00	572,408.31	3,202,685.52
NET PROFIT	-176,476.37	1,717,224.92	9,608,056.57

SUMMARY SHEET

RATIOS

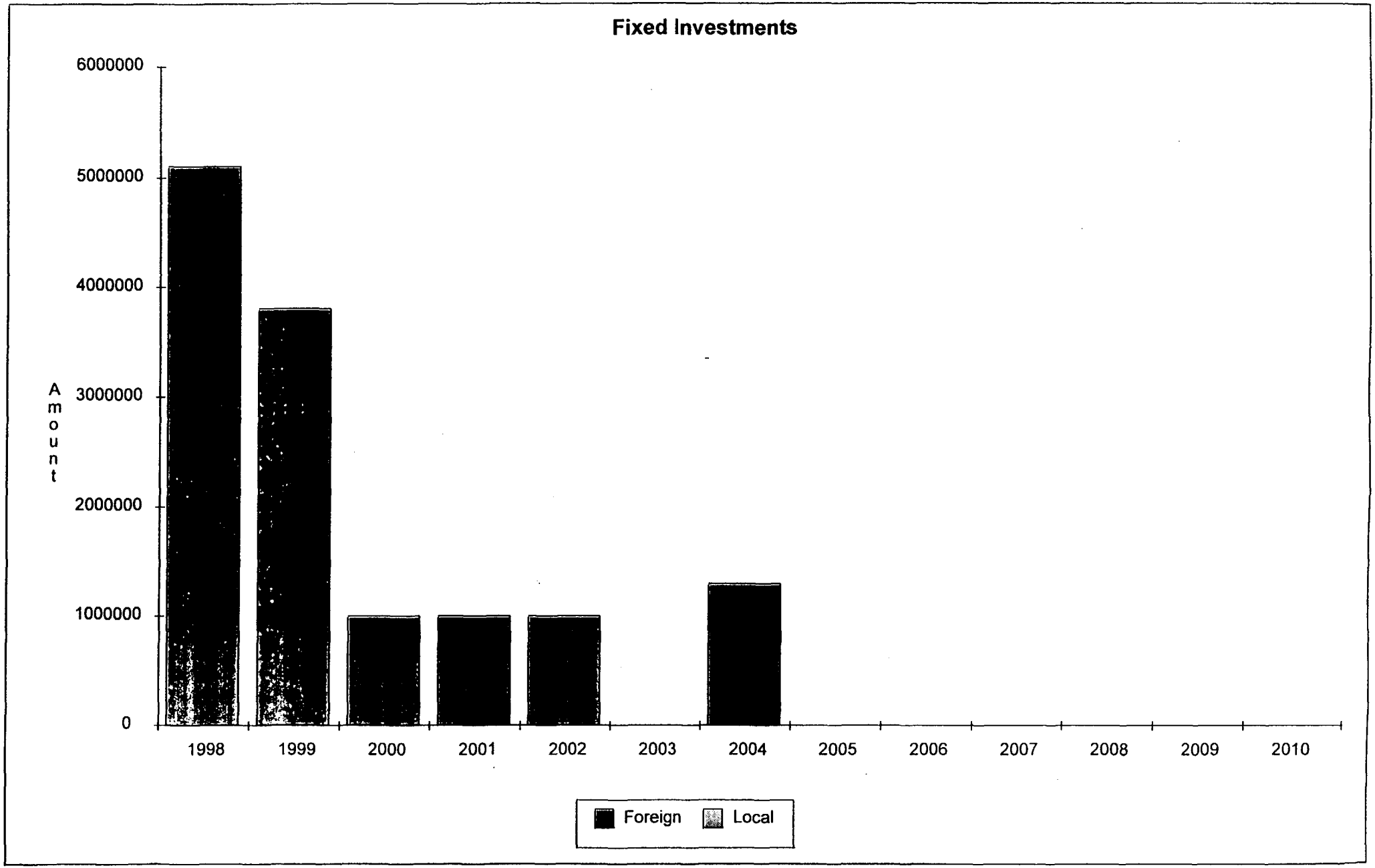
Net present value	at 12.00 %	4,972,055.77
Internal rate of return on investment (I	15.98 %	
Modified IRR on investment	15.98 %	
Internal rate of return on equity (IRRE)	15.72 %	
Modified IRRE on equity	15.72 %	

FIXED INVESTMENT COSTS - TOTAL
US Dollars

	Total construction	Total production	Construction 1998	Construction 1999	Production 2000	Production 2001	Production 2002	Production 2003
Land purchase	139,500.00	0.00	139,500.00	0.00	0.00	0.00	0.00	0.00
Site preparation and development	100,000.00	0.00	100,000.00	0.00	0.00	0.00	0.00	0.00
Civil works, structures and buildings	4,860,500.00	0.00	4,860,500.00	0.00	0.00	0.00	0.00	0.00
Plant machinery and equipment	2,875,000.00	4,300,000.00	0.00	2,875,000.00	1,000,000.00	1,000,000.00	1,000,000.00	0.00
Auxiliary and service plant equipment	910,000.00	0.00	0.00	910,000.00	0.00	0.00	0.00	0.00
Environmental protection	30,000.00	0.00	0.00	30,000.00	0.00	0.00	0.00	0.00
Incorporated fixed assets (project overhe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contingencies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL FIXED INVESTMENT COSTS	8,915,000.00	4,300,000.00	5,100,000.00	3,815,000.00	1,000,000.00	1,000,000.00	1,000,000.00	0.00
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00

FIXED INVESTMENT COSTS - TOTAL
US Dollars

	Production 2004	Production 2005	Production 2006	Production 2007	Production 2008	Production 2009	Production 2010
Land purchase	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Site preparation and development	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Civil works, structures and buildings	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant machinery and equipment	1,300,000.00	0.00	0.00	0.00	0.00	0.00	0.00
Auxiliary and service plant equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Environmental protection	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incorporated fixed assets (project overhe	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contingencies	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL FIXED INVESTMENT COSTS	1,300,000.00	0.00	0.00	0.00	0.00	0.00	0.00
Foreign share (%)	100.00	0.00	0.00	0.00	0.00	0.00	0.00

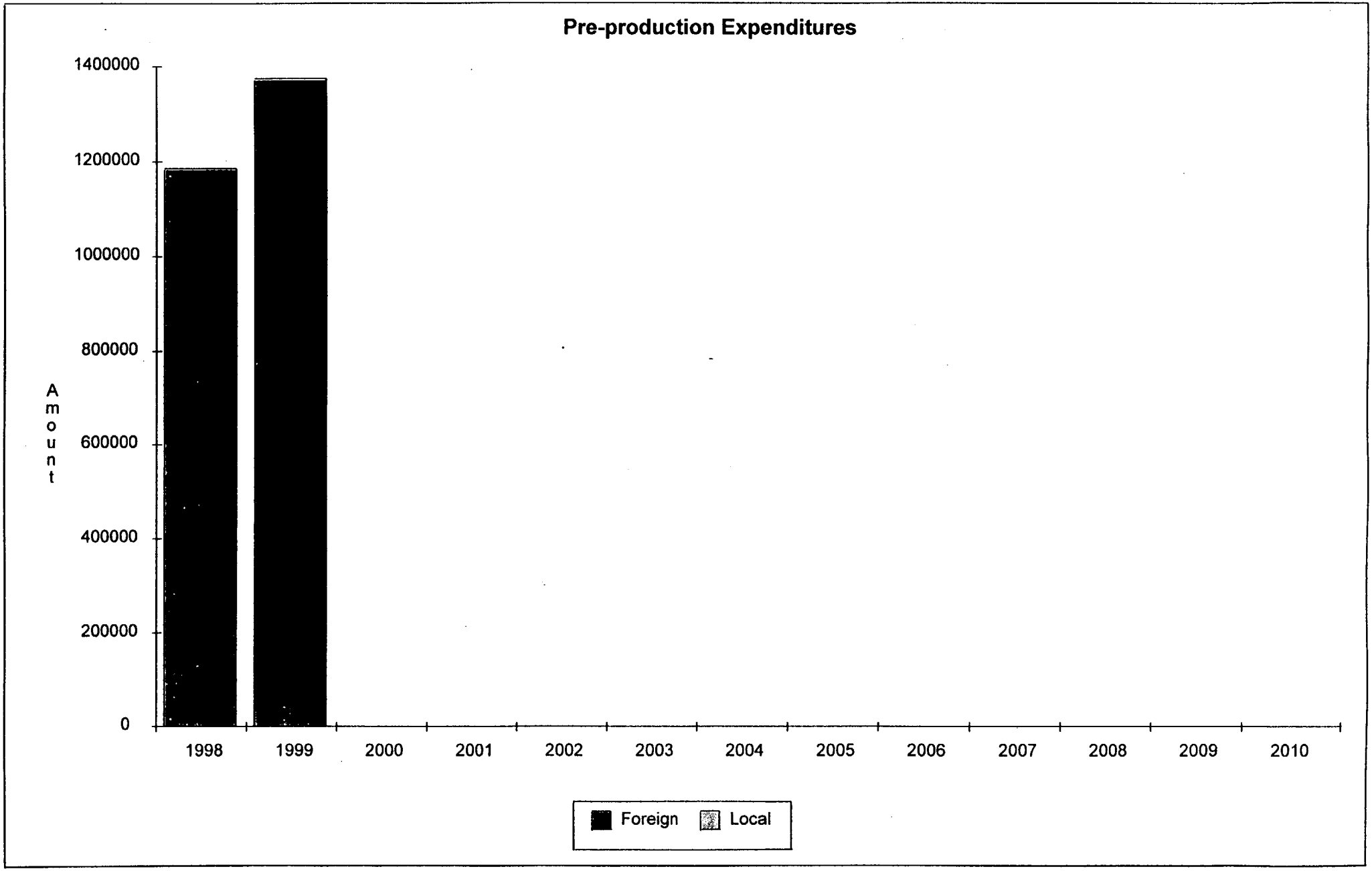

Fixed Investments
6000000
5000000
4000000
3000000
2000000
1000000
0
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local

PRE-PRODUCTION EXPENDITURES - TOTAL
US Dollars

	Total construction	Total production	Construction 1998	Construction 1999	Production 2000	Production 2001	Production 2002	Production 2003
Pre-production expenditures (net of intere	1,870,000.00	0.00	935,000.00	935,000.00	0.00	0.00	0.00	0.00
Interest	690,000.00	0.00	250,000.00	440,000.00	0.00	0.00	0.00	0.00
TOTAL PRE-PRODUCTION EXPENDIT	2,560,000.00	0.00	1,185,000.00	1,375,000.00	0.00	0.00	0.00	0.00
Foreign share (%)	100.00	0.00	100.00	100.00	0.00	0.00	0.00	0.00

PRE-PRODUCTION EXPENDITURES - TOTAL
US Dollars

	Production 2004	Production 2005	Production 2006	Production 2007	Production 2008	Production 2009	Production 2010
Pre-production expenditures (net of intere	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRE-PRODUCTION EXPENDIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Foreign share (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

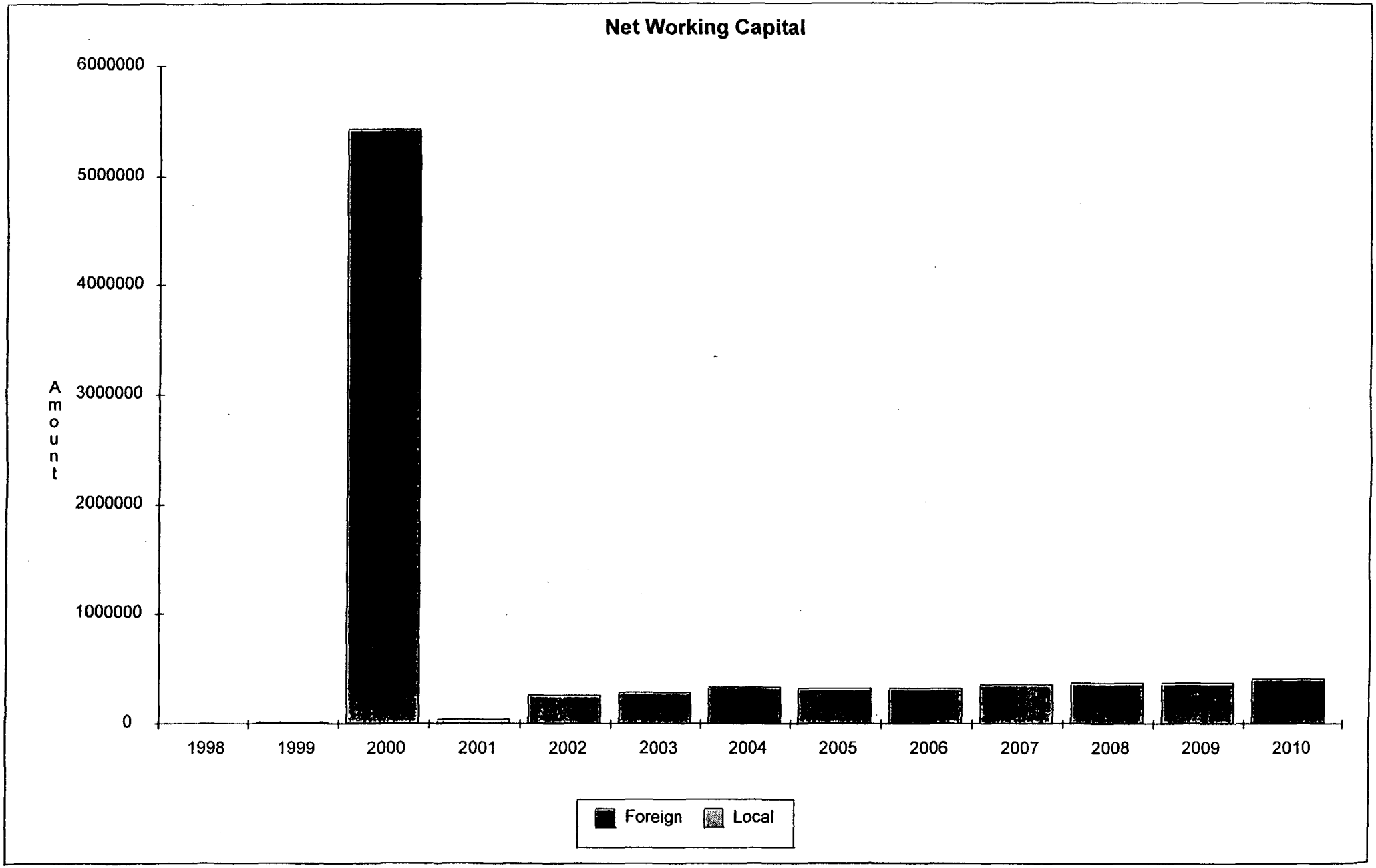

Pre-production Expenditures
1400000
1200000
1000000
800000
600000
400000
200000
0
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local

NET WORKING CAPITAL REQUIREMENTS - TOTAL
US Dollars

	Coefficient of turnover	Construction 1998	Construction 1999	Production 2000	Production 2001	Production 2002	Production 2003
Total inventory	0.00	6,240.00	24,960.00	5,861,219.61	5,666,870.54	5,965,724.52	6,264,477.63
Accounts receivable	0.00	0.00	0.00	514,697.56	540,093.16	567,817.78	595,872.82
Cash-in-hand	12.00	0.00	0.00	560,251.55	540,578.99	569,284.26	596,767.03
CURRENT ASSETS	0.00	6,240.00	24,960.00	6,936,168.72	6,747,542.69	7,102,826.56	7,457,117.49
Current liabilities							
Accounts payable	0.00	0.00	0.00	1,481,253.07	1,247,658.12	1,334,208.15	1,401,218.97
TOTAL NET WORKING CAPITAL REQUIRE	0.00	6,240.00	24,960.00	5,454,915.65	5,499,884.57	5,768,618.41	6,055,898.52
INCREASE IN NET WORKING CAPITAL	0.00	6,240.00	18,720.00	5,429,955.65	44,968.92	268,733.84	287,280.11
Foreign share (%)	0.00	100.00	100.00	100.00	100.00	100.00	100.00

NET WORKING CAPITAL REQUIREMENTS - TOTAL
US Dollars

	Production 2004	Production 2005	Production 2006	Production 2007	Production 2008	Production 2009	Production 2010
Total inventory	6,616,818.35	6,962,028.97	7,305,855.30	7,688,135.52	8,085,300.44	8,481,967.65	8,912,419.38
Accounts receivable	629,010.64	661,334.24	693,673.58	729,280.10	766,443.83	803,751.19	843,775.36
Cash-in-hand	635,960.13	668,369.72	702,133.37	736,812.56	772,165.81	806,067.11	848,941.83
CURRENT ASSETS	7,881,789.13	8,291,732.93	8,701,662.25	9,154,228.17	9,623,910.08	10,091,785.95	10,605,136.58
Current liabilities							
Accounts payable	1,483,248.42	1,561,822.45	1,640,187.32	1,727,493.47	1,817,278.36	1,905,303.99	2,006,841.23
TOTAL NET WORKING CAPITAL REQUIRE	6,398,540.70	6,729,910.47	7,061,474.94	7,426,734.70	7,806,631.72	8,186,481.95	8,598,295.34
INCREASE IN NET WORKING CAPITAL	342,642.18	331,369.77	331,564.46	365,259.77	379,897.02	379,850.23	411,813.39
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00

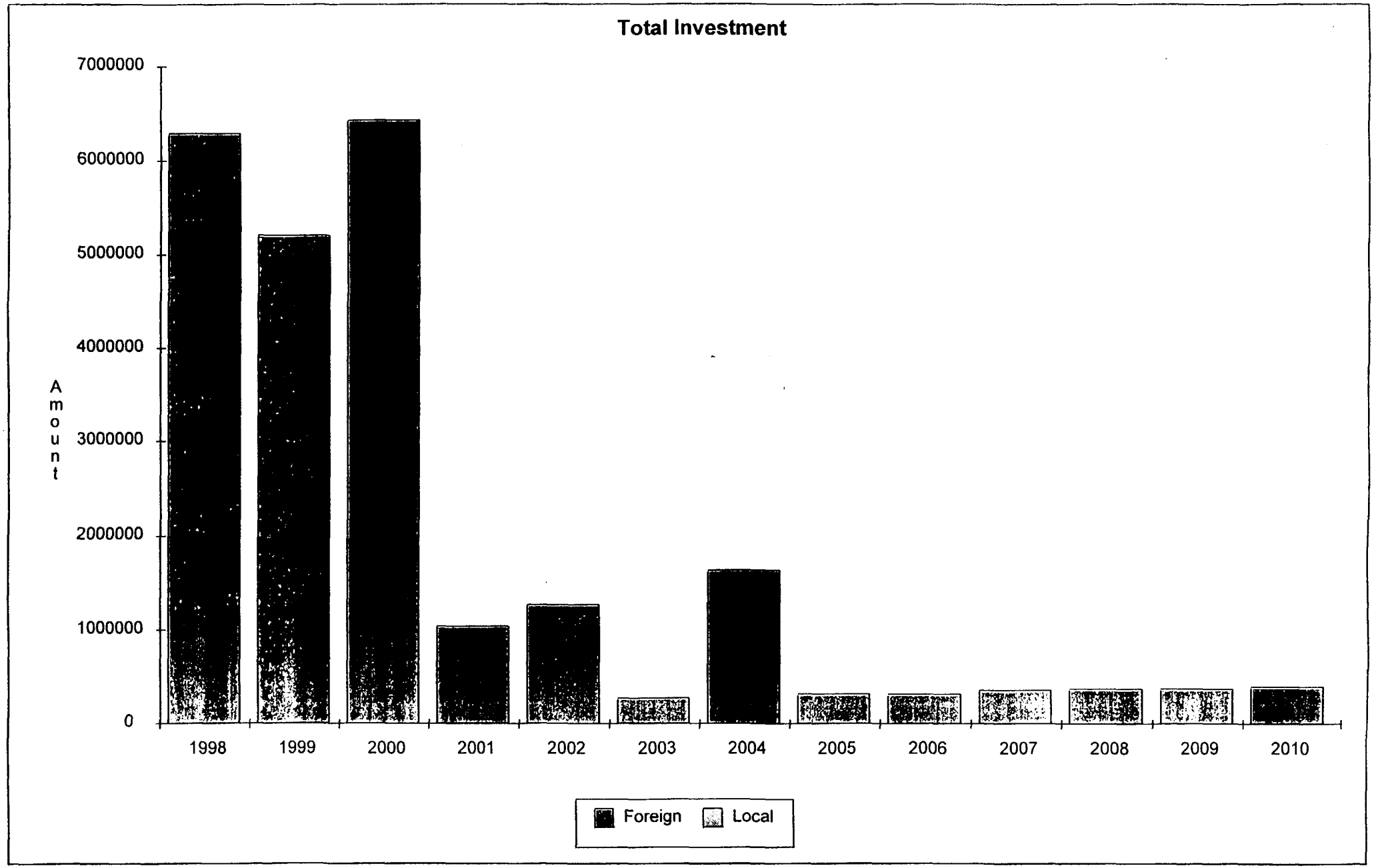

Net Working Capital
6000000
5000000
4000000
3000000
2000000
1000000
0
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local

INVESTMENT COSTS - TOTAL
US Dollars

	Total construction	Total production	Construction 1998	Construction 1999	Production 2000	Production 2001	Production 2002	Production 2003
Total fixed investment costs	8,915,000.00	4,300,000.00	5,100,000.00	3,815,000.00	1,000,000.00	1,000,000.00	1,000,000.00	0.00
Total pre-production expenditur	2,560,000.00	0.00	1,185,000.00	1,375,000.00	0.00	0.00	0.00	0.00
Increase in net working capital	24,960.00	8,573,335.34	6,240.00	18,720.00	5,429,955.65	44,968.92	268,733.84	287,280.11
TOTAL INVESTMENT COSTS	11,499,960.00	12,873,335.34	6,291,240.00	5,208,720.00	6,429,955.65	1,044,968.92	1,268,733.84	287,280.11
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

INVESTMENT COSTS - TOTAL
US Dollars

	Production 2004	Production 2005	Production 2006	Production 2007	Production 2008	Production 2009	Production 2010
Total fixed investment costs	1,300,000.00	0.00	0.00	0.00	0.00	0.00	0.00
Total pre-production expenditur	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Increase in net working capital	342,642.18	331,369.77	331,564.46	365,259.77	379,897.02	379,850.23	411,813.39
TOTAL INVESTMENT COSTS	1,642,642.18	331,369.77	331,564.46	365,259.77	379,897.02	379,850.23	411,813.39
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00

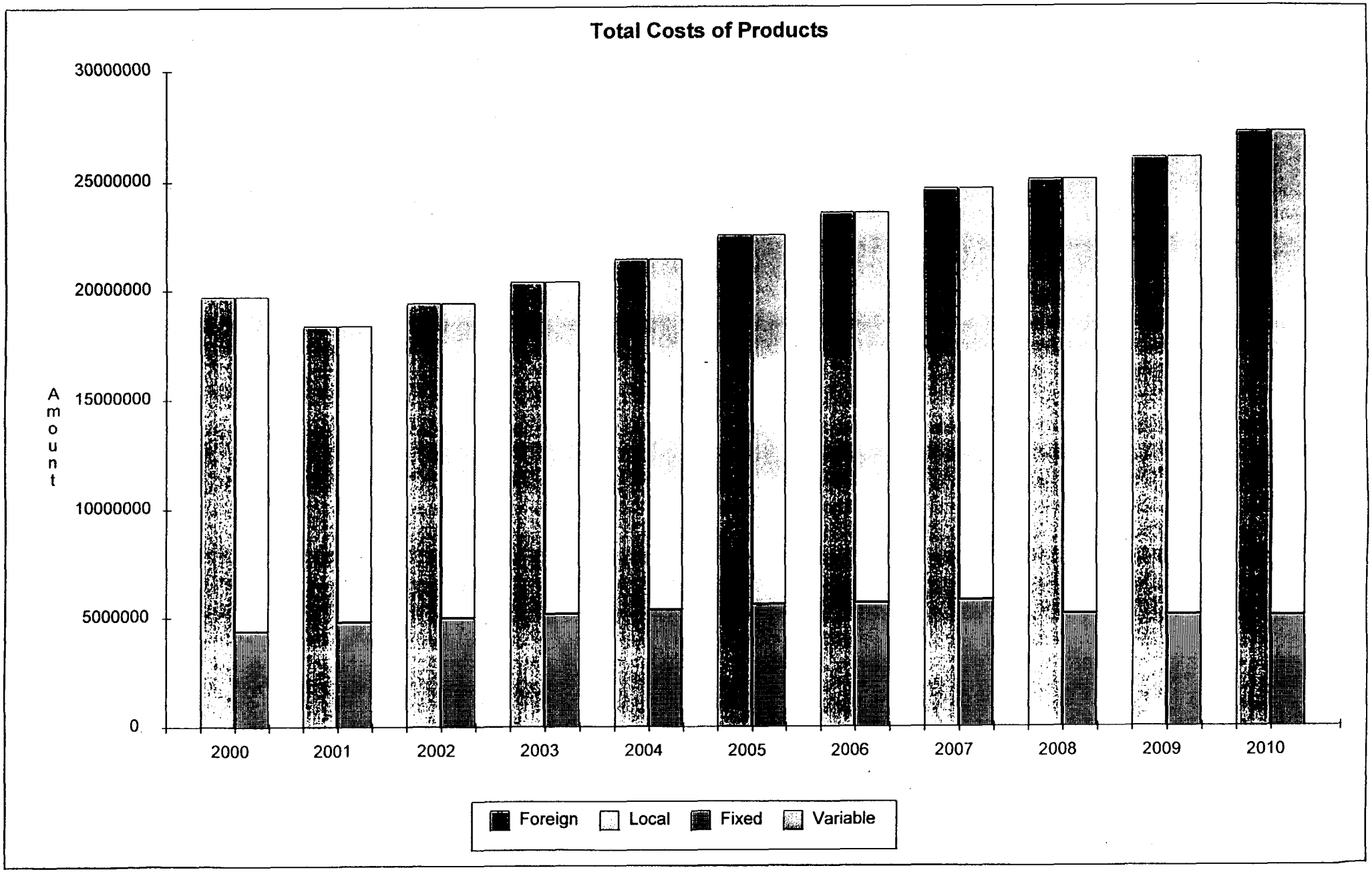

Total Investment
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local

ANNUAL COSTS OF PRODUCTS - TOTAL
US Dollars

	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004	Production 2005	Production 2006	Production 2007
Raw materials	8,671,174.01	7,581,080.22	8,021,569.42	8,448,188.02	8,912,151.87	9,398,023.15	9,883,994.51	10,431,301.01
Factory supplies	198,772.29	176,650.45	187,299.95	197,392.58	208,610.54	219,945.05	231,657.50	244,345.64
Utilities	158,553.48	146,334.21	153,464.54	160,039.80	167,574.44	174,775.47	182,615.42	190,594.15
Energy	39,556.72	36,081.58	38,044.79	39,861.17	41,932.10	43,932.23	46,085.63	48,307.60
Spare parts consumed	189,159.31	167,719.08	178,087.73	187,907.11	198,829.82	209,850.85	221,253.62	233,588.06
Repair, maintenance, material	59,360.02	54,337.72	57,617.20	60,600.33	64,071.75	67,294.39	70,899.76	74,450.99
Royalties	229,583.83	201,675.96	212,955.23	224,111.02	236,082.86	248,740.72	261,312.64	275,612.25
Labour	5,747,939.08	5,567,657.34	5,864,245.38	6,148,076.20	6,558,265.40	6,893,312.14	7,243,628.52	7,601,204.86
Labour overhead costs (taxes et	571,866.49	556,846.38	586,310.03	614,497.95	655,126.54	689,037.67	723,475.76	759,639.84
Factory overhead costs	81,655.98	75,386.81	78,453.81	81,350.20	84,579.18	87,828.57	91,198.31	94,832.76
FACTORY COSTS	15,947,621.22	14,563,769.77	15,378,048.08	16,162,024.39	17,127,224.49	18,032,740.23	18,956,121.67	19,953,877.16
Administrative overhead costs	32,613.18	31,043.65	31,829.51	32,568.68	33,395.86	34,223.11	35,085.48	36,009.99
OPERATING COSTS	15,980,234.40	14,594,813.42	15,409,877.60	16,194,593.07	17,160,620.35	18,066,963.34	18,991,207.15	19,989,887.15
Depreciation	760,426.50	872,926.50	985,426.50	1,097,926.50	1,097,926.50	1,244,176.50	1,244,176.50	1,244,176.50
Financial costs	450,250.00	649,308.31	607,856.67	562,064.49	511,477.28	455,592.92	393,856.74	325,655.98
TOTAL PRODUCTION COSTS	17,190,910.90	16,117,048.23	17,003,160.76	17,854,584.06	18,770,024.13	19,766,732.76	20,629,240.39	21,559,719.62
Direct marketing costs	2,280,090.28	2,013,356.60	2,133,908.13	2,249,473.47	2,376,550.63	2,507,219.93	2,640,297.92	2,786,901.39
Marketing overhead costs	250,000.00	250,000.00	250,000.00	250,000.00	250,000.00	250,000.00	250,000.00	250,000.00
COSTS OF PRODUCTS	19,721,001.18	18,380,404.83	19,387,068.89	20,354,057.53	21,396,574.75	22,523,952.69	23,519,538.31	24,596,621.01
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Variable share (%)	77.96	73.95	74.36	74.70	75.12	75.30	75.97	76.69

ANNUAL COSTS OF PRODUCTS - TOTAL
US Dollars

	Production 2008	Production 2009	Production 2010
Raw materials	11,000,009.97	11,558,729.83	12,207,151.87
Factory supplies	257,493.21	270,115.83	286,324.60
Utilities	198,824.17	206,444.61	217,815.19
Energy	50,600.18	52,734.18	55,838.86
Spare parts consumed	246,367.50	258,625.79	274,426.20
Repair, maintenance, material	78,104.20	81,417.18	86,766.25
Royalties	290,466.57	305,231.00	321,613.76
Labour	7,965,389.24	8,314,313.53	8,757,463.46
Labour overhead costs (taxes et	796,464.73	831,763.61	875,485.06
Factory overhead costs	98,597.92	102,201.35	106,887.51
FACTORY COSTS	20,982,317.69	21,981,576.91	23,189,772.76
Administrative overhead costs	36,967.01	37,878.60	39,085.94
OPERATING COSTS	21,019,284.70	22,019,455.50	23,228,858.71
Depreciation	581,239.00	468,739.00	346,239.00
Financial costs	250,313.70	167,082.10	75,135.07
TOTAL PRODUCTION COSTS	21,850,837.40	22,655,276.61	23,650,232.78
Direct marketing costs	2,939,144.31	3,087,229.24	3,267,801.67
Marketing overhead costs	250,000.00	250,000.00	250,000.00
COSTS OF PRODUCTS	25,039,981.71	25,992,505.84	27,168,034.45
Foreign share (%)	100.00	100.00	100.00
Variable share (%)	79.45	80.38	81.47

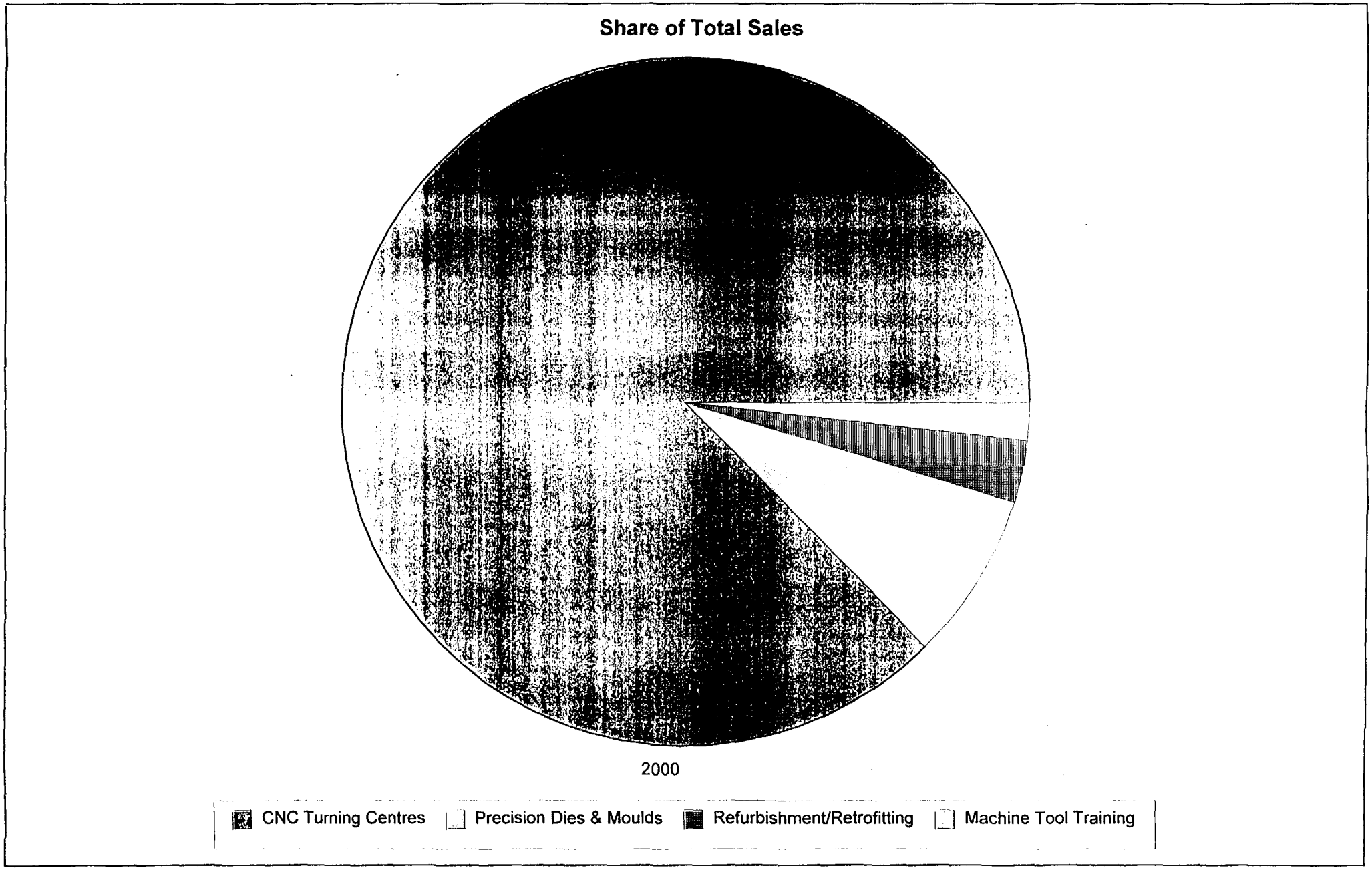

Total Costs of Products
30000000
25000000
20000000
15000000
10000000
5000000
0
Amount
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local
Fixed
Variable

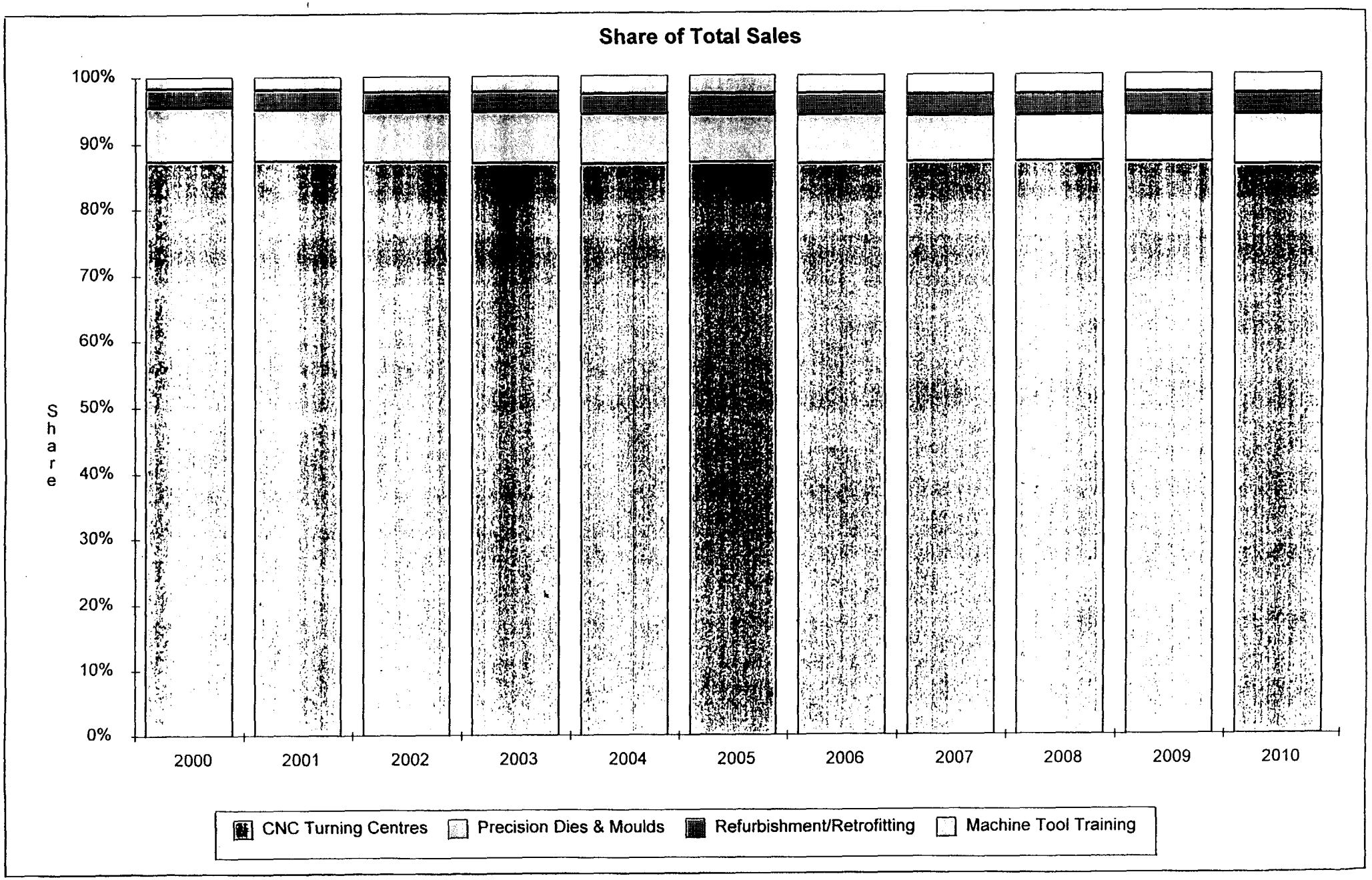
PRODUCTION AND SALES PROGRAMME - TOTAL
US Dollars

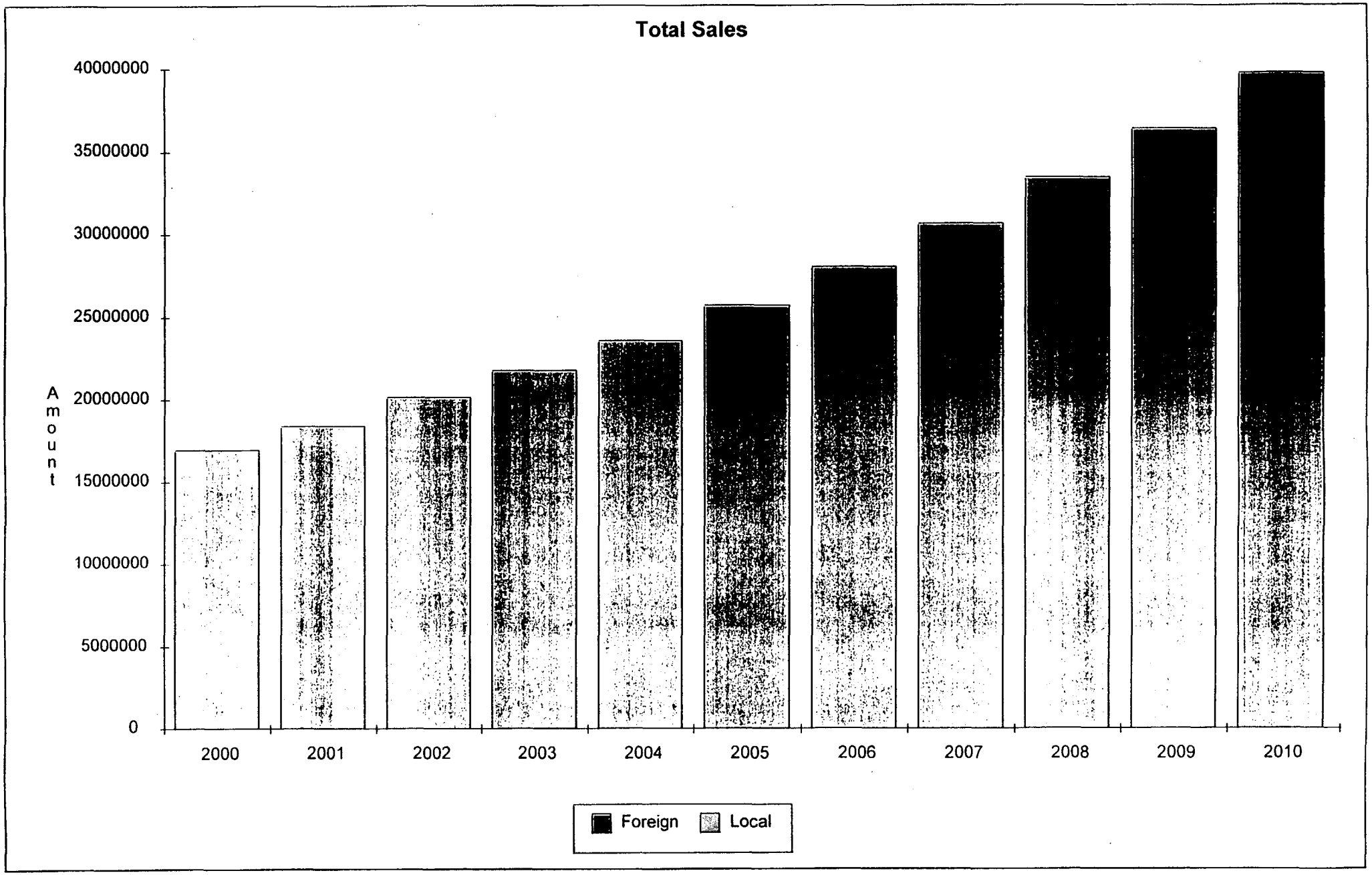
	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004	Production 2005	Production 2006	Production 2007	Production 2008
Gross sales revenue	6,940,000.00	8,418,750.00	0,139,600.00	1,765,000.00	3,523,850.00	5,700,000.00	8,067,800.00	0,624,500.00	3,437,000.00
Less sales tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net sales revenue	6,940,000.00	8,418,750.00	0,139,600.00	1,765,000.00	3,523,850.00	5,700,000.00	8,067,800.00	0,624,500.00	3,437,000.00
Subsidy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SALES REVENUE	6,940,000.00	8,418,750.00	0,139,600.00	1,765,000.00	3,523,850.00	5,700,000.00	8,067,800.00	0,624,500.00	3,437,000.00
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

PRODUCTION AND SALES PROGRAMME - TOTAL
US Dollars

	Production 2009	Production 2010
Gross sales revenue	6,345,700.00	9,757,600.00
Less sales tax	0.00	0.00
Net sales revenue	6,345,700.00	9,757,600.00
Subsidy	0.00	0.00
SALES REVENUE	6,345,700.00	9,757,600.00
Foreign share (%)	100.00	100.00


Share of Total Sales
2000
CNC Turning Centres
Precision Dies & Moulds
Refurbishment/Retrofitting
Machine Tool Training


Share of Total Sales
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Share
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
CNC Turning Centres
Precision Dies & Moulds
Refurbishment/Retrofitting
Machine Tool Training

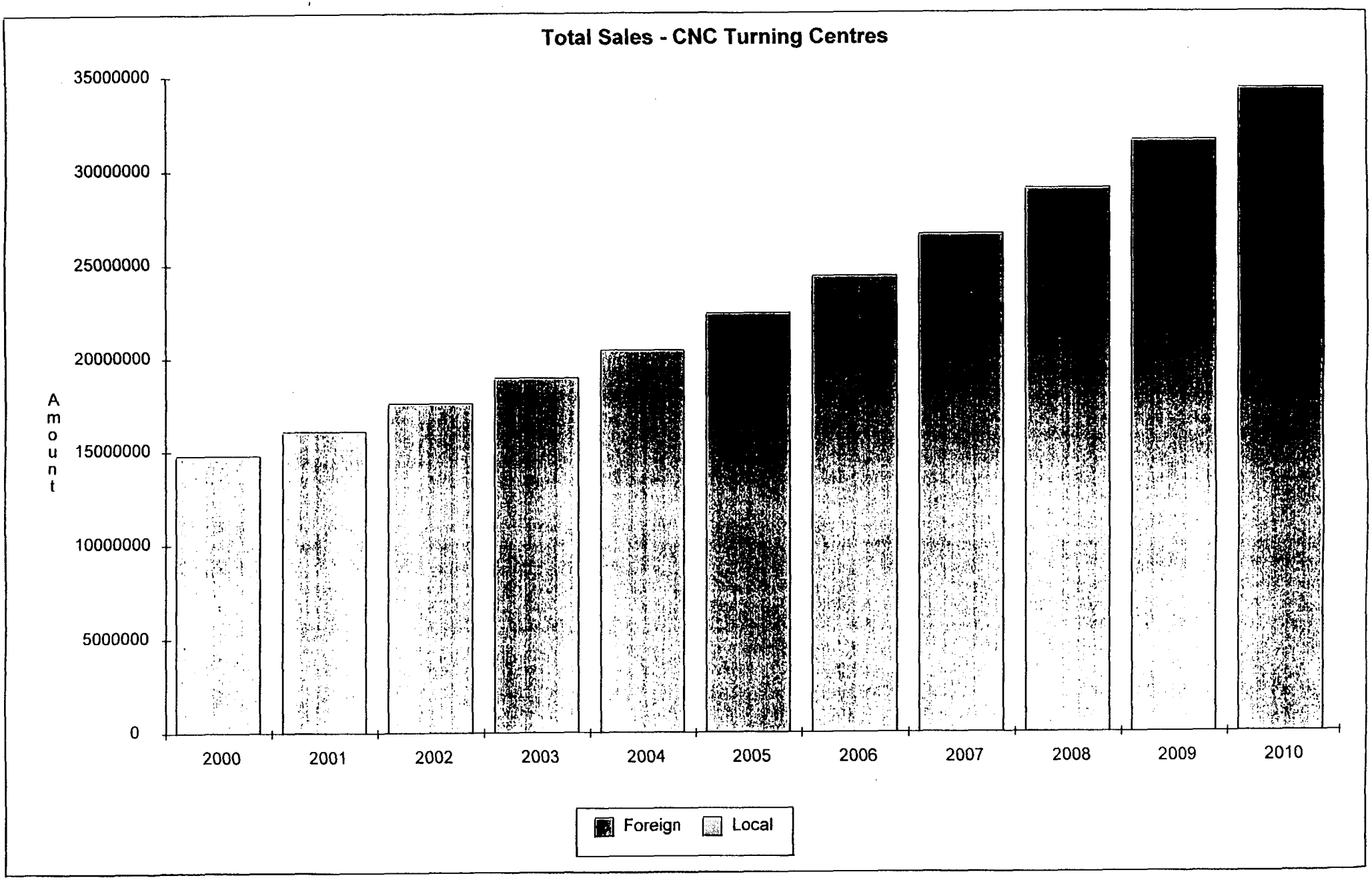

Total Sales
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
Amount
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local

PRODUCTION AND SALES PROGRAMME - CNC TURNING CENTRES - TOTAL
US Dollars

	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004	Production 2005	Production 2006	Production 2007	Production 2008
Stock brought forward	0.00	53.13	55.83	58.96	62.08	65.42	68.96	72.50	76.46
Quantity produced	308.13	270.71	286.13	301.13	317.33	334.54	351.54	370.96	391.17
Stock carried over	53.13	55.83	58.96	62.08	65.42	68.96	72.50	76.46	80.63
Quantity sold	255.00	268.00	283.00	298.00	314.00	331.00	348.00	367.00	387.00
Gross unit price (averag	58,000.00	60,000.00	62,000.00	63,500.00	65,000.00	67,500.00	70,000.00	72,500.00	75,000.00
Gross sales revenue	4,790,000.00	6,080,000.00	7,546,000.00	8,923,000.00	0,410,000.00	2,342,500.00	4,360,000.00	6,607,500.00	9,025,000.00
Less sales tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net sales revenue	4,790,000.00	6,080,000.00	7,546,000.00	8,923,000.00	0,410,000.00	2,342,500.00	4,360,000.00	6,607,500.00	9,025,000.00
Subsidy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SALES REVENUE	4,790,000.00	6,080,000.00	7,546,000.00	8,923,000.00	0,410,000.00	2,342,500.00	4,360,000.00	6,607,500.00	9,025,000.00
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

PRODUCTION AND SALES PROGRAMME - CNC TURNING CENTRES - TOTAL
US Dollars

	Production 2009	Production 2010
Stock brought forward	80.63	84.79
Quantity produced	411.17	433.58
Stock carried over	84.79	89.38
Quantity sold	407.0	
Gross unit price (averag		
Gross sales revenue		
Less sales tax		
Net sales revenue		
Subsidy		
SALES REVENUE		
Foreign share (%)		

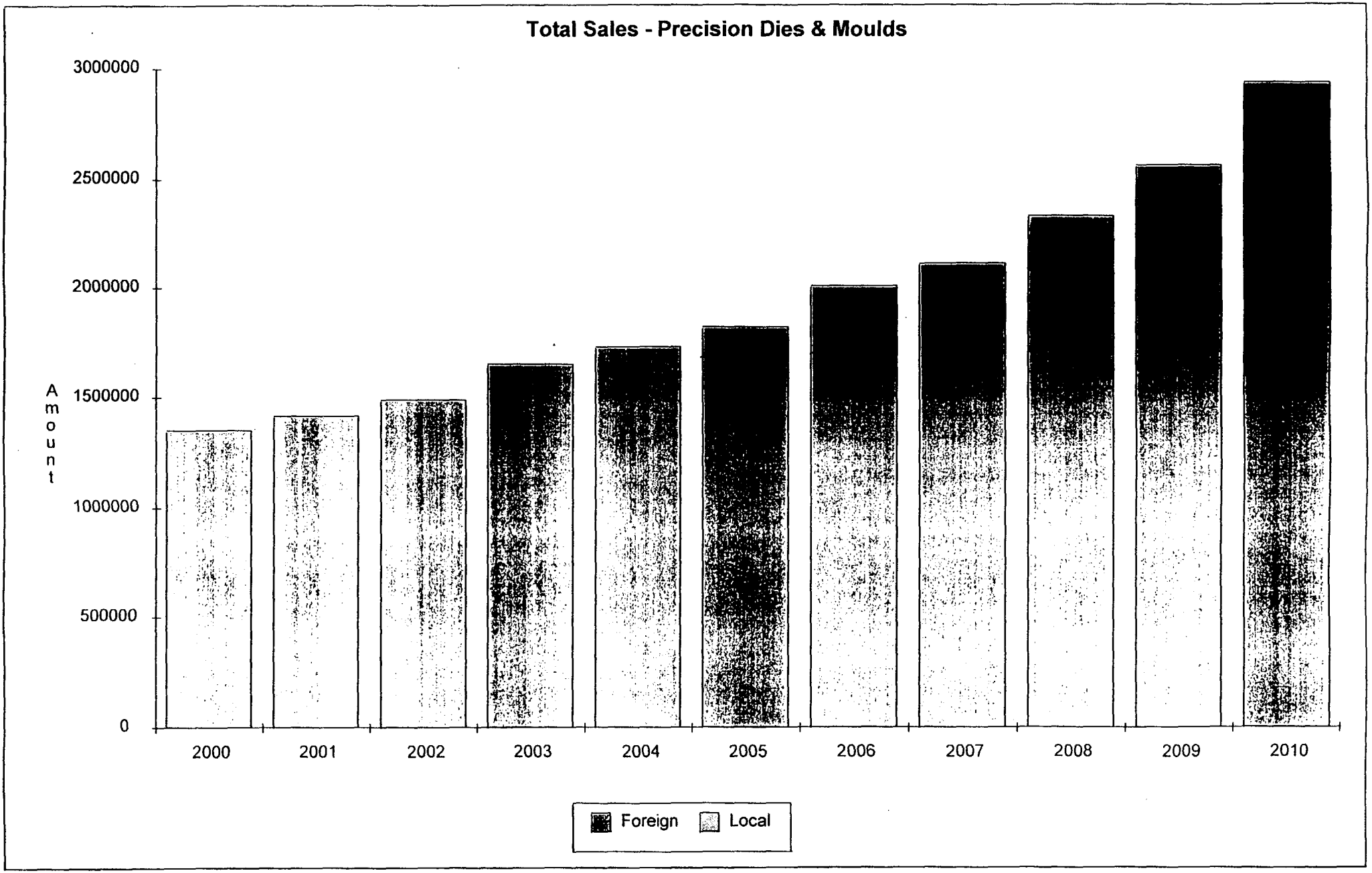

Total Sales - CNC Turning Centres
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
Amount
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local

PRODUCTION AND SALES PROGRAMME - PRECISION DIES & MOULDS - TOTAL
US Dollars

	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004	Production 2005	Production 2006	Production 2007	Production 2008
Stock brought forward	0.00	312.50	328.13	344.58	361.67	379.79	398.75	418.75	439.58
Quantity produced	1,812.50	1,590.63	1,670.46	1,753.08	1,841.13	1,932.96	2,030.00	2,130.83	2,238.08
Stock carried over	312.50	328.13	344.58	361.67	379.79	398.75	418.75	439.58	461.67
Quantity sold	1,500.00	1,575.00	1,654.00	1,736.00	1,823.00	1,914.00	2,010.00	2,110.00	2,216.00
Gross unit price (averag	900.00	900.00	900.00	950.00	950.00	950.00	1,000.00	1,000.00	1,050.00
Gross sales revenue	1,350,000.00	1,417,500.00	1,488,600.00	1,649,200.00	1,731,850.00	1,818,300.00	2,010,000.00	2,110,000.00	2,326,800.00
Less sales tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net sales revenue	1,350,000.00	1,417,500.00	1,488,600.00	1,649,200.00	1,731,850.00	1,818,300.00	2,010,000.00	2,110,000.00	2,326,800.00
Subsidy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SALES REVENUE	1,350,000.00	1,417,500.00	1,488,600.00	1,649,200.00	1,731,850.00	1,818,300.00	2,010,000.00	2,110,000.00	2,326,800.00
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

PRODUCTION AND SALES PROGRAMME - PRECISION DIES & MOULDS - TOTAL
US Dollars

	Production 2009	Production 2010
Stock brought forward	461.67	484.79
Quantity produced	2,350.13	2,467.17
Stock carried over	484.79	508.96
Quantity sold	2,327.00	2,443.00
Gross unit price (averag	1,100.00	1,200.00
Gross sales revenue	2,559,700.00	2,931,600.00
Less sales tax	0.00	0.00
Net sales revenue	2,559,700.00	2,931,600.00
Subsidy	0.00	0.00
SALES REVENUE	2,559,700.00	2,931,600.00
Foreign share (%)	100.00	100.00

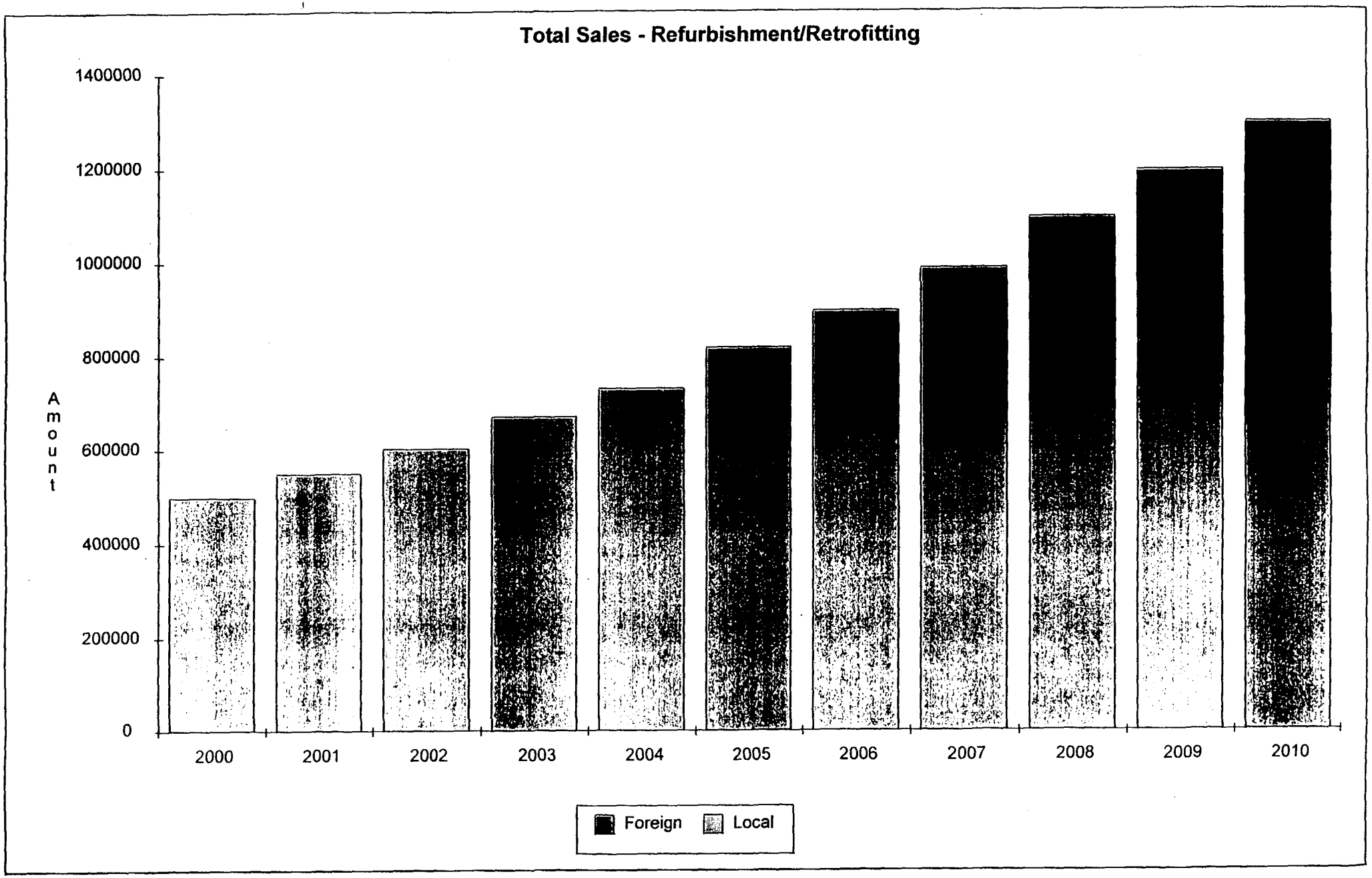

Total Sales - Precision Dies & Moulds
3000000
2500000
2000000
1500000
1000000
500000
0
Amount
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local

PRODUCTION AND SALES PROGRAMME - REFURBISHMENT/RETROFITTING - TOTAL
US Dollars

	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004	Production 2005	Production 2006	Production 2007	Production 2008
Stock brought forward	0.00	20.83	21.88	22.92	24.17	25.42	26.67	27.92	29.38
Quantity produced	120.83	106.04	111.04	117.25	123.25	129.25	135.25	142.46	149.46
Stock carried over	20.83	21.88	22.92	24.17	25.42	26.67	27.92	29.38	30.83
Quantity sold	100.00	105.00	110.00	116.00	122.00	128.00	134.00	141.00	148.00
Gross unit price (averag	5,000.00	5,250.00	5,500.00	5,800.00	6,000.00	6,400.00	6,700.00	7,000.00	7,400.00
Gross sales revenue	500,000.00	551,250.00	605,000.00	672,800.00	732,000.00	819,200.00	897,800.00	987,000.00	1,095,200.00
Less sales tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net sales revenue	500,000.00	551,250.00	605,000.00	672,800.00	732,000.00	819,200.00	897,800.00	987,000.00	1,095,200.00
Subsidy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SALES REVENUE	500,000.00	551,250.00	605,000.00	672,800.00	732,000.00	819,200.00	897,800.00	987,000.00	1,095,200.00
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

PRODUCTION AND SALES PROGRAMME - REFURBISHMENT/RETROFITTING - TOTAL
US Dollars

	Production 2009	Production 2010
Stock brought forward	30.83	32.29
Quantity produced	156.46	163.46
Stock carried over	32.29	33.75
Quantity sold	155.00	162.00
Gross unit price (averag	7,700.00	8,000.00
Gross sales revenue	1,193,500.00	1,296,000.00
Less sales tax	0.00	0.00
Net sales revenue	1,193,500.00	1,296,000.00
Subsidy	0.00	0.00
SALES REVENUE	1,193,500.00	1,296,000.00
Foreign share (%)	100.00	100.00

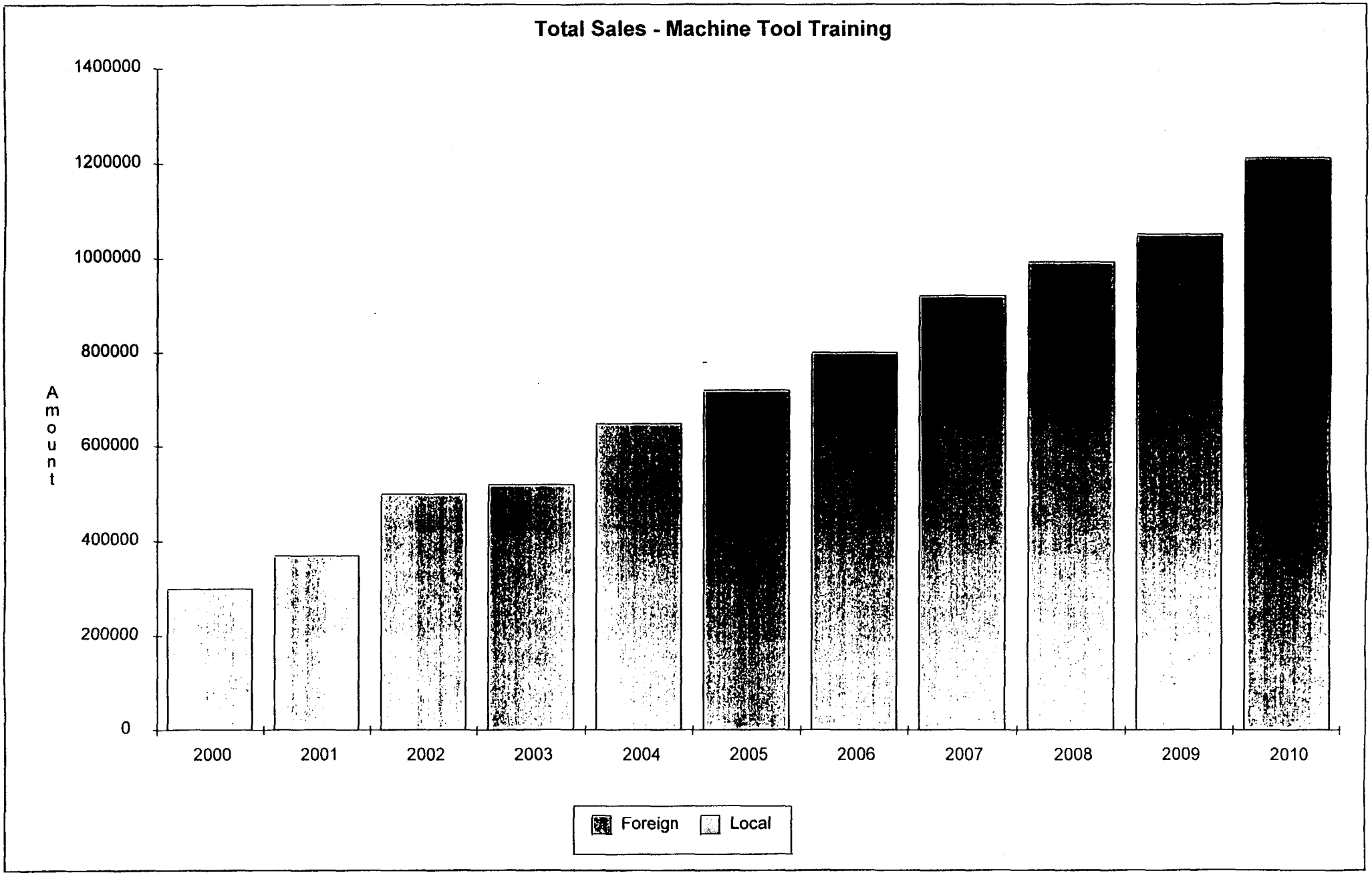

Total Sales - Refurbishment/Retrofitting
1400000
1200000
1000000
800000
600000
400000
200000
0
Amount
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local

PRODUCTION AND SALES PROGRAMME - MACHINE TOOL TRAINING - TOTAL
US Dollars

	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004	Production 2005	Production 2006	Production 2007	Production 2008
Stock brought forward	0.00	0.06	0.07	0.08	0.09	0.11	0.12	0.14	0.15
Quantity produced	20.06	24.01	30.02	34.01	40.02	44.01	50.02	54.01	58.01
Stock carried over	0.06	0.07	0.08	0.09	0.11	0.12	0.14	0.15	0.16
Quantity sold	20.00	24.00	30.00	34.00	40.00	44.00	50.00	54.00	58.00
Gross unit price (averag	15,000.00	15,416.67	16,666.67	15,294.12	16,250.00	16,363.64	16,000.00	17,037.04	17,068.97
Gross sales revenue	300,000.00	370,000.00	500,000.00	520,000.00	650,000.00	720,000.00	800,000.00	920,000.00	990,000.00
Less sales tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net sales revenue	300,000.00	370,000.00	500,000.00	520,000.00	650,000.00	720,000.00	800,000.00	920,000.00	990,000.00
Subsidy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SALES REVENUE	300,000.00	370,000.00	500,000.00	520,000.00	650,000.00	720,000.00	800,000.00	920,000.00	990,000.00
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

PRODUCTION AND SALES PROGRAMME - MACHINE TOOL TRAINING - TOTAL
US Dollars

	Production 2009	Production 2010
Stock brought forward	0.16	0.17
Quantity produced	60.01	72.03
Stock carried over	0.17	0.20
Quantity sold	60.00	72.00
Gross unit price (averag	17,500.00	16,805.56
Gross sales revenue	1,050,000.00	1,210,000.00
Less sales tax	0.00	0.00
Net sales revenue	1,050,000.00	1,210,000.00
Subsidy	0.00	0.00
SALES REVENUE	1,050,000.00	1,210,000.00
Foreign share (%)	100.00	100.00


Total Sales - Machine Tool Training
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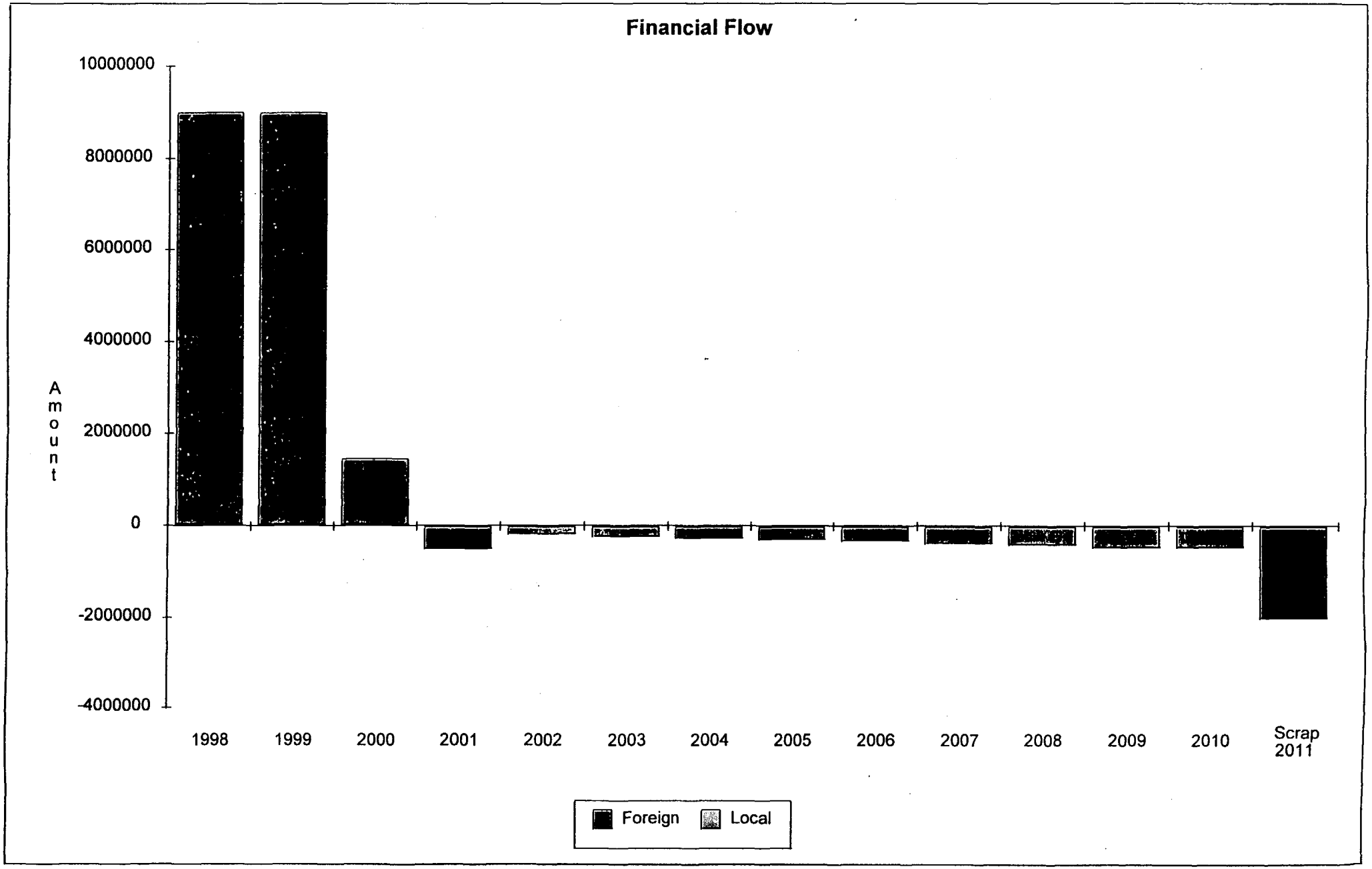
1200000
1000000
800000
600000
400000
200000
0
Amount
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign
Local

FINANCIAL FLOW - TOTAL
US Dollars

	Total inflow	Construction 1998	Construction 1999	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004
Equity capital	14,000,000.00	7,000,000.00	7,000,000.00	0.00	0.00	0.00	0.00	0.00
Long-term loans	4,000,000.00	2,000,000.00	2,000,000.00	-19,526.96	-247,412.09	-273,319.37	-301,939.48	-333,556.49
TOTAL LONG-TERM FINAN	18,000,000.00	9,000,000.00	9,000,000.00	-19,526.96	-247,412.09	-273,319.37	-301,939.48	-333,556.49
Total short-term loans	2,240,436.18	0.00	0.00	1,481,253.07	-233,594.95	86,550.03	67,010.82	82,029.46
TOTAL FINANCIAL FLOW	20,240,436.18	9,000,000.00	9,000,000.00	1,461,726.10	-481,007.04	-186,769.34	-234,928.66	-251,527.03
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

FINANCIAL FLOW - TOTAL
US Dollars

	Production 2005	Production 2006	Production 2007	Production 2008	Production 2009	Production 2010	Scrap 2011
Equity capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Long-term loans	-368,484.21	-407,069.32	-449,694.80	-496,783.72	-548,803.47	-553,410.07	0.00
TOTAL LONG-TERM FINAN	-368,484.21	-407,069.32	-449,694.80	-496,783.72	-548,803.47	-553,410.07	0.00
Total short-term loans	78,574.03	78,364.86	87,306.15	89,784.89	88,025.64	101,537.24	-2,006,841.23
TOTAL FINANCIAL FLOW	-289,910.18	-328,704.46	-362,388.65	-406,998.84	-460,777.84	-451,872.83	-2,006,841.23
Foreign share (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00


Financial Flow
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Amount
1998
1999
2000
2001
2002
2003
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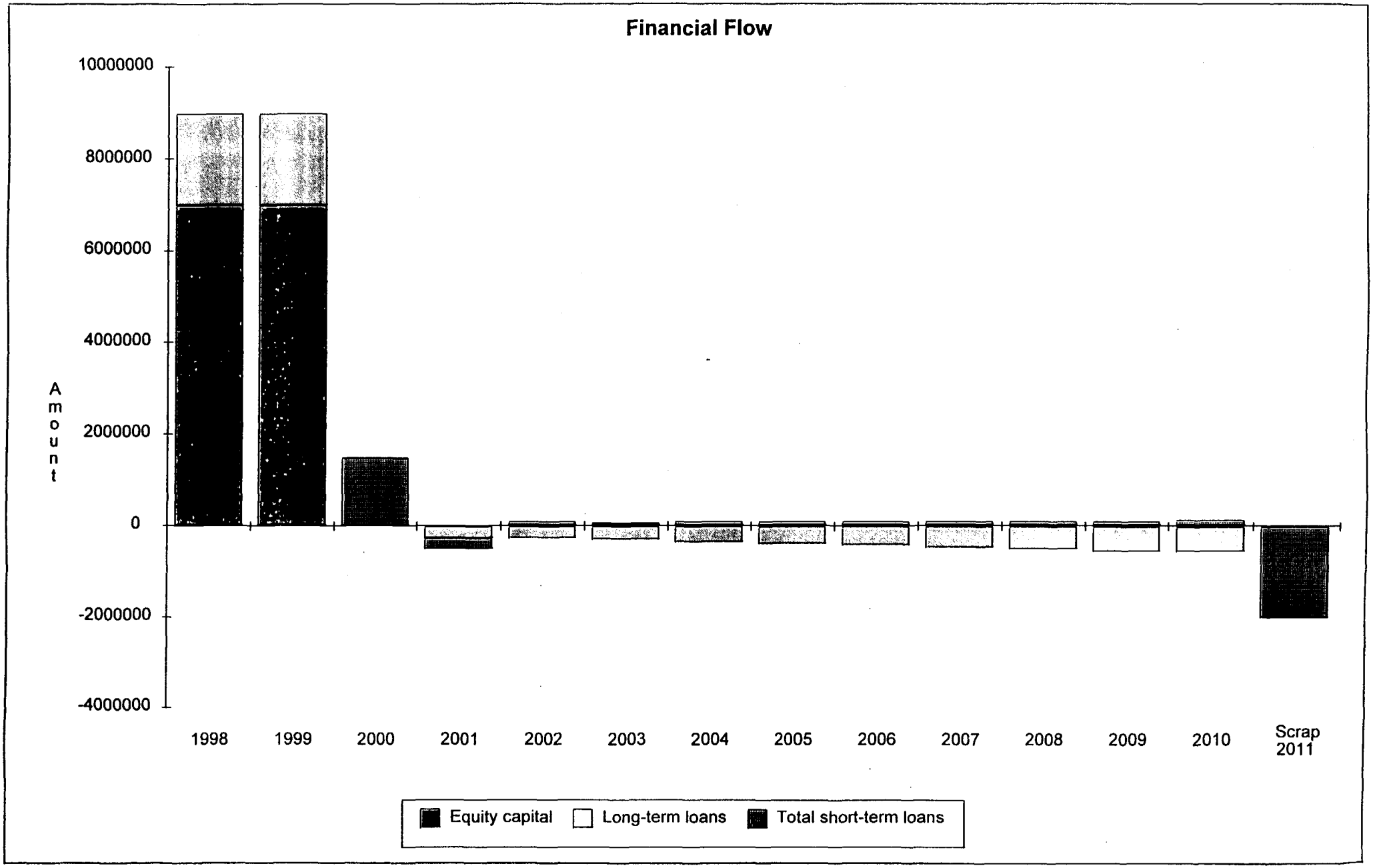
2005
2006
2007
2008
2009
2010
Scrap 2011
Foreign
Local


Financial Flow
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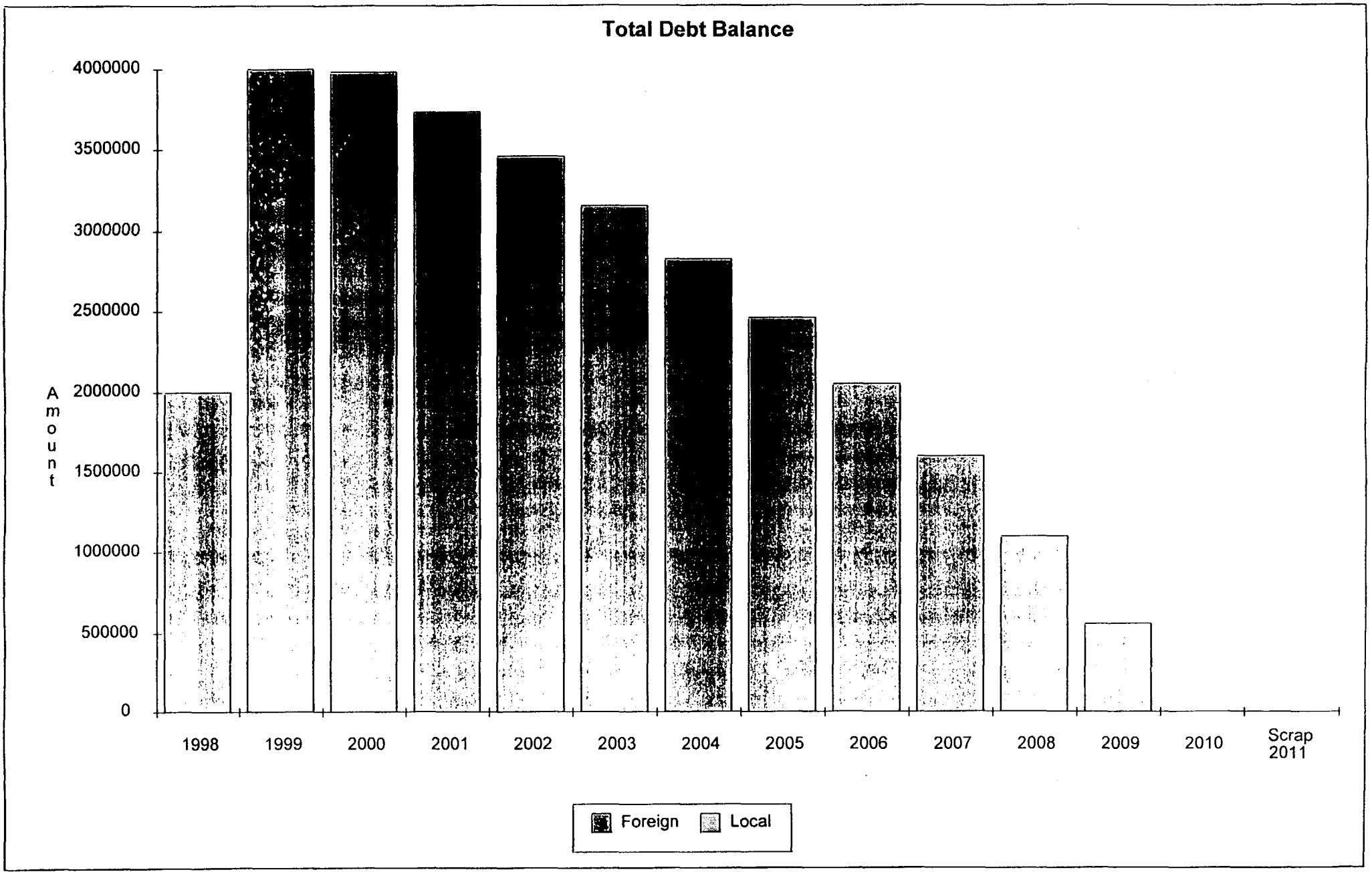
8000000
6000000
4000000
2000000
0
-2000000
-4000000
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Scrap 2011
Equity capital
Long-term loans
Total short-term loans

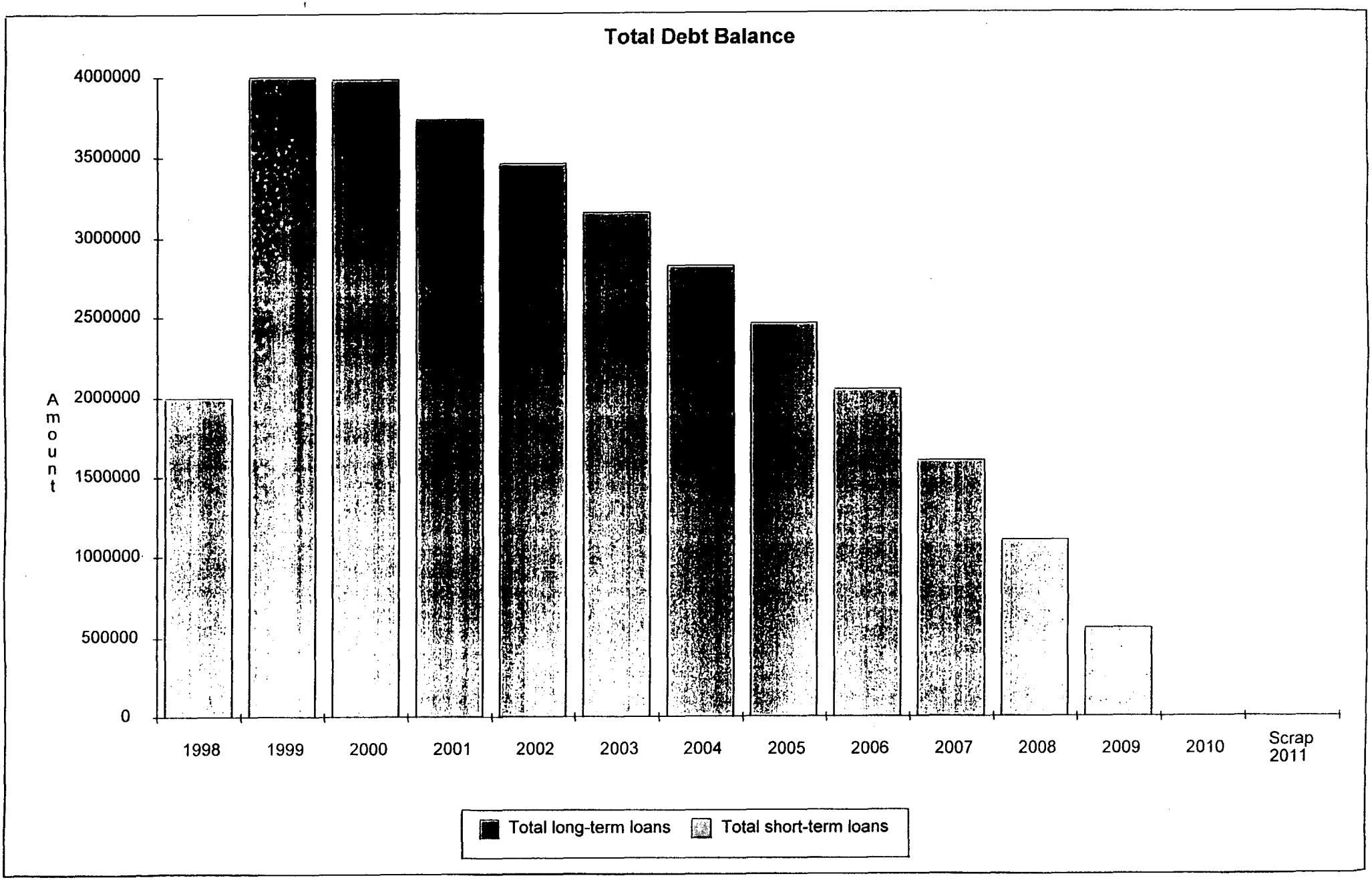
DEBT SERVICE - TOTAL
US Dollars

	Total inflow	onstruction 1998	onstruction 1999	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004	Production 2005	Production 2006
Total long-term loans										
Disbursement	4,000,000.00	2,000,000.00	2,000,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repayment	4,000,000.00	0.00	0.00	19,526.96	247,412.09	273,319.37	301,939.48	333,556.49	368,484.21	407,069.32
Debt balance	0.00	2,000,000.00	4,000,000.00	3,980,473.04	3,733,060.95	3,459,741.58	3,157,802.10	2,824,245.61	2,455,761.40	2,048,692.07
Exchange rate adjustments	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capitalized interest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest payable	3,309,902.04	200,000.00	400,000.00	400,000.00	386,911.45	361,004.17	332,384.06	300,767.05	265,839.32	227,254.21
Other financial costs	1,495,941.22	50,000.00	40,000.00	20,000.00	232,146.87	216,602.50	199,430.43	180,460.23	159,503.59	136,352.53
Total short-term loans										
Disbursement	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repayment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Debt balance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exchange rate adjustments	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capitalized interest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest payable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other financial costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DEBT SERVICE										
Disbursement	4,000,000.00	2,000,000.00	2,000,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repayment	4,000,000.00	0.00	0.00	19,526.96	247,412.09	273,319.37	301,939.48	333,556.49	368,484.21	407,069.32
Debt balance	0.00	2,000,000.00	4,000,000.00	3,980,473.04	3,733,060.95	3,459,741.58	3,157,802.10	2,824,245.61	2,455,761.40	2,048,692.07
Exchange rate adjustments	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capitalized interest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest payable	3,309,902.04	200,000.00	400,000.00	400,000.00	386,911.45	361,004.17	332,384.06	300,767.05	265,839.32	227,254.21
Other financial costs	1,495,941.22	50,000.00	40,000.00	20,000.00	232,146.87	216,602.50	199,430.43	180,460.23	159,503.59	136,352.53

DEBT SERVICE - TOTAL
US Dollars

	Production 2007	Production 2008	Production 2009	Production 2010	Scrap 2011
Total long-term loans					
Disbursement	0.00	0.00	0.00	0.00	0.00
Repayment	449,694.80	496,783.72	548,803.47	553,410.07	0.00
Debt balance	1,598,997.27	1,102,213.54	553,410.07	0.00	0.00
Exchange rate adjustments	0.00	0.00	0.00	0.00	0.00
Capitalized interest	0.00	0.00	0.00	0.00	0.00
Interest payable	184,628.73	137,539.81	85,520.07	28,053.17	0.00
Other financial costs	110,777.24	82,523.89	51,312.04	16,831.90	0.00
Total short-term loans					
Disbursement	0.00	0.00	0.00	0.00	0.00
Repayment	0.00	0.00	0.00	0.00	0.00
Debt balance	0.00	0.00	0.00	0.00	0.00
Exchange rate adjustments	0.00	0.00	0.00	0.00	0.00
Capitalized interest	0.00	0.00	0.00	0.00	0.00
Interest payable	0.00	0.00	0.00	0.00	0.00
Other financial costs	0.00	0.00	0.00	0.00	0.00
TOTAL DEBT SERVICE					
Disbursement	0.00	0.00	0.00	0.00	0.00
Repayment	449,694.80	496,783.72	548,803.47	553,410.07	0.00
Debt balance	1,598,997.27	1,102,213.54	553,410.07	0.00	0.00
Exchange rate adjustments	0.00	0.00	0.00	0.00	0.00
Capitalized interest	0.00	0.00	0.00	0.00	0.00
Interest payable	184,628.73	137,539.81	85,520.07	28,053.17	0.00
Other financial costs	110,777.24	82,523.89	51,312.04	16,831.90	0.00


Total Debt Balance
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Scrap 2011
Foreign
Local

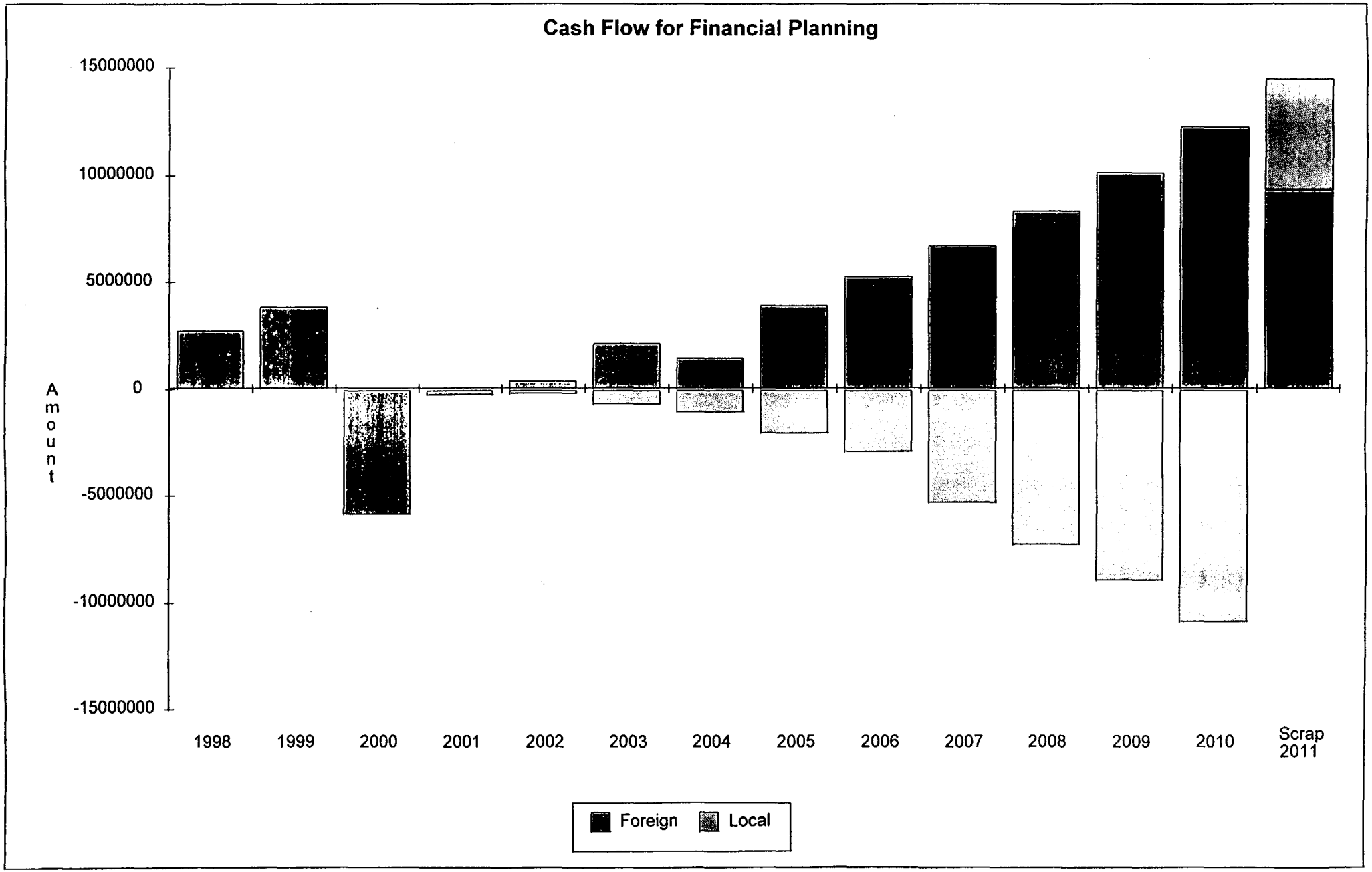

Total Debt Balance
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Scrap 2011
Total long-term loans
Total short-term loans

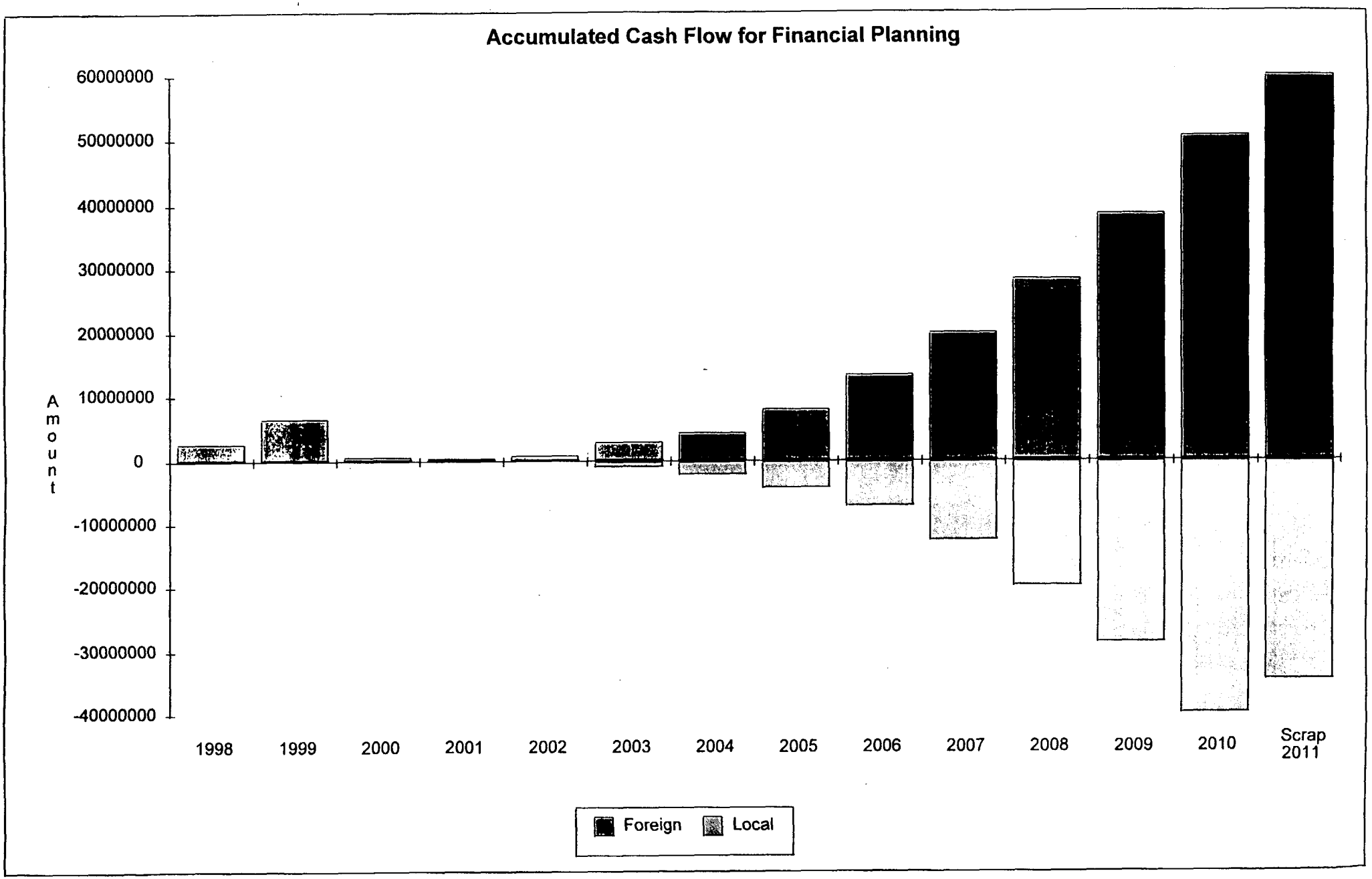
CASH FLOW FOR FINANCIAL PLANNING - TOTAL
US Dollars

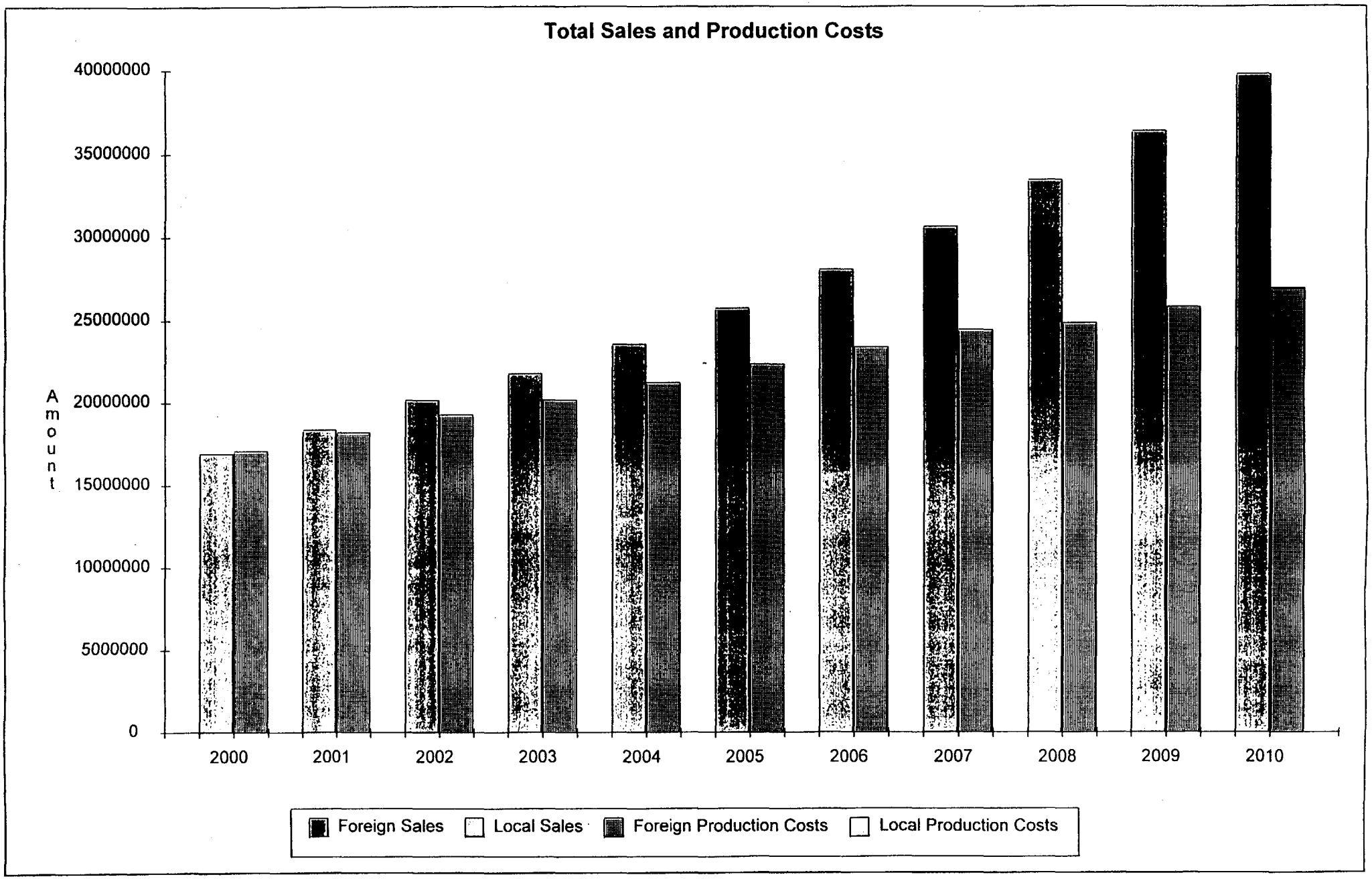
	Construction 1998	Construction 1999	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004	Production 2005
TOTAL CASH INFLOW	9,000,000.00	9,000,000.00	18,421,253.07	18,418,750.00	20,226,150.03	21,832,010.82	23,605,879.46	25,778,574.03
Inflow funds	9,000,000.00	9,000,000.00	1,481,253.07	0.00	86,550.03	67,010.82	82,029.46	78,574.03
Inflow operation	0.00	0.00	16,940,000.00	18,418,750.00	20,139,600.00	21,765,000.00	23,523,850.00	25,700,000.00
Other income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL CASH OUTFLOW	6,291,240.00	5,208,720.00	24,286,785.55	18,667,282.59	20,103,716.21	20,502,373.97	23,282,094.19	23,978,841.80
Increase in fixed assets	6,035,000.00	4,750,000.00	1,000,000.00	1,000,000.00	1,000,000.00	0.00	1,300,000.00	0.00
Increase in current assets	6,240.00	18,720.00	6,911,208.72	-188,626.03	355,283.87	354,290.93	424,671.64	409,943.80
Operating costs	0.00	0.00	13,763,299.87	14,481,968.27	15,281,374.28	16,064,562.93	17,022,428.00	17,920,841.35
Marketing costs	0.00	0.00	2,142,500.00	2,243,625.00	2,361,380.00	2,476,770.00	2,602,385.00	2,731,630.00
Income (corporate) tax	0.00	0.00	0.00	0.00	224,502.02	390,919.02	572,408.31	836,939.81
Financial costs	250,000.00	440,000.00	450,250.00	649,308.31	607,856.67	562,064.49	511,477.28	455,592.92
Loan repayment	0.00	0.00	19,526.96	481,007.04	273,319.37	301,939.48	333,556.49	368,484.21
Dividends	0.00	0.00	0.00	0.00	0.00	351,827.12	515,167.48	1,255,409.71
Equity capital refund	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SURPLUS (DEFICIT)	2,708,760.00	3,791,280.00	-5,865,532.48	-248,532.59	122,433.82	1,329,636.85	323,785.27	1,799,732.23
CUMULATIVE CASH BALANC	2,708,760.00	6,500,040.00	634,507.52	385,974.93	508,408.74	1,838,045.60	2,161,830.87	3,961,563.09
Foreign surplus (deficit)	2,708,760.00	3,791,280.00	-5,865,532.48	-248,532.59	346,935.84	2,072,382.99	1,411,361.05	3,892,081.75
Local surplus (deficit)	0.00	0.00	0.00	0.00	-224,502.02	-742,746.14	-1,087,575.78	-2,092,349.52
Foreign cumulative cash balanc	2,708,760.00	6,500,040.00	634,507.52	385,974.93	732,910.77	2,805,293.76	4,216,654.81	8,108,736.56
Local cumulative cash balance	0.00	0.00	0.00	0.00	-224,502.02	-967,248.16	-2,054,823.95	-4,147,173.46
Net flow of funds	8,750,000.00	8,560,000.00	1,041,726.10	-1,100,065.35	-764,376.01	-1,118,570.27	-1,247,921.79	-1,970,662.81

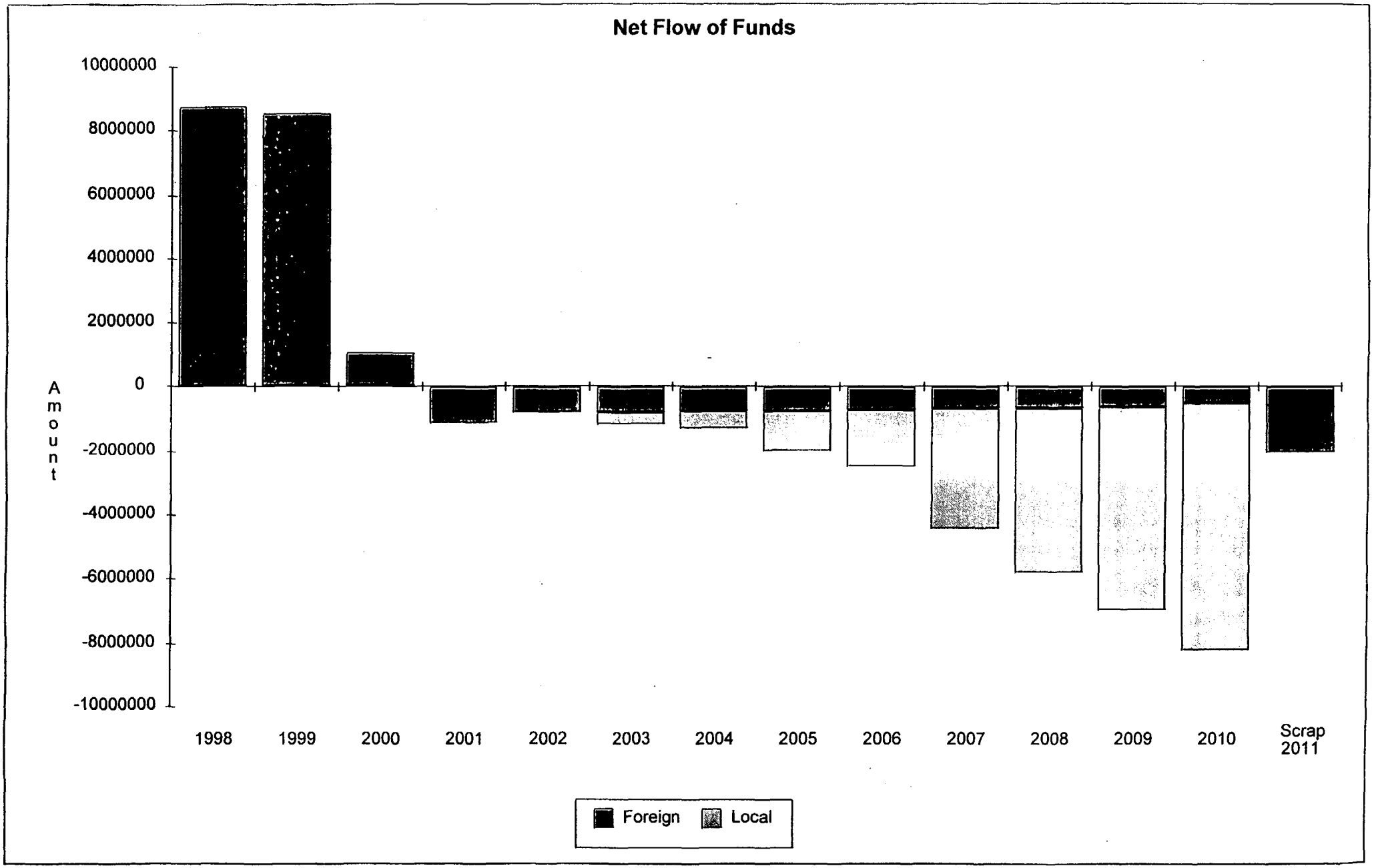
CASH FLOW FOR FINANCIAL PLANNING - TOTAL
US Dollars

	Production 2006	Production 2007	Production 2008	Production 2009	Production 2010	Scrap 2011
TOTAL CASH INFLOW	28,146,164.86	30,711,806.15	33,526,784.89	36,433,725.64	39,859,137.24	16,436,757.58
Inflow funds	78,364.86	87,306.15	89,784.89	88,025.64	101,537.24	0.00
Inflow operation	28,067,800.00	30,624,500.00	33,437,000.00	36,345,700.00	39,757,600.00	0.00
Other income	0.00	0.00	0.00	0.00	0.00	16,436,757.58
TOTAL CASH OUTFLOW	25,870,379.21	29,349,586.12	32,532,407.31	35,310,316.10	38,556,510.39	2,006,841.23
Increase in fixed assets	0.00	0.00	0.00	0.00	0.00	0.00
Increase in current assets	409,929.33	452,565.92	469,681.91	467,875.87	513,350.63	0.00
Operating costs	18,844,518.91	19,826,380.18	20,847,581.82	21,847,318.95	23,040,698.83	0.00
Marketing costs	2,864,600.00	3,008,300.00	3,159,070.00	3,307,065.00	3,484,785.00	0.00
Income (corporate) tax	1,180,161.96	1,554,996.84	2,149,698.87	2,638,873.74	3,202,685.52	0.00
Financial costs	393,856.74	325,655.98	250,313.70	167,082.10	75,135.07	0.00
Loan repayment	407,069.32	449,694.80	496,783.72	548,803.47	553,410.07	2,006,841.23
Dividends	1,770,242.94	3,731,992.41	5,159,277.29	6,333,296.97	7,686,445.26	0.00
Equity capital refund	0.00	0.00	0.00	0.00	0.00	0.00
SURPLUS (DEFICIT)	2,275,785.66	1,362,220.03	994,377.58	1,123,409.54	1,302,626.85	14,429,916.34
CUMULATIVE CASH BALANC	6,237,348.75	7,599,568.78	8,593,946.36	9,717,355.90	11,019,982.75	25,449,899.10
Foreign surplus (deficit)	5,226,190.56	6,649,209.27	8,303,353.74	10,095,580.25	12,191,757.63	9,288,295.34
Local surplus (deficit)	-2,950,404.91	-5,286,989.24	-7,308,976.16	-8,972,170.71	10,889,130.78	5,141,621.00
Foreign cumulative cash balanc	13,334,927.12	19,984,136.40	28,287,490.13	38,383,070.38	50,574,828.01	59,863,123.35
Local cumulative cash balance	-7,097,578.37	12,384,567.61	19,693,543.77	28,665,714.48	39,554,845.26	34,413,224.26
Net flow of funds	-2,462,554.15	-4,389,787.03	-5,786,339.82	-6,930,906.91	-8,183,203.16	-2,006,841.23


Cash Flow for Financial Planning
15000000
10000000
5000000
0
-5000000
-10000000
-15000000
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Scrap 2011
Foreign
Local


Accumulated Cash Flow for Financial Planning
60000000
50000000
40000000
30000000
20000000
10000000
0
-10000000
-20000000
-30000000
-40000000
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Scrap 2011
Foreign
Local


Total Sales and Production Costs
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
Amount
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Foreign Sales
Local Sales
Foreign Production Costs
Local Production Costs

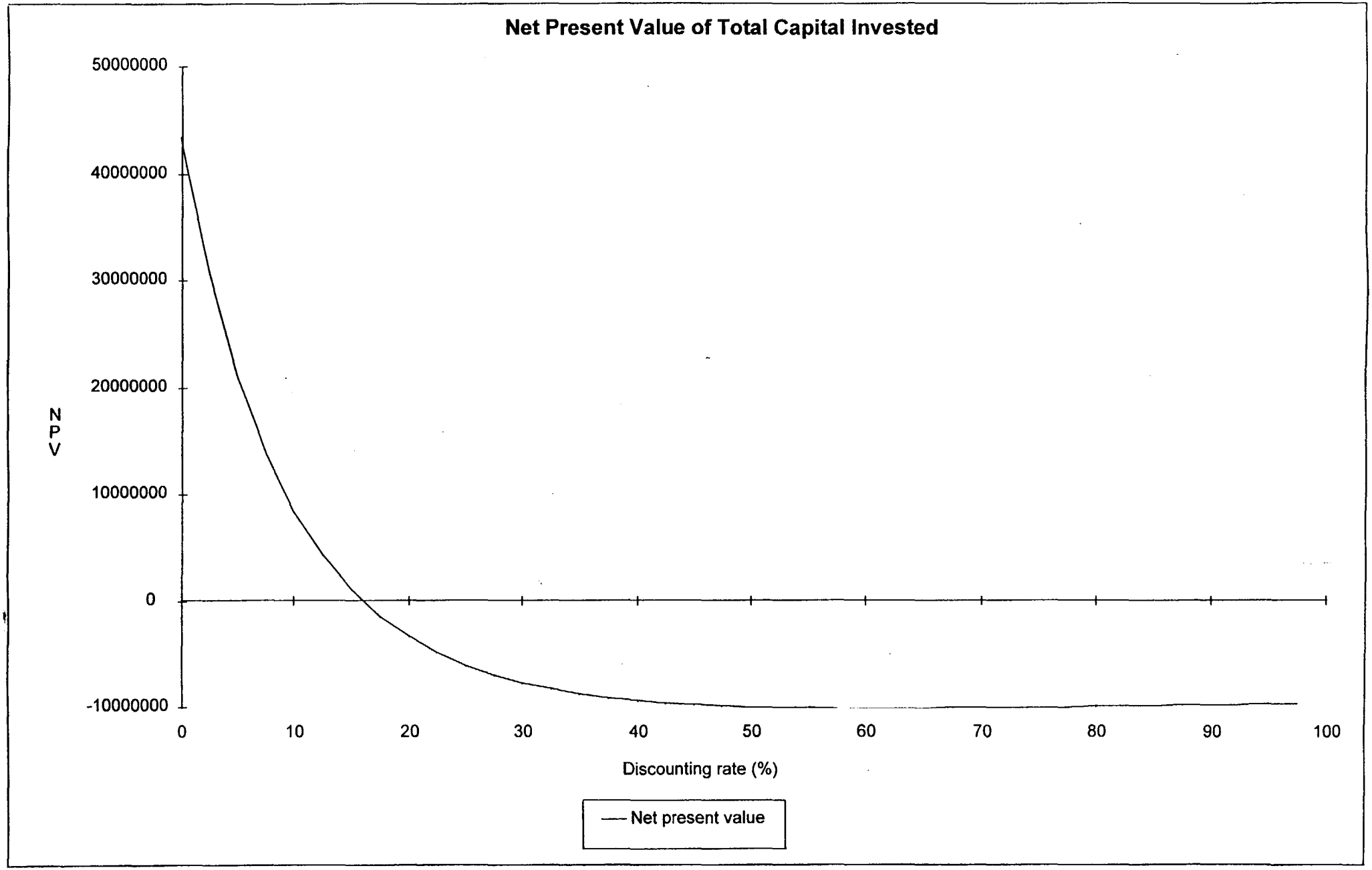

Net Flow of Funds
10000000
8000000
6000000
4000000
2000000
0
-2000000
-4000000
-6000000
-8000000
-10000000
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Scrap 2011
Foreign
Local

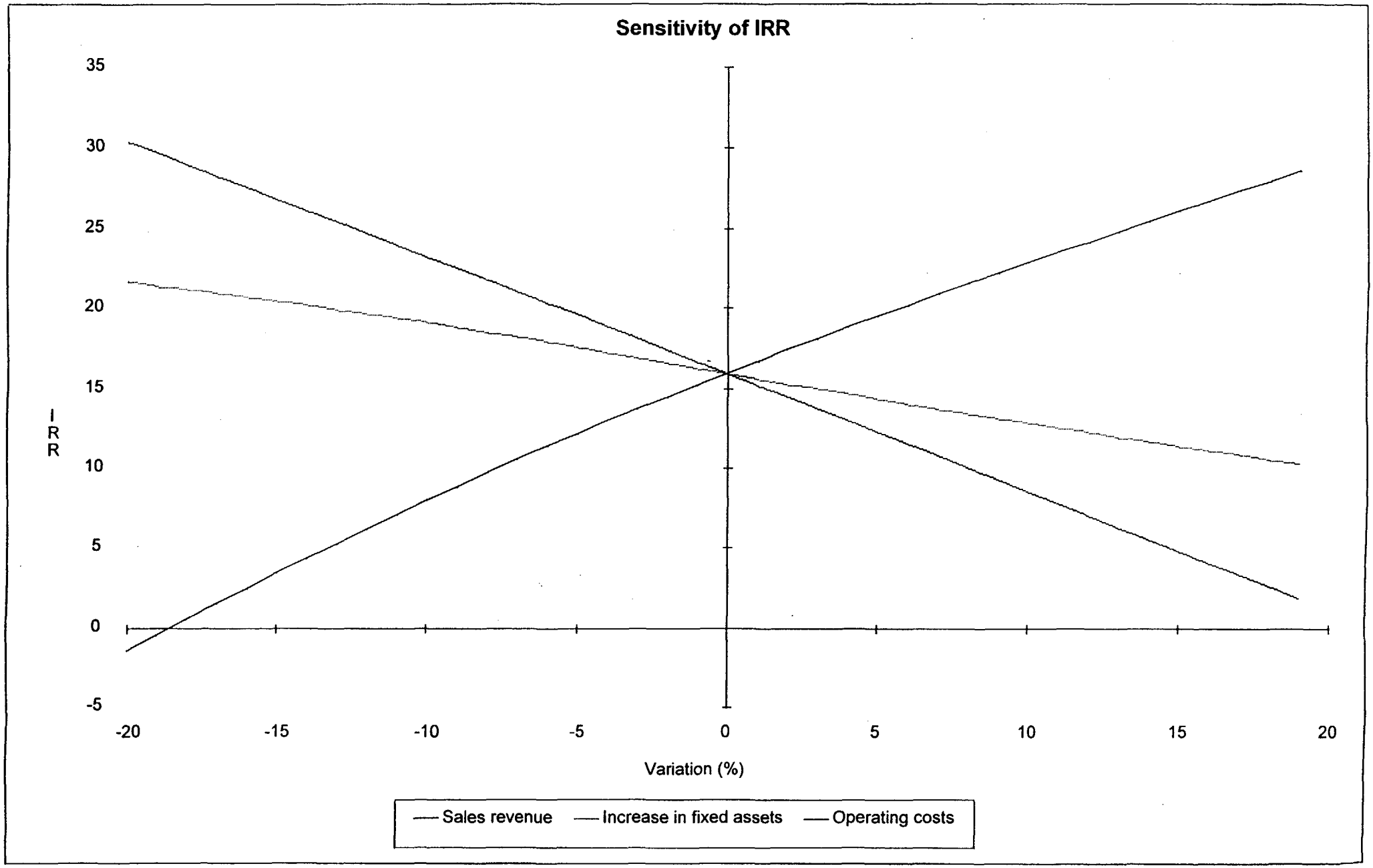
DISCOUNTED CASH FLOW - TOTAL CAPITAL INVESTED
US Dollars

	Construction 1998	Construction 1999	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004
TOTAL CASH INFLOW	0.00	0.00	16,940,000.00	18,418,750.00	20,139,600.00	21,765,000.00	23,523,850.00
Inflow operation	0.00	0.00	16,940,000.00	18,418,750.00	20,139,600.00	21,765,000.00	23,523,850.00
Other income	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL CASH OUTFLOW	6,041,240.00	4,768,720.00	22,335,755.52	17,770,562.19	19,135,990.14	19,219,532.06	21,839,863.49
Increase in fixed assets	6,035,000.00	4,750,000.00	1,000,000.00	1,000,000.00	1,000,000.00	0.00	1,300,000.00
Increase in net working capital	6,240.00	18,720.00	5,429,955.65	44,968.92	268,733.84	287,280.11	342,642.18
Operating costs	0.00	0.00	13,763,299.87	14,481,968.27	15,281,374.28	16,064,562.93	17,022,428.00
Marketing costs	0.00	0.00	2,142,500.00	2,243,625.00	2,361,380.00	2,476,770.00	2,602,385.00
Income (corporate) tax	0.00	0.00	0.00	0.00	224,502.02	390,919.02	572,408.31
NET CASH FLOW	-6,041,240.00	-4,768,720.00	-5,395,755.52	648,187.81	1,003,609.86	2,545,467.94	1,683,986.51
CUMULATIVE NET CASH FLOW	-6,041,240.00	-10,809,960.00	-16,205,715.52	-15,557,527.71	-14,553,917.85	-12,008,449.91	-10,324,463.40
Net present value	-6,041,240.00	-4,257,785.71	-4,301,463.27	461,367.28	637,812.21	1,444,366.87	853,159.97
Cumulative net present value	-6,041,240.00	-10,299,025.71	-14,600,488.98	-14,139,121.70	-13,501,309.49	-12,056,942.62	-11,203,782.65
NET PRESENT VALUE	at 12.00 %	4,972,055.77					
INTERNAL RATE OF RETURN	15.98 %						
MODIFIED INTERNAL RATE OF RET	15.98 %						
NORMAL PAYBACK	at 0.00 %	10 years					
DYNAMIC PAYBACK	at 12.00 %	13 years					
NPV RATIO	0.27						

DISCOUNTED CASH FLOW - TOTAL CAPITAL INVESTED
US Dollars

	Production 2005	Production 2006	Production 2007	Production 2008	Production 2009	Production 2010	Scrap 2011
TOTAL CASH INFLOW	25,700,000.00	28,067,800.00	30,624,500.00	33,437,000.00	36,345,700.00	39,757,600.00	14,429,916.34
Inflow operation	25,700,000.00	28,067,800.00	30,624,500.00	33,437,000.00	36,345,700.00	39,757,600.00	0.00
Other income	0.00	0.00	0.00	0.00	0.00	0.00	14,429,916.34
TOTAL CASH OUTFLOW	21,820,780.93	23,220,845.34	24,754,936.78	26,536,247.71	28,173,107.92	30,139,982.75	0.00
Increase in fixed assets	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Increase in net working capital	331,369.77	331,564.46	365,259.77	379,897.02	379,850.23	411,813.39	0.00
Operating costs	17,920,841.35	18,844,518.91	19,826,380.18	20,847,581.82	21,847,318.95	23,040,698.83	0.00
Marketing costs	2,731,630.00	2,864,600.00	3,008,300.00	3,159,070.00	3,307,065.00	3,484,785.00	0.00
Income (corporate) tax	836,939.81	1,180,161.96	1,554,996.84	2,149,698.87	2,638,873.74	3,202,685.52	0.00
NET CASH FLOW	3,879,219.07	4,846,954.66	5,869,563.22	6,900,752.29	8,172,592.08	9,617,617.25	14,429,916.34
CUMULATIVE NET CASH FLOW	-6,445,244.33	-1,598,289.66	4,271,273.55	11,172,025.84	19,344,617.93	28,962,235.18	43,392,151.52
Net present value	1,754,761.70	1,957,603.70	2,116,623.34	2,221,857.55	2,349,424.93	2,468,602.80	3,306,964.39
Cumulative net present value	-9,449,020.94	-7,491,417.25	-5,374,793.91	-3,152,936.36	-803,511.43	1,665,091.37	4,972,055.77
NET PRESENT VALUE							
INTERNAL RATE OF RETURN							
MODIFIED INTERNAL RATE OF RET							
NORMAL PAYBACK							
DYNAMIC PAYBACK							
NPV RATIO							


Net Present Value of Total Capital Invested
50000000
40000000
30000000
20000000
10000000
0
-10000000
NPV
0
10
20
30
40
50
60
70
80
90
100
Discounting rate (%)
Net present value

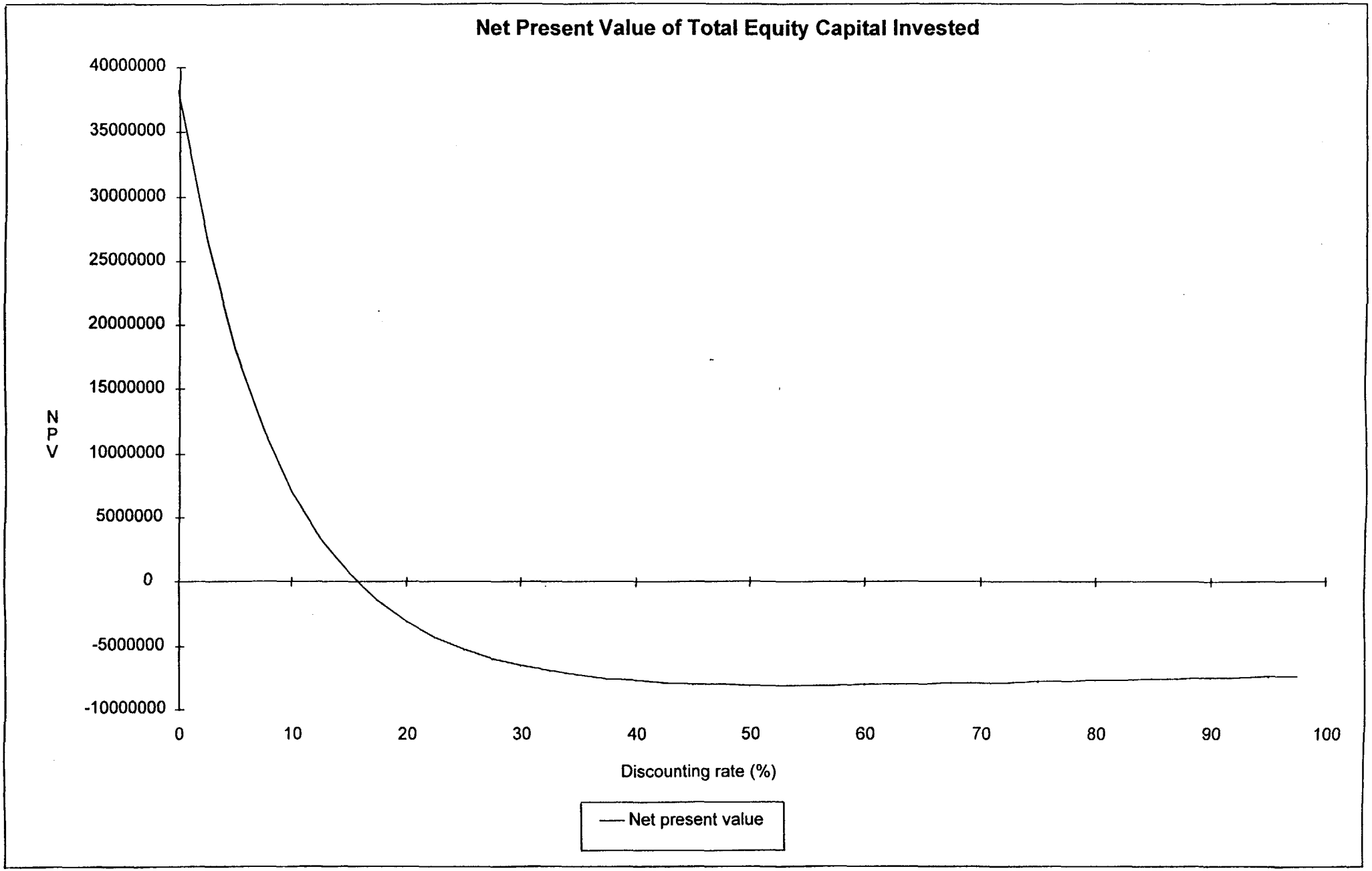

Sensitivity of IRR
35
30
25
20
15
10
5
0
-5
IRR
-20
-15
-10
-5
0
5
10
15
20
Variation (%)
Sales revenue
Increase in fixed assets
Operating costs

DISCOUNTED CASH FLOW - EQUITY CAPITAL INVESTED
US Dollars

	Construction 1998	Construction 1999	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004
TOTAL CASH INFLOW	2,708,760.00	3,791,280.00	-5,865,532.48	-248,532.59	122,433.82	1,681,463.97	838,952.74
Surplus (deficit)	2,708,760.00	3,791,280.00	-5,865,532.48	-248,532.59	122,433.82	1,329,636.85	323,785.27
Dividends	0.00	0.00	0.00	0.00	0.00	351,827.12	515,167.48
Equity capital refund	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL CASH OUTFLOW	7,000,000.00	7,000,000.00	0.00	0.00	0.00	0.00	0.00
Equity capital paid	7,000,000.00	7,000,000.00	0.00	0.00	0.00	0.00	0.00
NET CASH RETURN	-4,291,240.00	-3,208,720.00	-5,865,532.48	-248,532.59	122,433.82	1,681,463.97	838,952.74
CUMULATIVE NET CASH RETURN	-4,291,240.00	-7,499,960.00	-13,365,492.48	-13,614,025.07	-13,491,591.26	-11,810,127.29	-10,971,174.54
Net present value	-4,291,240.00	-2,864,928.57	-4,675,966.58	-176,900.59	77,808.90	954,107.81	425,039.57
Cumulative net present value	-4,291,240.00	-7,156,168.57	-11,832,135.16	-12,009,035.74	-11,931,226.84	-10,977,119.03	-10,552,079.46
NET PRESENT VALUE	at 12.00 %	4,040,231.19					
INTERNAL RATE OF RETURN	15.72 %						
MODIFIED INTERNAL RATE OF RET	15.72 %						
SHORT NET PRESENT VALUE	at 12.00 %	733,266.80	for 13 years				
NORMAL PAYBACK	at 0.00 %	10 years					
DYNAMIC PAYBACK	at 12.00 %	13 years					

DISCOUNTED CASH FLOW - EQUITY CAPITAL INVESTED
US Dollars

	Production 2005	Production 2006	Production 2007	Production 2008	Production 2009	Production 2010	Scrap 2011
TOTAL CASH INFLOW	3,055,141.94	4,046,028.60	5,094,212.44	6,153,654.87	7,456,706.51	8,989,072.11	14,429,916.34
Surplus (deficit)	1,799,732.23	2,275,785.66	1,362,220.03	994,377.58	1,123,409.54	1,302,626.85	14,429,916.34
Dividends	1,255,409.71	1,770,242.94	3,731,992.41	5,159,277.29	6,333,296.97	7,686,445.26	0.00
Equity capital refund	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL CASH OUTFLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equity capital paid	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NET CASH RETURN	3,055,141.94	4,046,028.60	5,094,212.44	6,153,654.87	7,456,706.51	8,989,072.11	14,429,916.34
CUMULATIVE NET CASH RETURN	-7,916,032.60	-3,870,004.00	1,224,208.44	7,377,863.31	14,834,569.81	23,823,641.92	38,253,558.26
Net present value	1,381,991.06	1,634,123.09	1,837,024.07	1,981,312.17	2,143,624.94	2,307,270.92	3,306,964.39
Cumulative net present value	-9,170,088.40	-7,535,965.31	-5,698,941.23	-3,717,629.06	-1,574,004.12	733,266.80	4,040,231.19
NET PRESENT VALUE							
INTERNAL RATE OF RETURN							
MODIFIED INTERNAL RATE OF RET							
SHORT NET PRESENT VALUE							
NORMAL PAYBACK							
DYNAMIC PAYBACK							

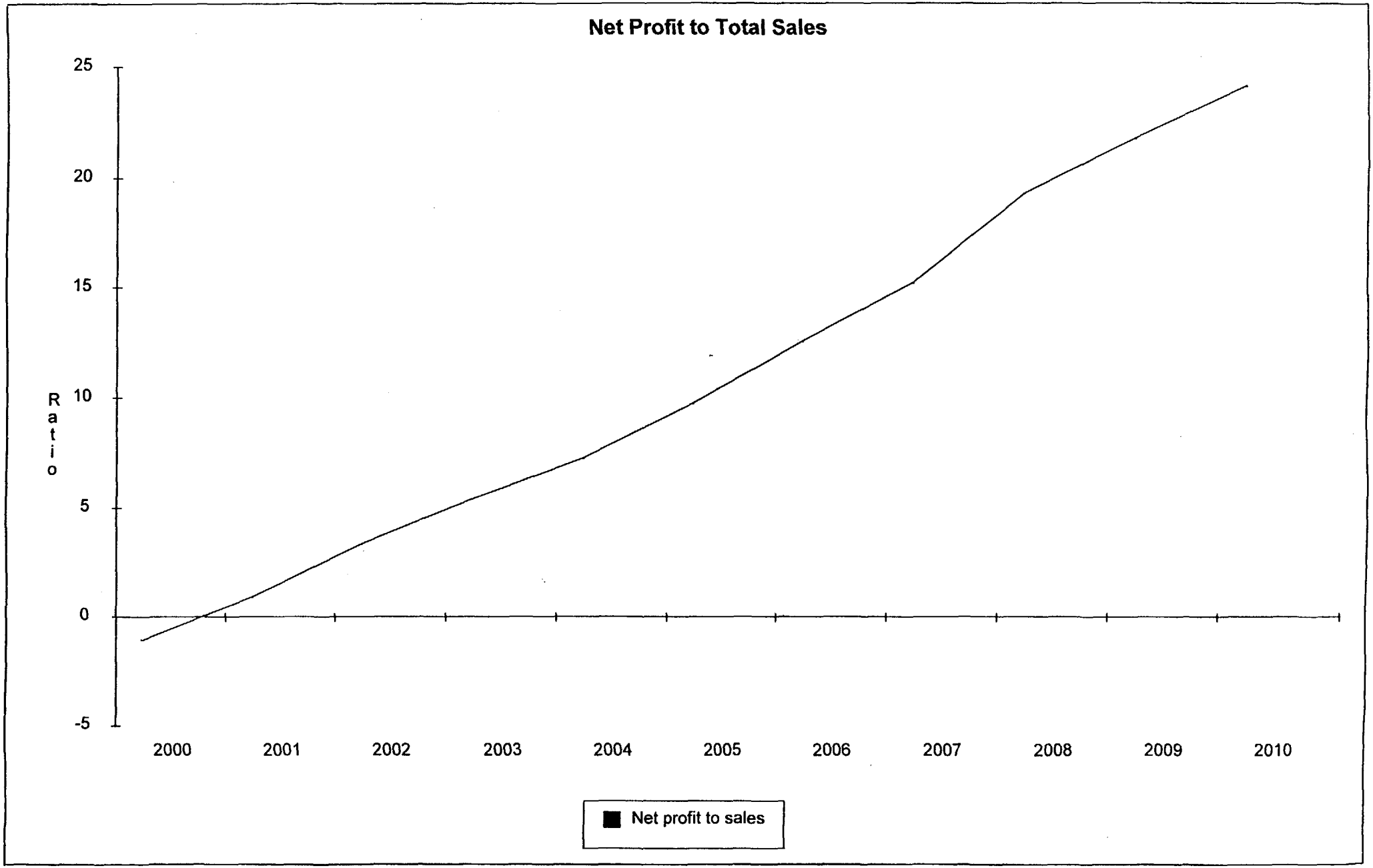

Net Present Value of Total Equity Capital Invested
40000000
35000000
30000000
25000000
20000000
15000000
NPV
10000000
5000000
0
-5000000
-10000000
0
10
20
30
40
50
60
70
80
90
100
Discounting rate (%)
Net present value

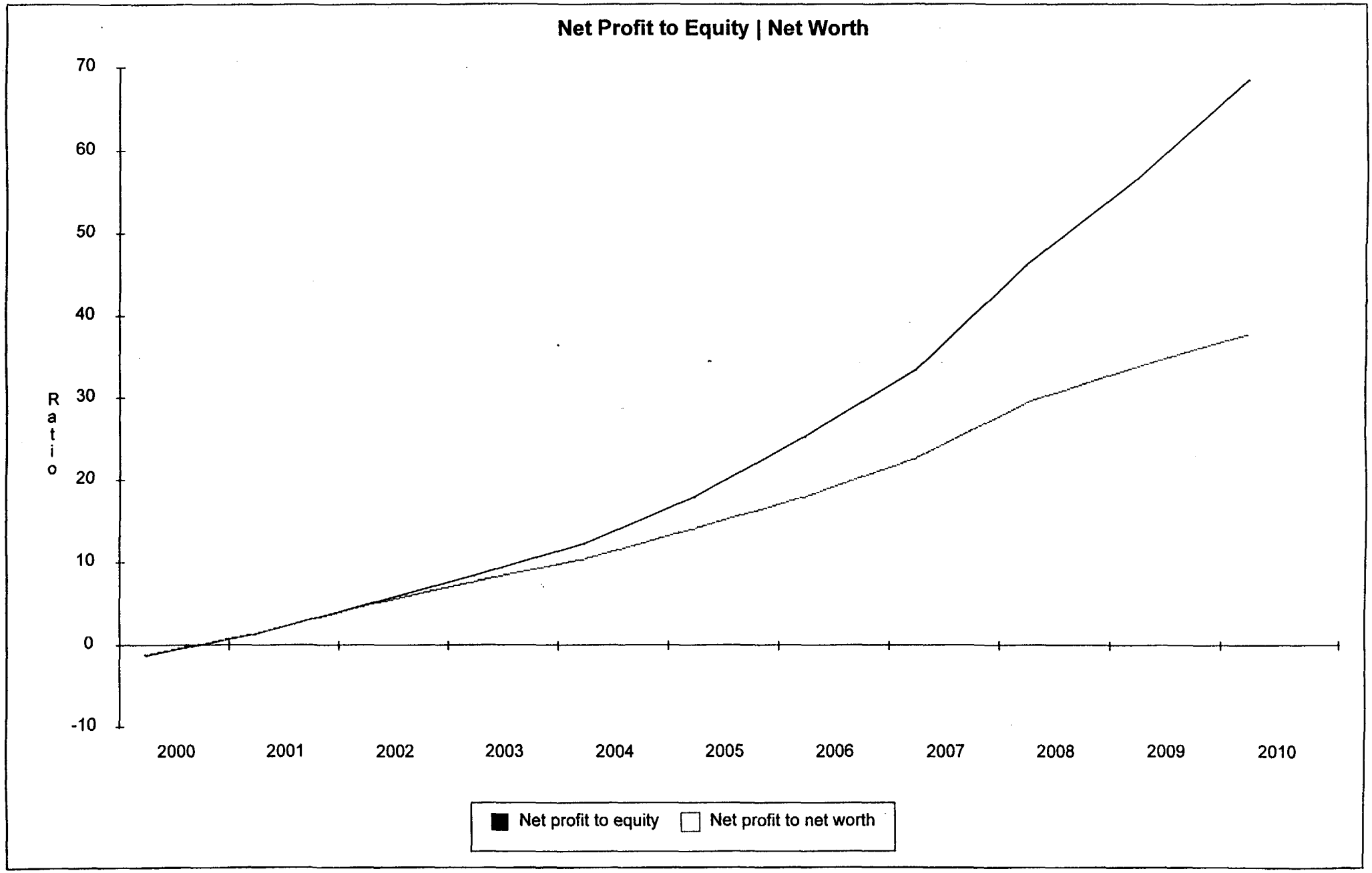
NET INCOME STATEMENT
US Dollars

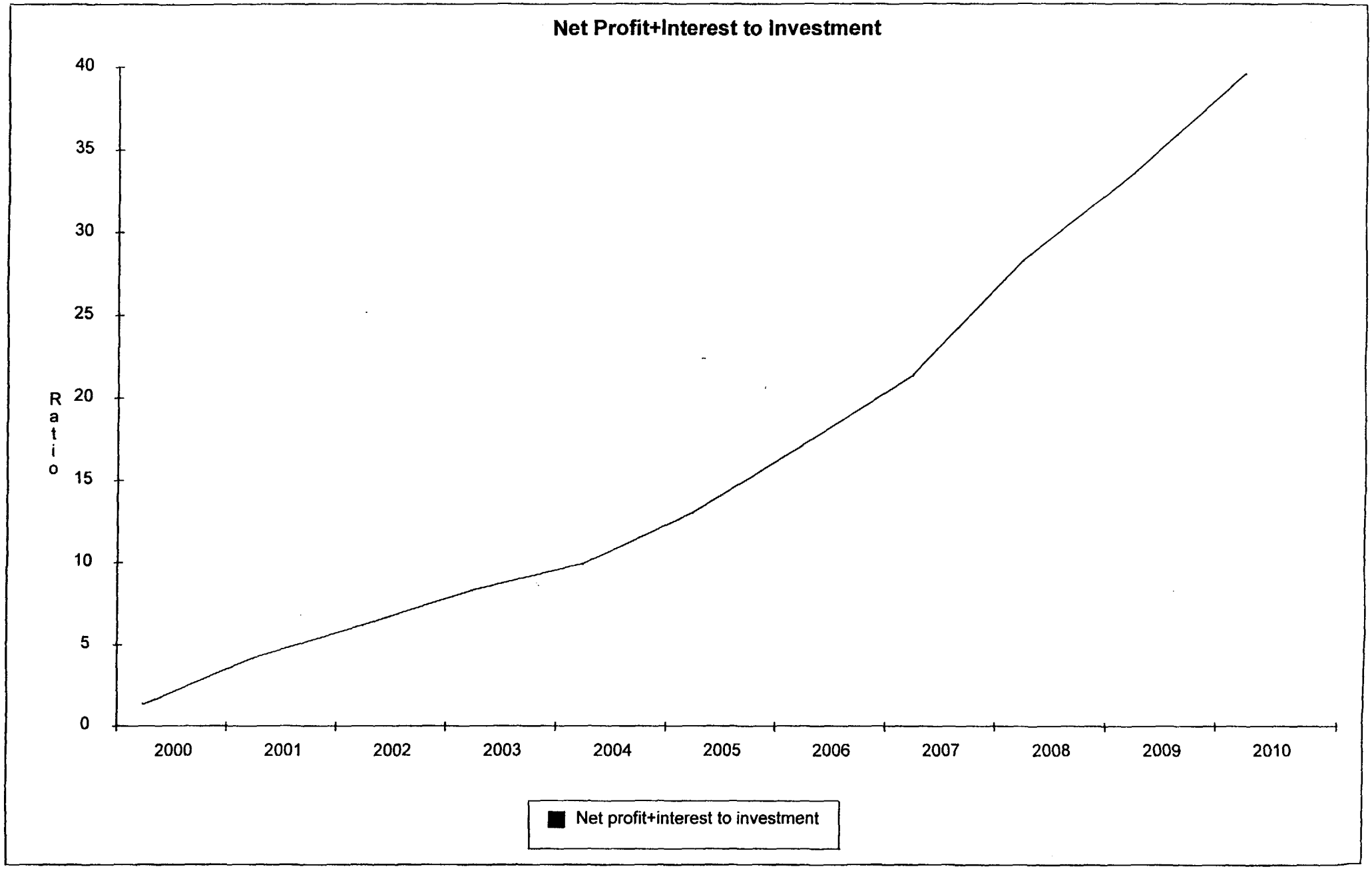
	Production 2000	Production 2001	Production 2002	Production 2003	Production 2004	Production 2005	Production 2006	Production 2007
Sales revenue	6,940,000.00	8,418,750.00	0,139,600.00	1,765,000.00	3,523,850.00	5,700,000.00	8,067,800.00	0,624,500.00
Less variable costs	2,769,247.44	3,459,121.49	4,264,330.89	5,050,957.93	5,910,534.72	6,788,257.59	7,695,969.66	8,671,595.45
VARIABLE MARGIN	4,170,752.56	4,959,628.51	5,875,269.11	6,714,042.07	7,613,315.28	8,911,742.41	0,371,830.34	1,952,904.55
in % of sales revenue	24.62	26.93	29.17	30.85	32.36	34.68	36.95	39.03
Less fixed costs	3,927,228.93	4,169,648.28	4,394,099.89	4,618,551.50	4,842,454.78	5,138,640.26	5,287,575.75	5,437,511.23
OPERATIONAL MARGIN	243,523.63	789,980.23	1,481,169.22	2,095,490.57	2,770,860.50	3,773,102.15	5,084,254.59	6,515,393.32
in % of sales revenue	1.44	4.29	7.35	9.63	11.78	14.68	18.11	21.28
Interest on short-term deposits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Financial costs	420,000.00	619,058.31	577,606.67	531,814.49	481,227.28	425,342.92	363,606.74	295,405.98
GROSS PROFIT FROM OPERATI	-176,476.37	170,921.92	903,562.55	1,563,676.08	2,289,633.22	3,347,759.23	4,720,647.85	6,219,987.35
in % of sales revenue	-1.04	0.93	4.49	7.18	9.73	13.03	16.82	20.31
Extraordinary income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Extraordinary loss	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation allowances	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROSS PROFIT	-176,476.37	170,921.92	903,562.55	1,563,676.08	2,289,633.22	3,347,759.23	4,720,647.85	6,219,987.35
Investment allowances	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Deductible loss	0.00	170,921.92	5,554.45	0.00	0.00	0.00	0.00	0.00
TAXABLE PROFIT	0.00	0.00	898,008.10	1,563,676.08	2,289,633.22	3,347,759.23	4,720,647.85	6,219,987.35
Income (corporate) tax	0.00	0.00	224,502.02	390,919.02	572,408.31	836,939.81	1,180,161.96	1,554,996.84
NET PROFIT	-176,476.37	170,921.92	679,060.53	1,172,757.06	1,717,224.92	2,510,819.42	3,540,485.89	4,664,990.51
in % of sales revenue	-1.04	0.93	3.37	5.39	7.30	9.77	12.61	15.23
Dividends	0.00	0.00	0.00	351,827.12	515,167.48	1,255,409.71	1,770,242.94	3,731,992.41
RETAINED PROFIT	-176,476.37	170,921.92	679,060.53	820,929.94	1,202,057.44	1,255,409.71	1,770,242.94	932,998.10
Ratios (%)								
Net profit to equity	-1.26	1.22	4.85	8.38	12.27	17.93	25.29	33.32
Net profit to net worth	-1.28	1.22	4.63	7.57	10.28	13.99	17.95	22.59
Net profit+interest to investment	1.36	4.16	6.21	8.30	9.91	13.05	17.10	21.38

NET INCOME STATEMENT
US Dollars

	Production 2008	Production 2009	Production 2010
Sales revenue	3,437,000.00	6,345,700.00	9,757,600.00
Less variable costs	9,693,631.61	0,691,428.25	1,913,592.65
VARIABLE MARGIN	3,743,368.39	5,654,271.75	7,844,007.35
in % of sales revenue	41.10	43.07	44.88
Less fixed costs	4,924,509.22	4,961,944.70	4,988,380.18
OPERATIONAL MARGIN	8,818,859.18	0,692,327.05	2,855,627.17
in % of sales revenue	26.37	29.42	32.34
Interest on short-term deposits	0.00	0.00	0.00
Financial costs	220,063.70	136,832.10	44,885.07
GROSS PROFIT FROM OPERATI	8,598,795.48	0,555,494.95	2,810,742.09
in % of sales revenue	25.72	29.04	32.22
Extraordinary income	0.00	0.00	0.00
Extraordinary loss	0.00	0.00	0.00
Depreciation allowances	0.00	0.00	0.00
GROSS PROFIT	8,598,795.48	0,555,494.95	2,810,742.09
Investment allowances	0.00	0.00	0.00
Deductible loss	0.00	0.00	0.00
TAXABLE PROFIT	8,598,795.48	0,555,494.95	2,810,742.09
Income (corporate) tax	2,149,698.87	2,638,873.74	3,202,685.52
NET PROFIT	6,449,096.61	7,916,621.21	9,608,056.57
in % of sales revenue	19.29	21.78	24.17
Dividends	5,159,277.29	6,333,296.97	7,686,445.26
RETAINED PROFIT	1,289,819.32	1,583,324.24	1,921,611.31
Ratios (%)			
Net profit to equity	46.06	56.55	68.63
Net profit to net worth	29.39	33.65	37.75
Net profit+interest to investment	28.28	33.61	39.60


Net Profit to Total Sales
25
20
15
10
5
0
-5
Ratio
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Net profit to sales


Net Profit to Equity | Net Worth
70
60
50
40
30
20
10
0
-10
Ratio
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Net profit to equity
Net profit to net worth

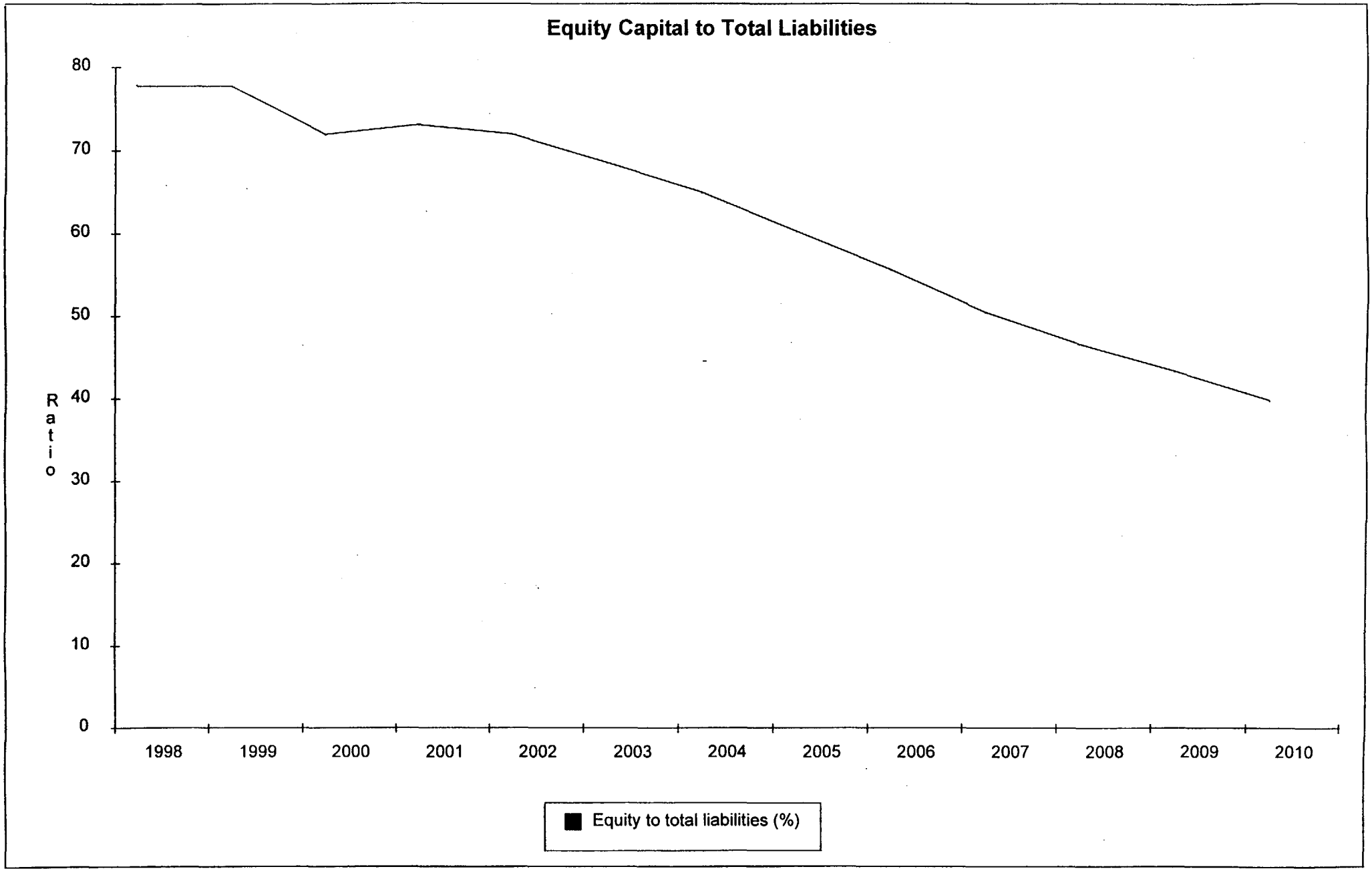

Net Profit+Interest to Investment
Ratio
40
35
30
25
20
15
10
5
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Net profit+interest to investment

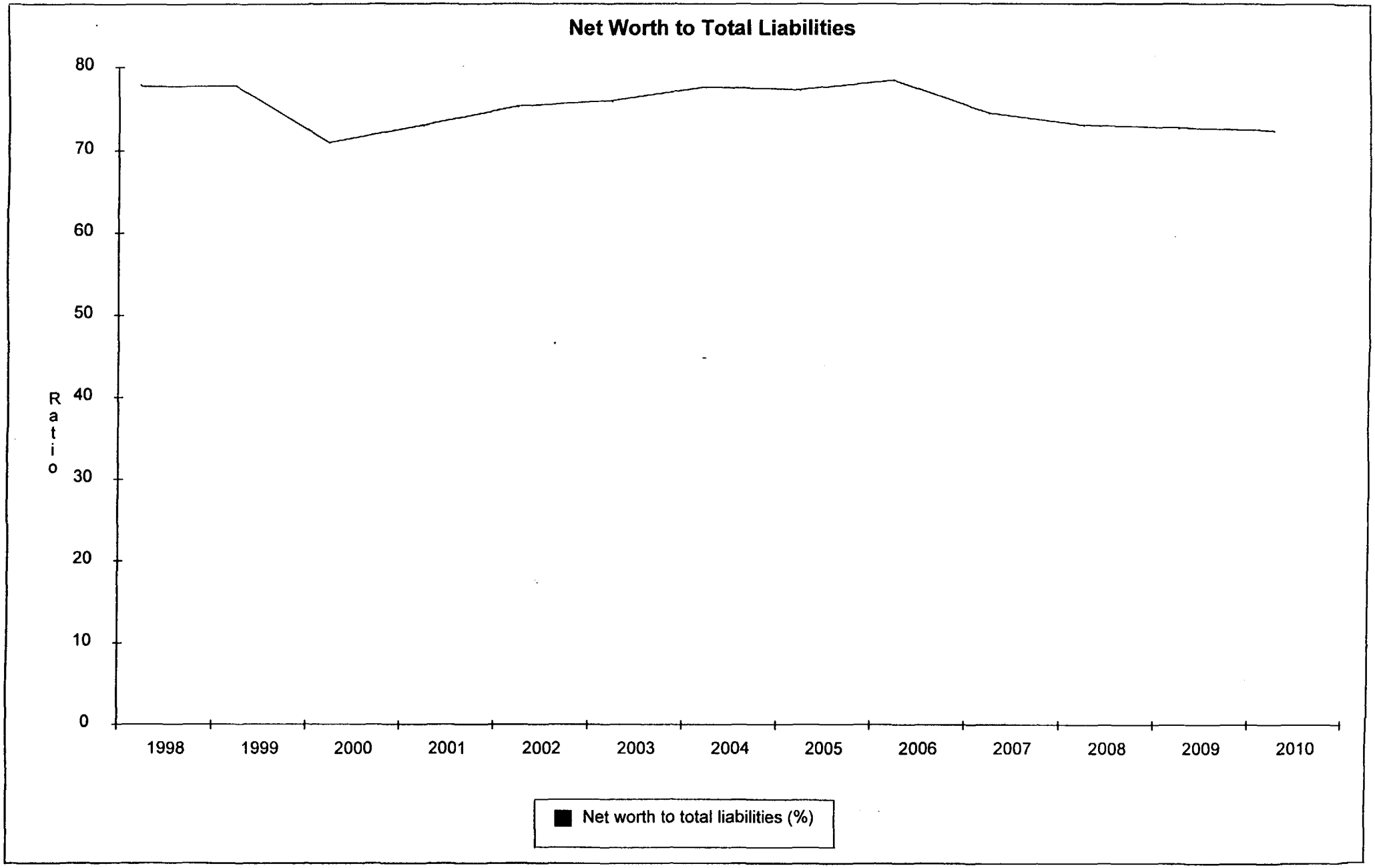
PROJECTED BALANCE SHEET
US Dollars

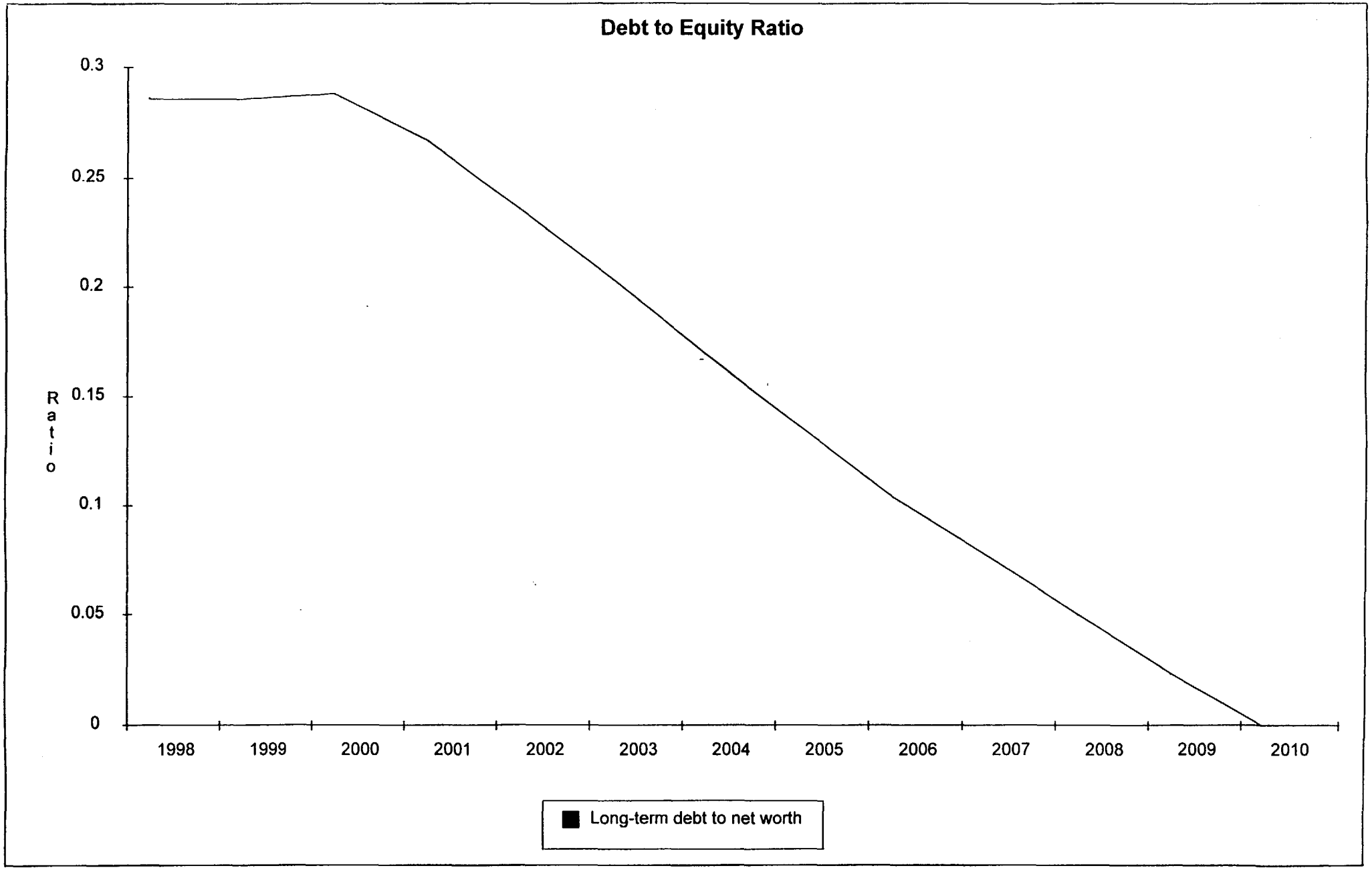
	1998	1999	2000	2001	2002	2003	2004	2005
TOTAL ASSETS	9,000,000.00	8,000,000.00	9,461,726.10	9,151,640.98	9,473,010.25	0,405,284.20	1,519,154.97	3,224,896.73
Total current assets	2,715,000.00	6,525,000.00	7,570,676.24	7,133,517.61	7,611,235.30	9,646,990.20	0,558,787.47	3,508,705.73
Total fixed assets, net of depreciation	6,285,000.00	1,475,000.00	1,714,573.50	1,841,647.00	1,856,220.50	0,758,294.00	0,960,367.50	9,716,191.00
Accumulated losses brought forward	0.00	0.00	0.00	176,476.37	5,554.45	0.00	0.00	0.00
Loss in current year	0.00	0.00	176,476.37	0.00	0.00	0.00	0.00	0.00
TOTAL LIABILITIES	9,000,000.00	8,000,000.00	9,461,726.10	9,151,640.98	9,473,010.25	0,405,284.20	1,519,154.97	3,224,896.73
Total current liabilities	0.00	0.00	1,481,253.07	1,247,658.12	1,334,208.15	1,401,218.97	1,483,248.42	1,561,822.45
Total long-term loans	2,000,000.00	4,000,000.00	3,980,473.04	3,733,060.95	3,459,741.58	3,157,802.10	2,824,245.61	2,455,761.40
Total equity	7,000,000.00	4,000,000.00	4,000,000.00	4,000,000.00	4,000,000.00	4,000,000.00	4,000,000.00	4,000,000.00
Reserves, retained profit brought forw	0.00	0.00	0.00	0.00	0.00	673,506.07	1,494,436.02	2,696,493.46
Net profit after tax	0.00	0.00	0.00	170,921.92	679,060.53	1,172,757.06	1,717,224.92	2,510,819.42
Net worth	7,000,000.00	4,000,000.00	3,823,523.63	3,994,445.55	4,673,506.07	5,494,436.02	6,696,493.46	7,951,903.17
Ratios (%)								
Equity to total liabilities	77.78	77.78	71.94	73.10	71.89	68.61	65.06	60.28
Net worth to total liabilities	77.78	77.78	71.03	73.07	75.35	75.93	77.59	77.30
Long-term debt to net worth	0.29	0.29	0.29	0.27	0.24	0.20	0.17	0.14
Current assets to current liabilities	0.00	0.00	5.11	5.72	5.70	6.88	7.12	8.65

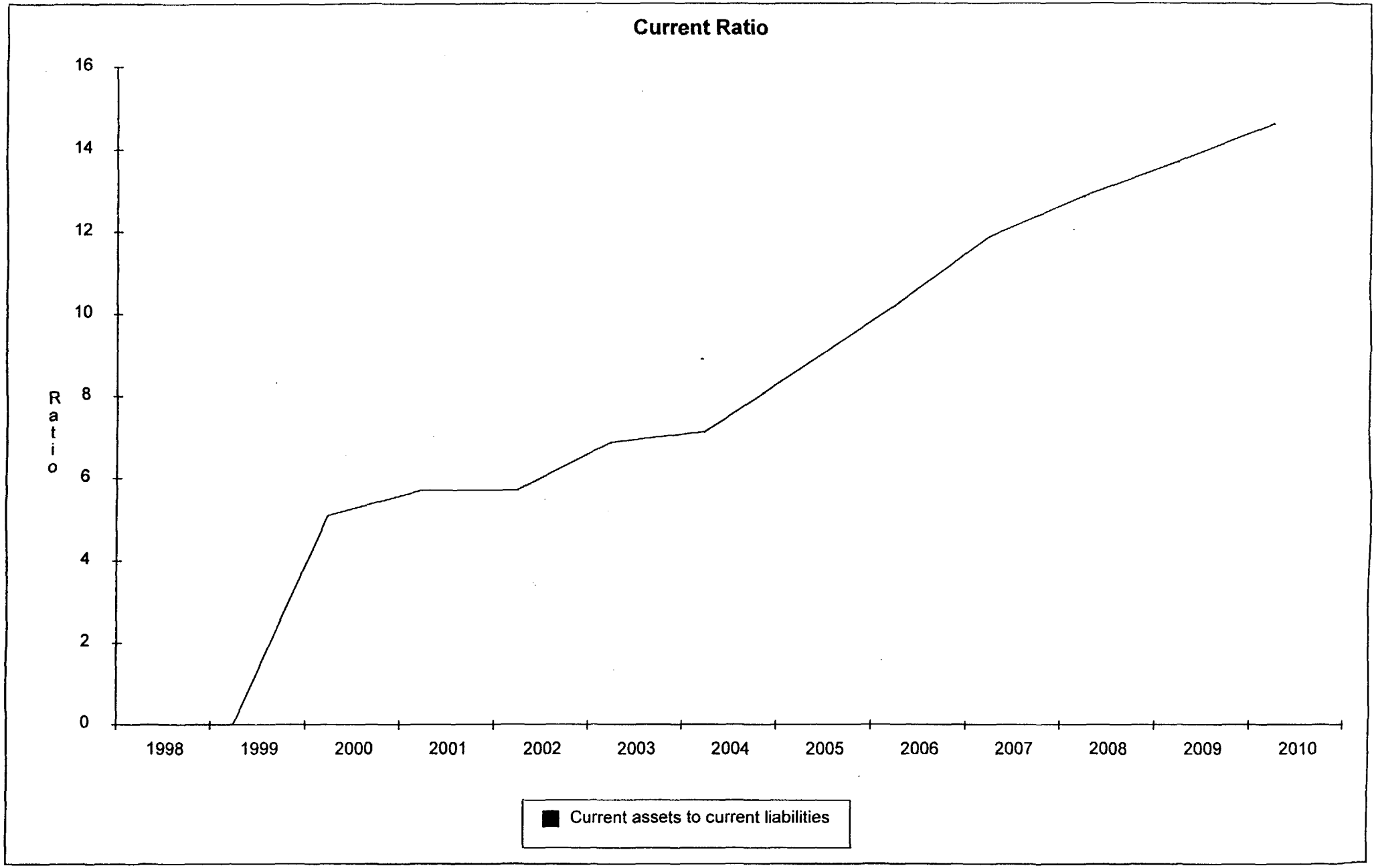
PROJECTED BALANCE SHEET
US Dollars

	2006	2007	2008	2009	2010
TOTAL ASSETS	5,181,268.45	7,713,627.36	0,023,732.73	2,320,298.82	5,143,185.59
Total current assets	6,709,253.95	0,485,789.36	3,377,133.73	6,142,438.82	9,311,564.59
Total fixed assets, net of depreciation	8,472,014.50	7,227,838.00	6,646,599.00	6,177,860.00	5,831,621.00
Accumulated losses brought forward	0.00	0.00	0.00	0.00	0.00
Loss in current year	0.00	0.00	0.00	0.00	0.00
TOTAL LIABILITIES	5,181,268.45	7,713,627.36	0,023,732.73	2,320,298.82	5,143,185.59
Total current liabilities	1,640,187.32	1,727,493.47	1,817,278.36	1,905,303.99	2,006,841.23
Total long-term loans	2,048,692.07	1,598,997.27	1,102,213.54	553,410.07	0.00
Total equity	4,000,000.00	4,000,000.00	4,000,000.00	4,000,000.00	4,000,000.00
Reserves, retained profit brought forw	3,951,903.17	5,722,146.12	6,655,144.22	7,944,963.54	9,528,287.78
Net profit after tax	3,540,485.89	4,664,990.51	6,449,096.61	7,916,621.21	9,608,056.57
Net worth	9,722,146.12	0,655,144.22	1,944,963.54	3,528,287.78	5,449,899.10
Ratios (%)					
Equity to total liabilities	55.60	50.52	46.63	43.32	39.84
Net worth to total liabilities	78.32	74.53	73.09	72.80	72.42
Long-term debt to net worth	0.10	0.08	0.05	0.02	0.00
Current assets to current liabilities	10.19	11.86	12.86	13.72	14.61


Equity Capital to Total Liabilities
80
70
60
50
40
30
20
10
0
Ratio
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Equity to total liabilities (%)

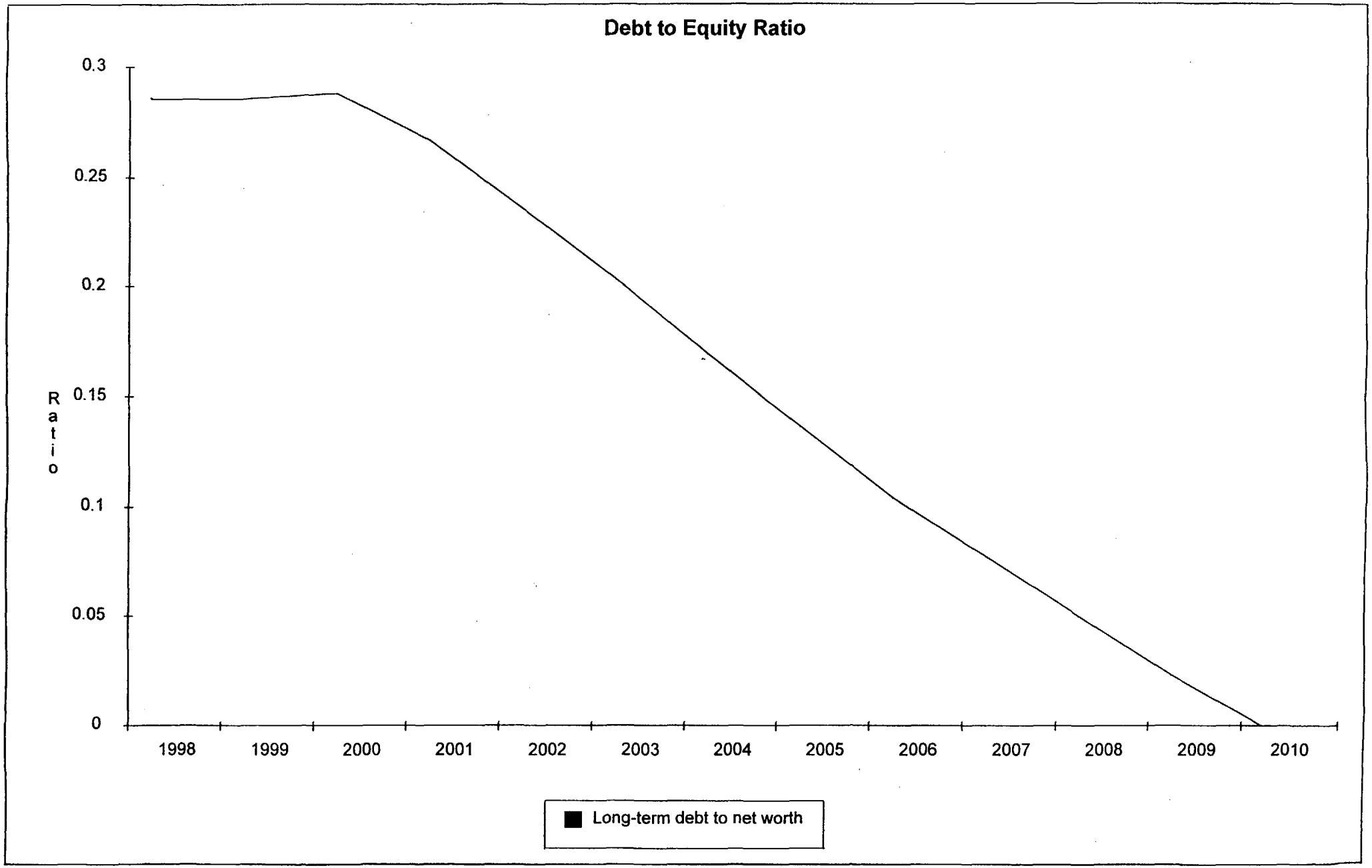

Net Worth to Total Liabilities
Ratio
80
70
60
50
40
30
20
10
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Net worth to total liabilities (%)

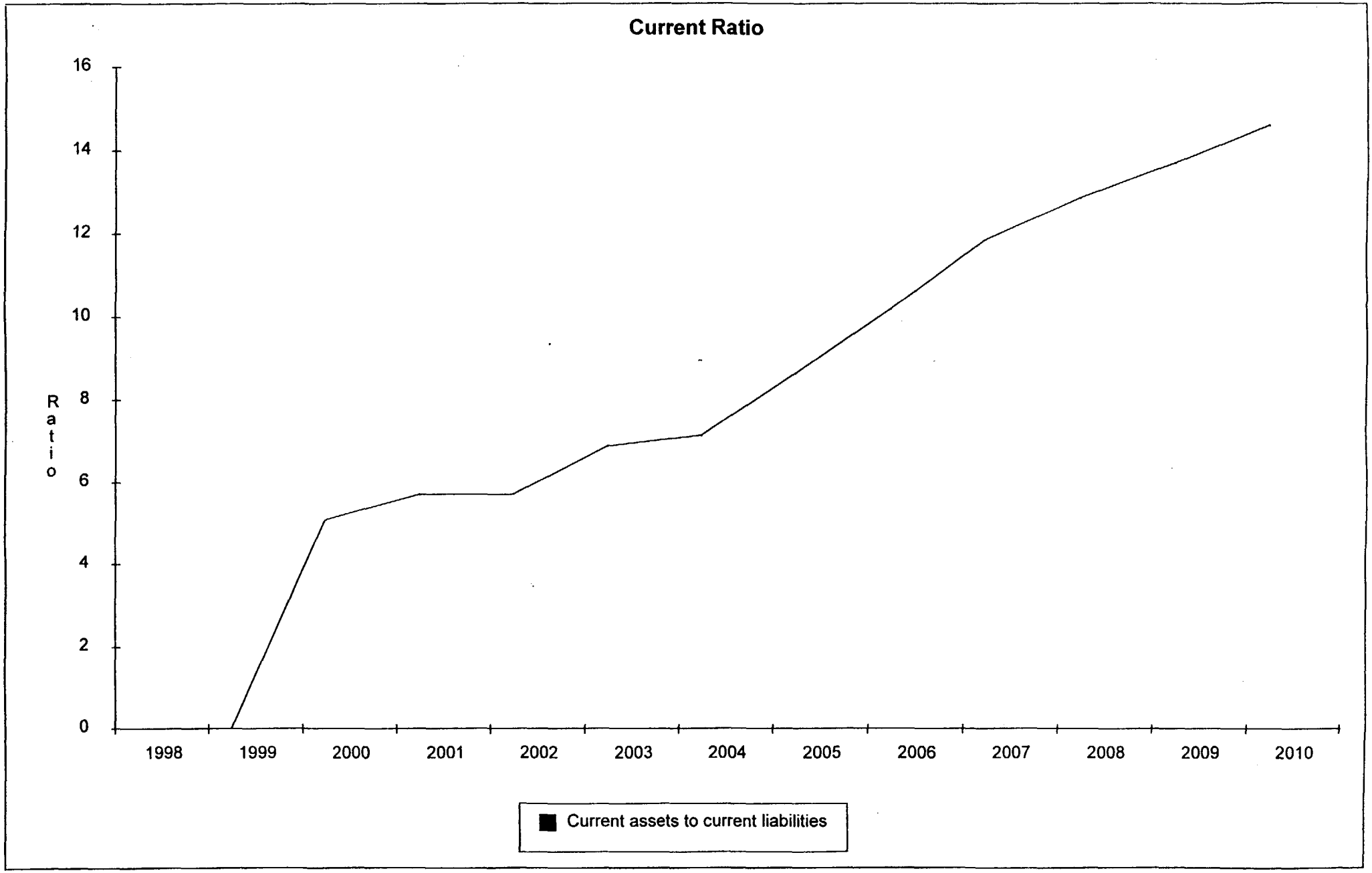

Debt to Equity Ratio
0.3
0.25
0.2
0.15
0.1
0.05
0
Ratio
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Long-term debt to net worth

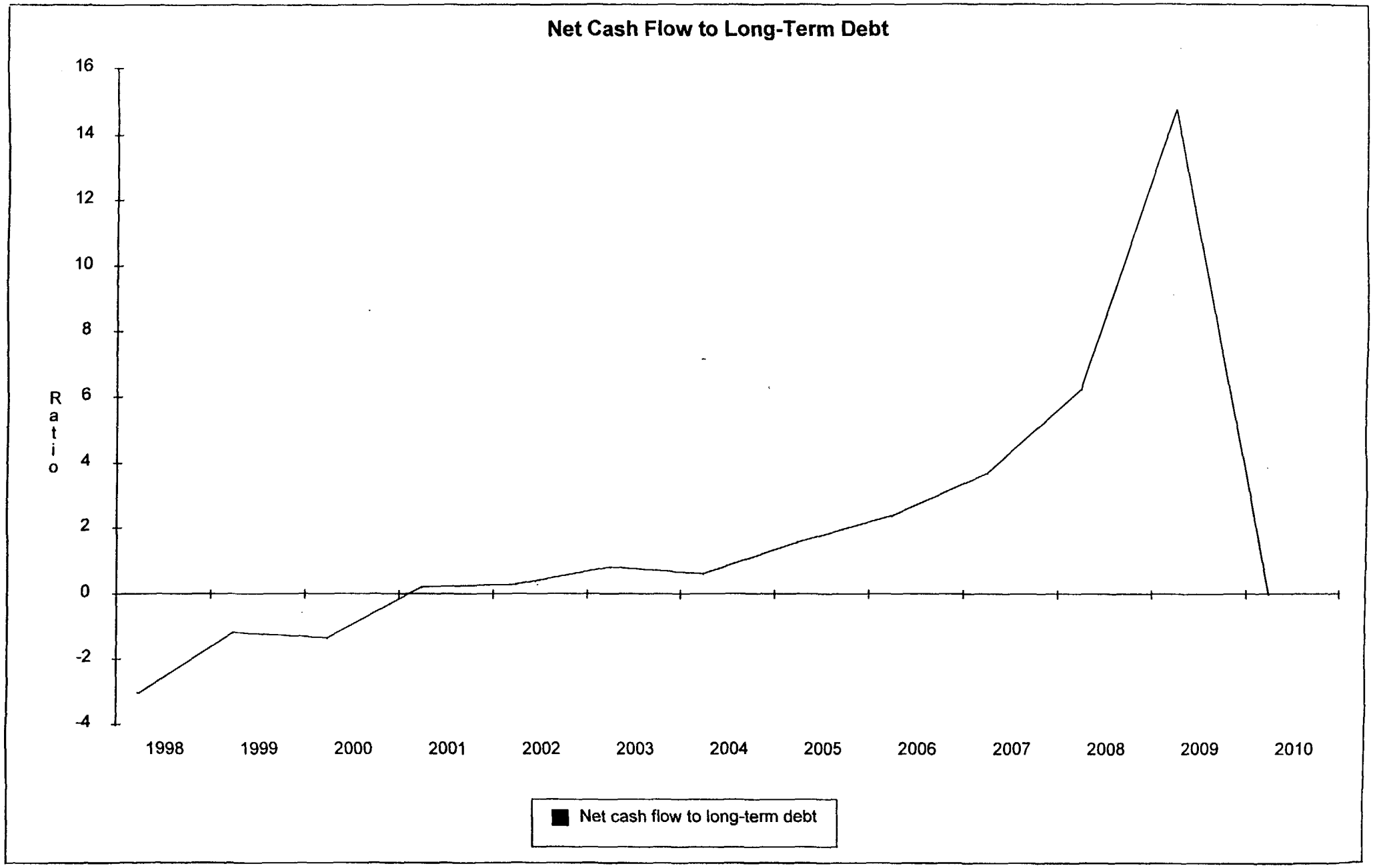

Current Ratio
16
14
12
10
8
6
4
2
0
Ratio
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Current assets to current liabilities

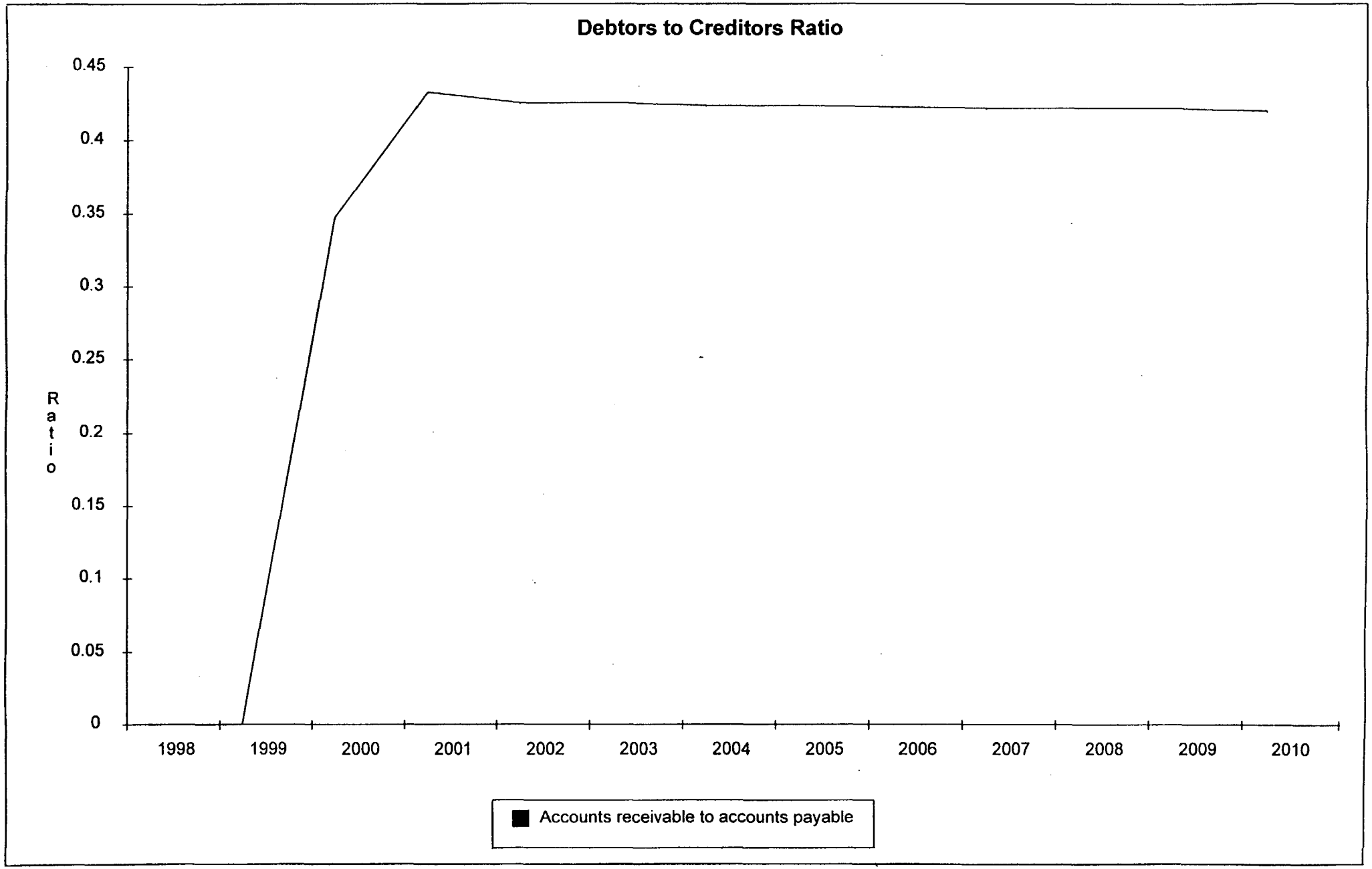
FINANCIAL RATIOS

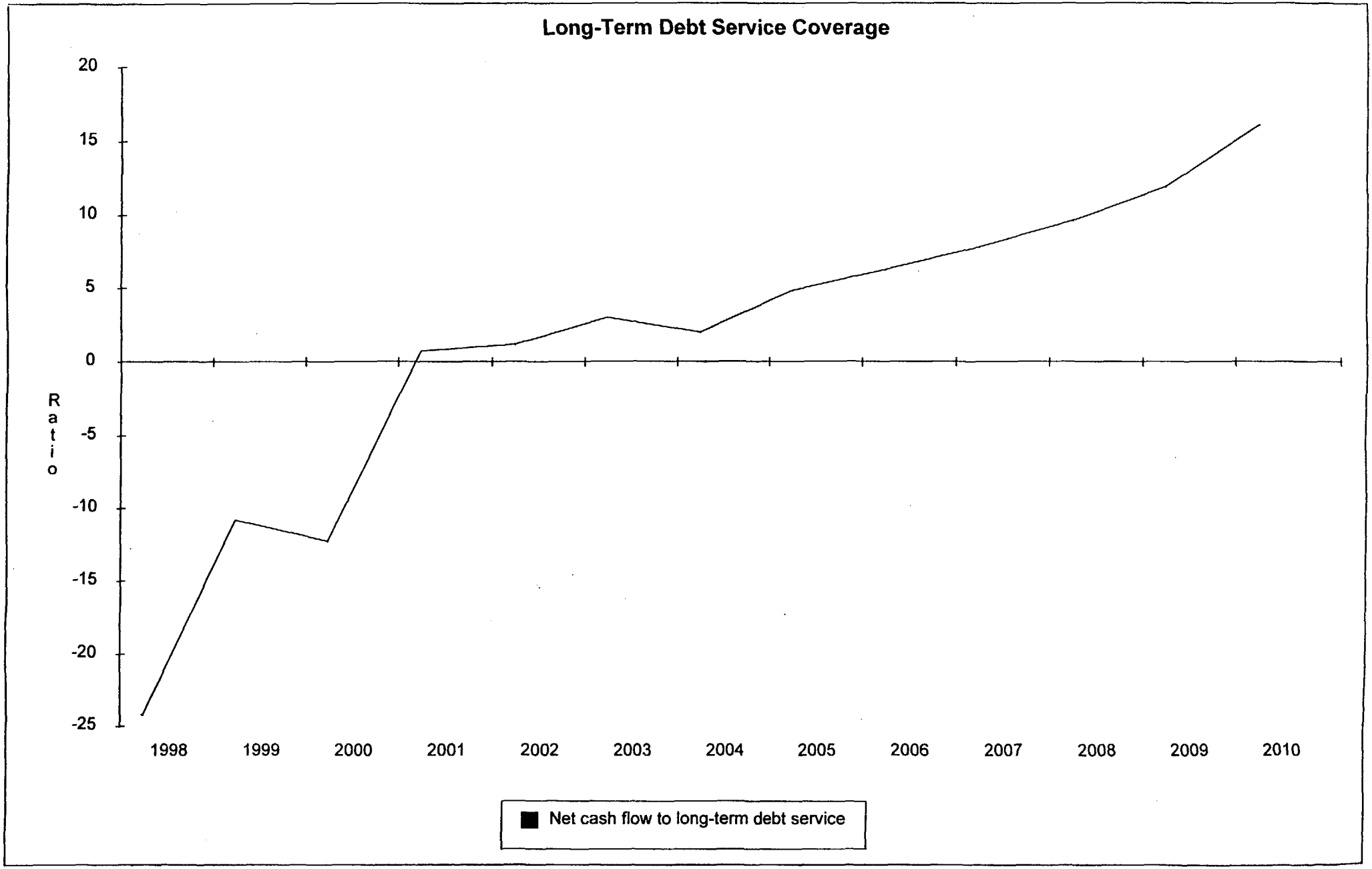
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Long-term debt to net worth	0.29	0.29	0.29	0.27	0.24	0.20	0.17	0.14	0.10	0.08	0.05	0.02	0.00
Current assets to current liabilities	0.00	0.00	5.11	5.72	5.70	6.88	7.12	8.65	10.19	11.86	12.86	13.72	14.61
Net cash flow to long-term debt	-3.02	-1.19	-1.36	0.17	0.29	0.81	0.60	1.58	2.37	3.67	6.26	14.77	0.00
Accounts receivable to accounts paya	0.00	0.00	0.35	0.43	0.43	0.43	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Net cash flow to long-term debt servic	-24.16	-10.84	-12.28	0.75	1.18	3.05	2.07	4.89	6.29	7.88	9.63	11.92	16.08


Debt to Equity Ratio
0.3
0.25
0.2
0.15
0.1
0.05
0
Ratio
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Long-term debt to net worth


Current Ratio
Ratio
16
14
12
10
8
6
4
2
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Current assets to current liabilities

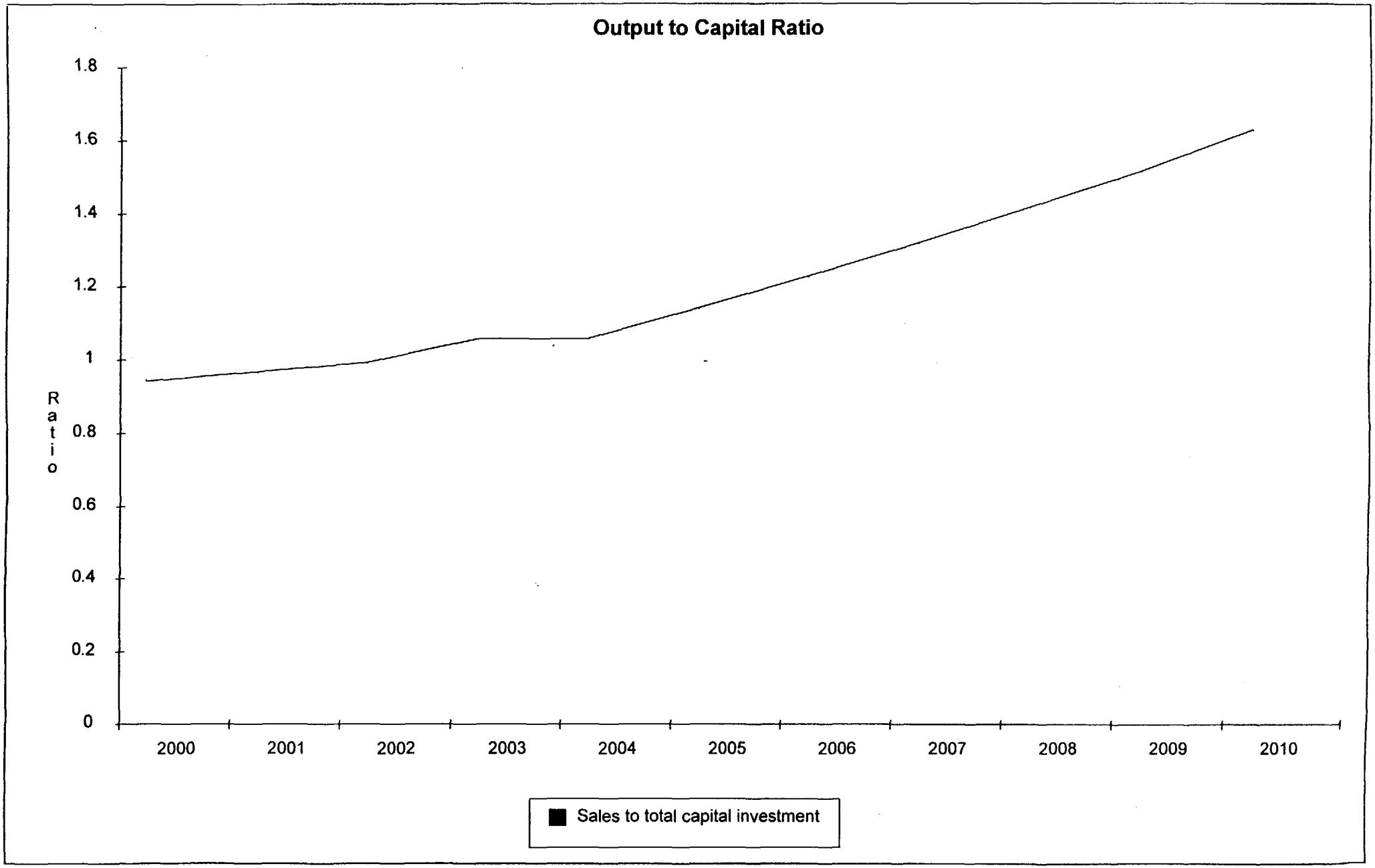

Net Cash Flow to Long-Term Debt
Ratio
16
14
12
10
8
6
4
2
0
-2
-4
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Net cash flow to long-term debt

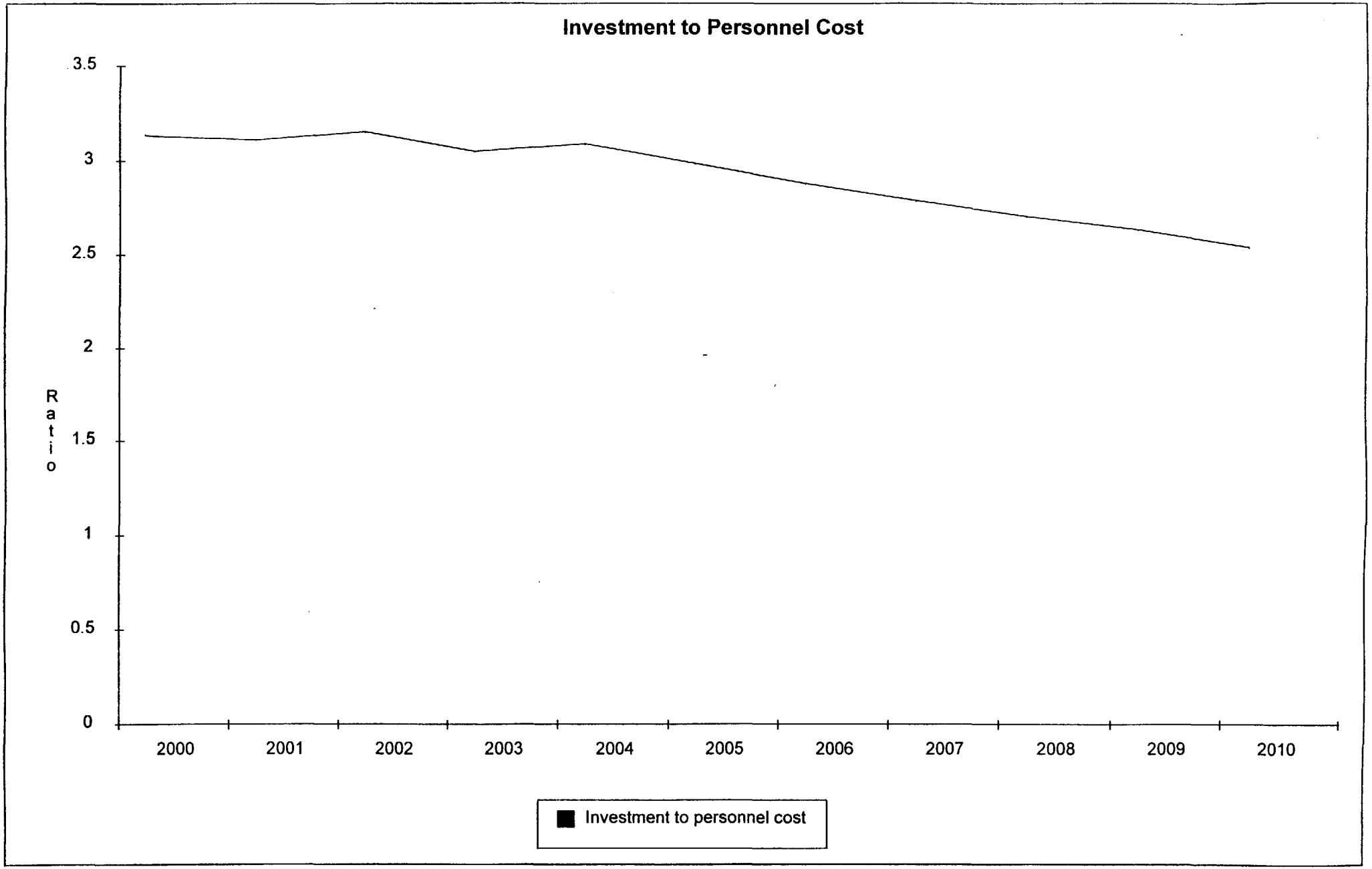

Debtors to Creditors Ratio
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Ratio
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Accounts receivable to accounts payable

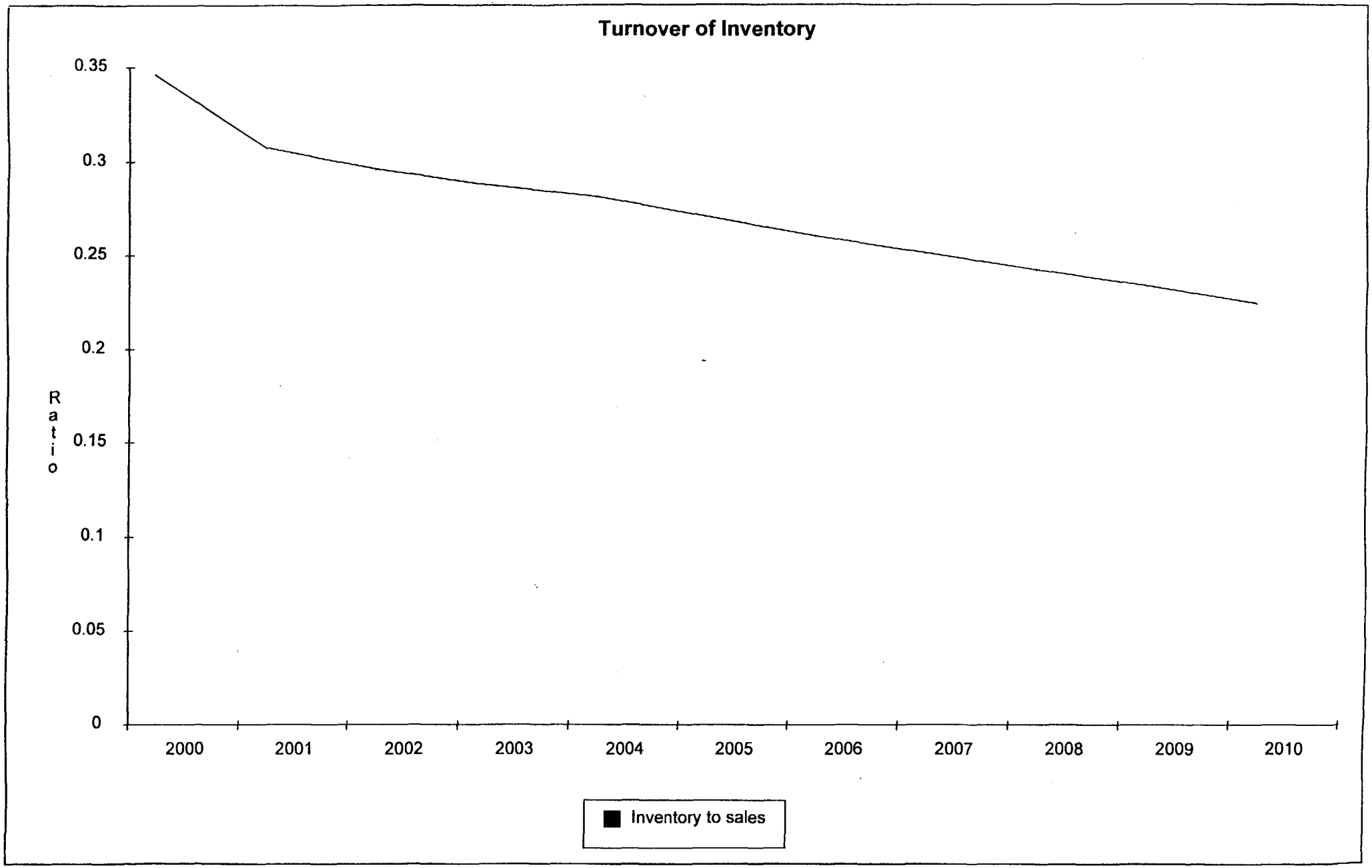

Long-Term Debt Service Coverage
20
15
10
5
0
-5
-10
-15
-20
-25
Ratio
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Net cash flow to long-term debt service

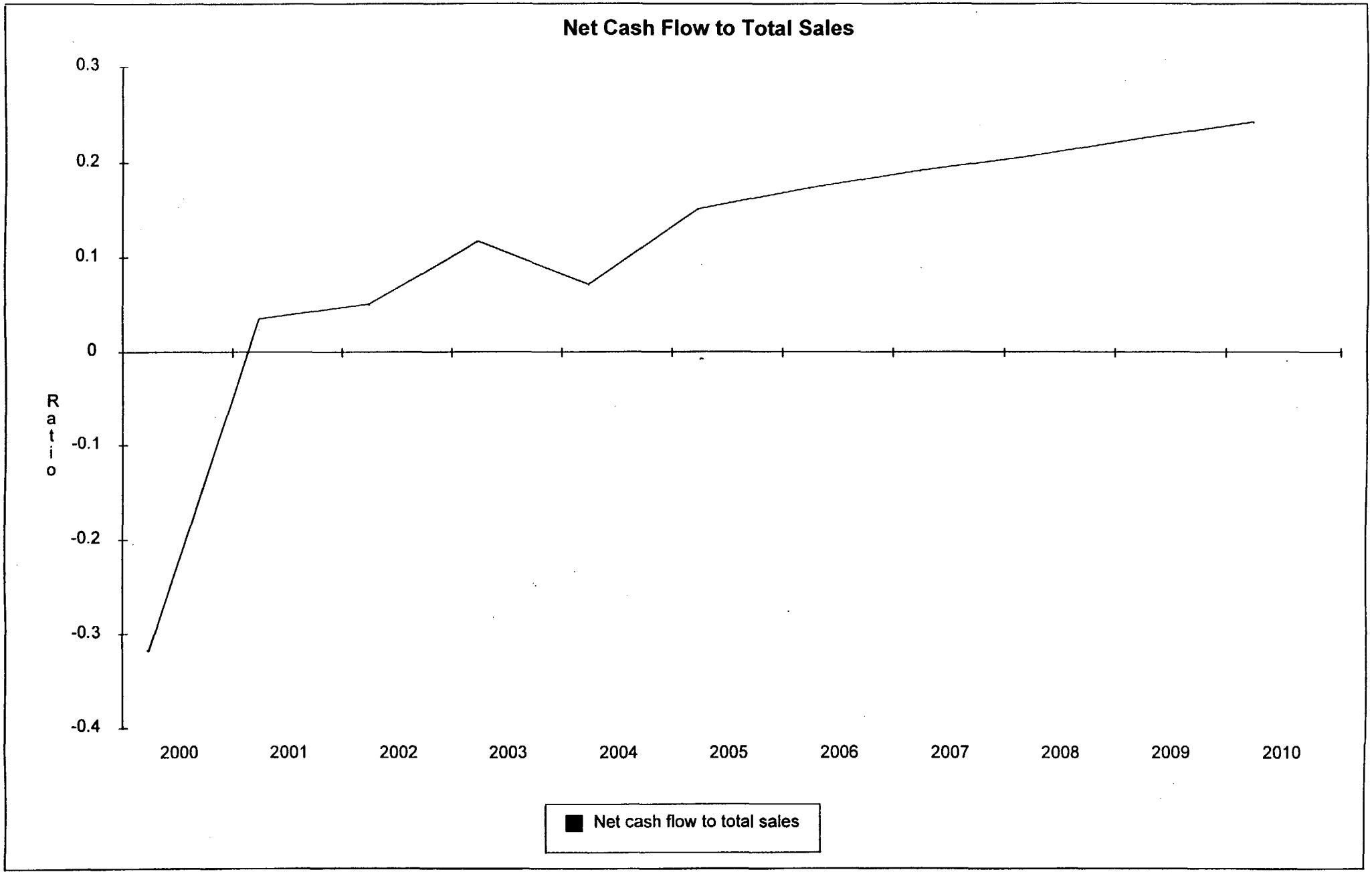
EFFICIENCY RATIOS

	roduction 2000	roduction 2001	roduction 2002	roduction 2003	roduction 2004	roduction 2005	roduction 2006	roduction 2007	roduction 2008	roduction 2009	roduction 2010
Sales to total capital investmen	0.94	0.97	0.99	1.06	1.06	1.14	1.23	1.32	1.42	1.52	1.63
Investment to personnel cost	3.13	3.11	3.15	3.05	3.09	2.98	2.88	2.79	2.71	2.63	2.54
Inventory to sales	0.35	0.31	0.30	0.29	0.28	0.27	0.26	0.25	0.24	0.23	0.22
Net cash flow to total sales	-0.32	0.04	0.05	0.12	0.07	0.15	0.17	0.19	0.21	0.22	0.24


Output to Capital Ratio
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Ratio
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Sales to total capital investment


Investment to Personnel Cost
3.5
3
2.5
2
1.5
1
0.5
0
Ratio
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Investment to personnel cost


Turnover of Inventory
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Ratio
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Inventory to sales


Net Cash Flow to Total Sales
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
Ratio
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Net cash flow to total sales

VALUE-ADDED CRITERIA
US Dollars

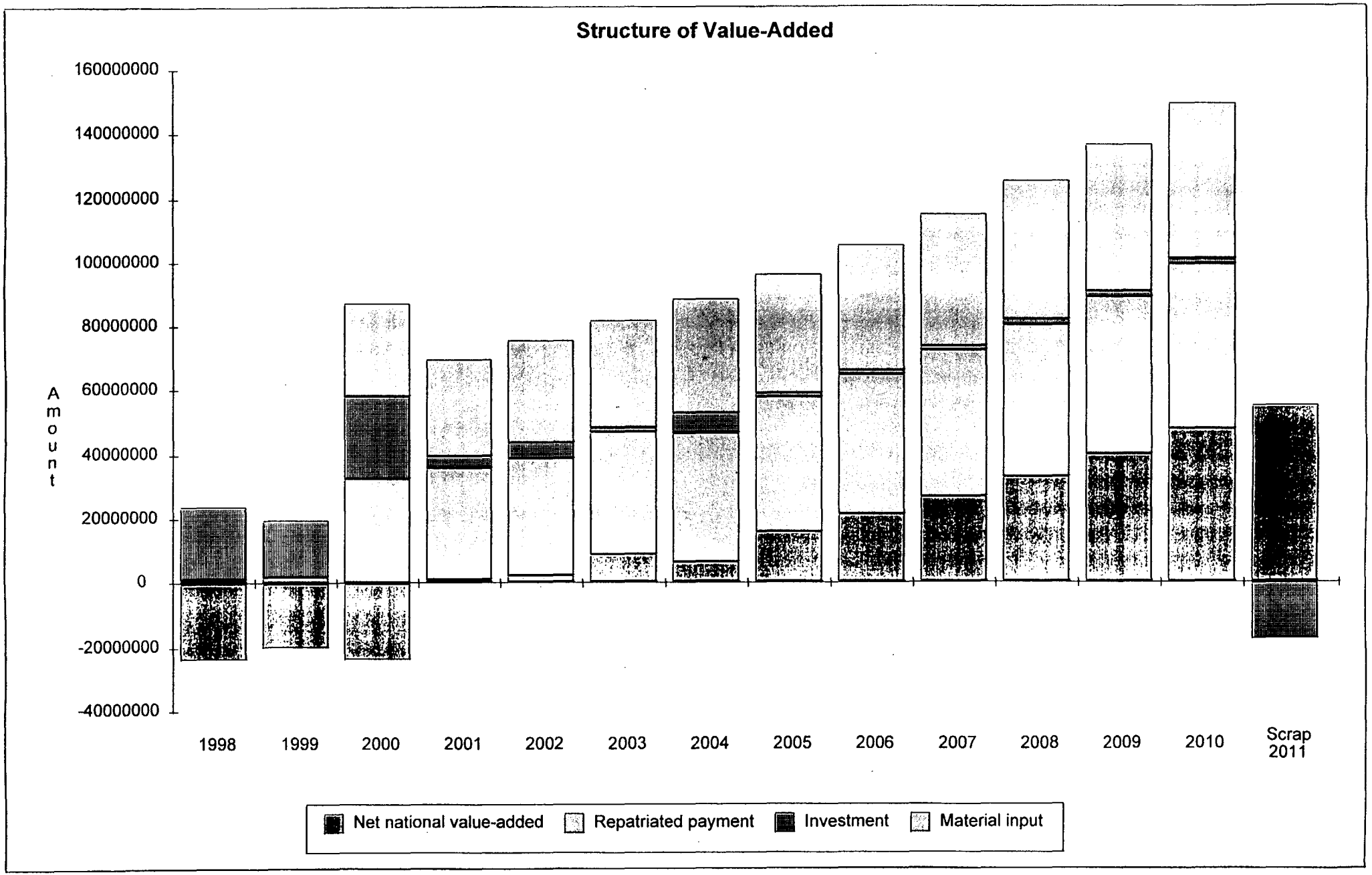
	Present value	Grand total	1998	1999	2000	2001	2002
Value of output (incl. tax)	558,946,580.51	,144,137,238.22	0.00	0.00	63,525,000.00	69,799,121.51	75,523,500.00
Material input	212,265,579.45	415,423,254.92	0.00	0.00	28,846,104.06	30,105,524.16	31,826,199.01
GROSS DOMESTIC VALUE-AD	346,681,001.06	728,713,983.29	0.00	0.00	34,678,895.94	39,693,597.34	43,697,300.99
Investment	68,971,780.11	73,638,159.47	22,654,650.00	17,882,700.00	25,635,973.53	3,750,000.00	4,870,702.41
NET DOMESTIC VALUE-ADDE	277,709,220.95	655,075,823.83	-22,654,650.00	-17,882,700.00	9,042,922.42	35,943,597.34	38,826,598.58
Repatriated payment	239,920,946.86	463,808,032.50	937,500.00	1,650,000.00	32,489,082.95	35,050,356.77	36,613,592.06
NET NATIONAL VALUE-ADDED	37,788,274.09	191,267,791.32	-23,592,150.00	-19,532,700.00	-23,446,160.53	893,240.57	2,213,006.52
Distribution of value-added							
Wages to value-added	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dividends, interest to value-adde	1.01	0.53	0.00	0.00	0.00	0.00	0.00
Government to value-added	0.51	0.25	0.00	0.00	0.00	0.00	0.38
Others to value-added	-0.52	0.22	1.00	1.00	1.00	1.00	0.62
Absolute efficiency test							
PV (NNVA) to PV (wages)	0.00						
Relative efficiency test							
PV (NNVA) to PV (investment)	0.55						
PV (NNVA) to PV (foreign excha	0.42						
PV (NNVA) to PV (skilled labour)	0.24						
PV (NNVA) to PV (labour)	0.24						

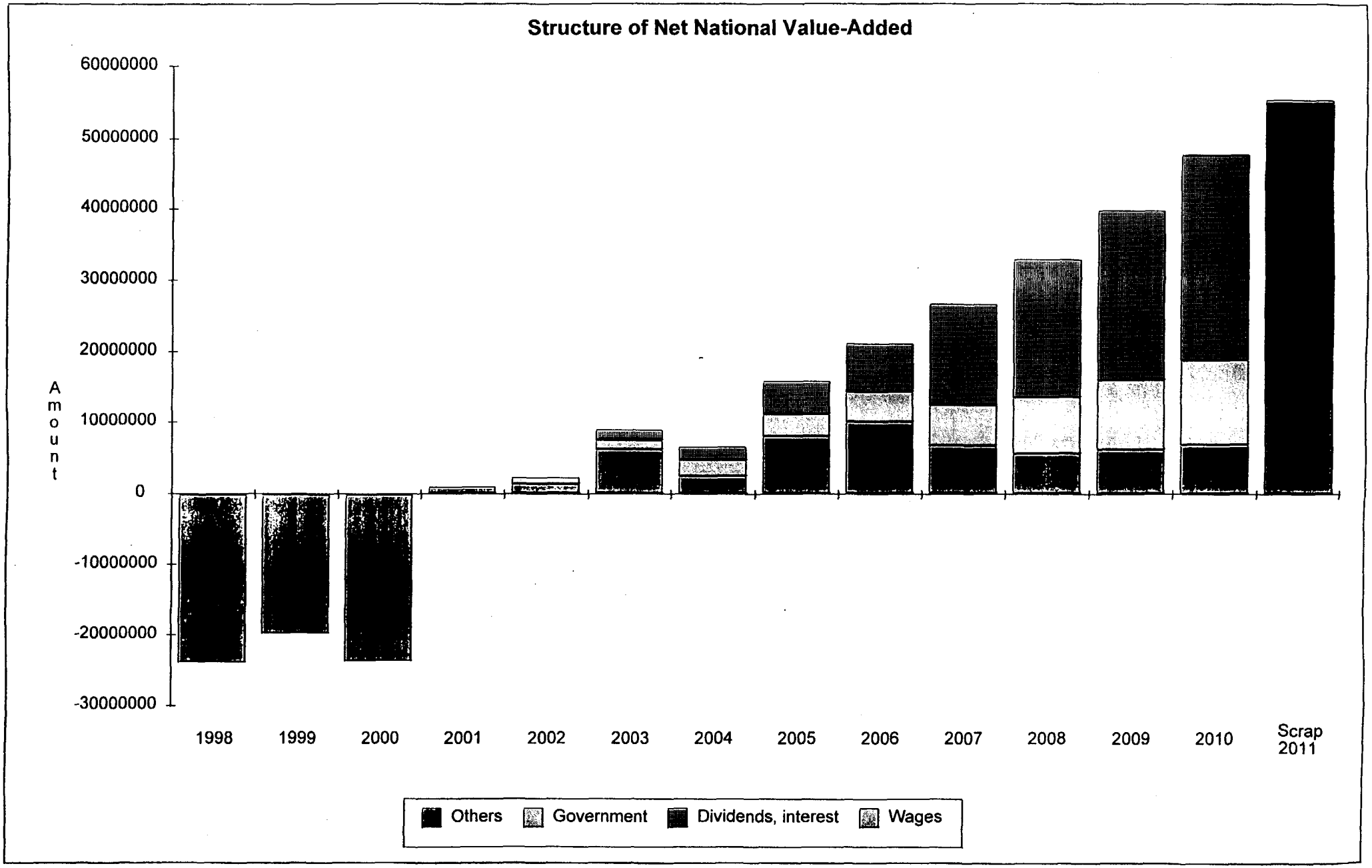
VALUE-ADDED CRITERIA
US Dollars

	2003	2004	2005	2006	2007	2008	2009
Value of output (incl. tax)	81,618,750.00	88,214,437.50	96,375,000.00	105,254,250.00	114,841,875.00	125,388,750.00	136,296,375.00
Material input	33,530,439.91	35,366,940.00	37,285,134.07	39,231,049.78	41,370,148.66	43,617,037.14	45,841,624.04
GROSS DOMESTIC VALUE-AD	48,088,310.09	52,847,497.50	59,089,865.93	66,023,200.22	73,471,726.34	81,771,712.86	90,454,750.96
Investment	1,120,324.19	6,196,277.69	1,294,539.83	1,289,348.74	1,433,550.80	1,489,368.46	1,487,502.03
NET DOMESTIC VALUE-ADDE	46,967,985.90	46,651,219.81	57,795,326.09	64,733,851.48	72,038,175.54	80,282,344.40	88,967,248.93
Repatriated payment	38,107,300.40	40,144,148.54	41,870,106.95	43,655,108.91	45,481,111.92	47,346,583.57	49,113,873.65
NET NATIONAL VALUE-ADDED	8,860,685.50	6,507,071.28	15,925,219.15	21,078,742.58	26,557,063.62	32,935,760.83	39,853,375.28
Distribution of value-added							
Wages to value-added	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dividends, interest to value-adde	0.15	0.30	0.30	0.31	0.53	0.59	0.60
Government to value-added	0.17	0.33	0.20	0.21	0.22	0.24	0.25
Others to value-added	0.69	0.37	0.51	0.48	0.25	0.17	0.16
Absolute efficiency test							
PV (NNVA) to PV (wages)							
Relative efficiency test							
PV (NNVA) to PV (investment)							
PV (NNVA) to PV (foreign excha							
PV (NNVA) to PV (skilled labour)							
PV (NNVA) to PV (labour)							

VALUE-ADDED CRITERIA
US Dollars

	2010	Scrap 2011
Value of output (incl. tax)	149,091,000.00	38,209,179.21
Material input	48,403,054.10	0.00
GROSS DOMESTIC VALUE-AD	100,687,945.90	38,209,179.21
Investment	1,614,194.02	-17,080,972.23
NET DOMESTIC VALUE-ADDE	99,073,751.89	55,290,151.44
Repatriated payment	51,349,266.80	0.00
NET NATIONAL VALUE-ADDED	47,724,485.09	55,290,151.44
Distribution of value-added		
Wages to value-added	0.00	0.00
Dividends, interest to value-adde	0.60	0.00
Government to value-added	0.25	0.00
Others to value-added	0.14	1.00
Absolute efficiency test		
PV (NNVA) to PV (wages)		
Relative efficiency test		
PV (NNVA) to PV (investment)		
PV (NNVA) to PV (foreign excha		
PV (NNVA) to PV (skilled labour)		
PV (NNVA) to PV (labour)		


Structure of Value-Added
160000000
140000000
120000000
100000000
80000000
60000000
40000000
20000000
0
-20000000
-40000000
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Scrap 2011
Net national value-added
Repatriated payment
Investment
Material input


Structure of Net National Value-Added
60000000
50000000
40000000
30000000
20000000
10000000
0
-10000000
-20000000
-30000000
Amount
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Scrap 2011
Others
Government
Dividends, interest
Wages

NET FOREIGN EXCHANGE EFFECTS
US Dollars

	Present value	Grand total	1998	1999	2000	2001
TOTAL FOREIGN EXCHANGE INFL	629,968,225.17	1,223,457,647.85	33,750,000.00	33,750,000.00	69,079,699.00	69,070,312.50
Equity share	50,113,636.36	52,500,000.00	26,250,000.00	26,250,000.00	0.00	0.00
Loans	20,254,166.25	23,401,635.68	7,500,000.00	7,500,000.00	5,554,699.00	0.00
Subsidies, grants	0.00	0.00	0.00	0.00	0.00	0.00
Export of products	547,331,177.32	1,105,199,250.00	0.00	0.00	63,525,000.00	69,070,312.50
Other income	12,269,245.24	42,356,762.16	0.00	0.00	0.00	0.00
TOTAL FOREIGN EXCHANGE OUT	539,924,526.94	998,970,935.27	23,592,150.00	19,532,700.00	91,075,445.81	70,002,309.72
Fixed investments	50,054,146.74	56,568,750.00	22,631,250.00	17,812,500.00	3,750,000.00	3,750,000.00
Material input	212,265,579.45	415,423,254.92	0.00	0.00	28,846,104.06	30,105,524.16
Debt service	21,637,752.82	41,423,547.90	937,500.00	1,650,000.00	1,648,226.11	4,125,245.07
Wages	159,844,038.15	312,505,184.99	0.00	0.00	21,476,704.48	22,854,004.32
Equity capital refund	0.00	0.00	0.00	0.00	0.00	0.00
Dividends transfer	0.00	0.00	0.00	0.00	0.00	0.00
Others	96,123,009.78	173,050,197.46	23,400.00	70,200.00	35,354,411.16	9,167,536.17
NET FOREIGN EXCHANGE FLOW	90,043,698.23	224,486,712.57	10,157,850.00	14,217,300.00	-21,995,746.81	-931,997.22
Indirect foreign exchange inflows	0.00	0.00	0.00	0.00	0.00	0.00
Indirect foreign exchange outflows	0.00	0.00	0.00	0.00	0.00	0.00
NET FOREIGN INDIRECT EFFECTS	0.00	0.00	0.00	0.00	0.00	0.00
NET FOREIGN EXCHANGE EFFEC	90,043,698.23	224,486,712.57	10,157,850.00	14,217,300.00	-21,995,746.81	-931,997.22

NET FOREIGN EXCHANGE EFFECTS
US Dollars

	2002	2003	2004	2005	2006	2007
TOTAL FOREIGN EXCHANGE INFL	75,848,062.62	81,870,040.57	88,522,047.96	96,669,652.62	105,548,118.23	115,169,273.07
Equity share	0.00	0.00	0.00	0.00	0.00	0.00
Loans	324,562.62	251,290.57	307,610.46	294,652.62	293,868.23	327,398.07
Subsidies, grants	0.00	0.00	0.00	0.00	0.00	0.00
Export of products	75,523,500.00	81,618,750.00	88,214,437.50	96,375,000.00	105,254,250.00	114,841,875.00
Other income	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL FOREIGN EXCHANGE OUT	74,547,053.21	74,098,604.35	83,229,444.02	82,074,346.06	85,949,903.62	90,234,738.29
Fixed investments	3,750,000.00	0.00	4,875,000.00	0.00	0.00	0.00
Material input	31,826,199.01	33,530,439.91	35,366,940.00	37,285,134.07	39,231,049.78	41,370,148.66
Debt service	3,190,972.64	3,126,577.39	3,055,439.12	2,976,851.74	2,890,035.24	2,794,127.92
Wages	24,063,569.67	25,229,823.93	26,913,000.00	28,289,794.91	29,731,217.89	31,191,713.19
Equity capital refund	0.00	0.00	0.00	0.00	0.00	0.00
Dividends transfer	0.00	0.00	0.00	0.00	0.00	0.00
Others	11,716,311.89	12,211,763.12	13,019,064.90	13,522,565.34	14,097,600.71	14,878,748.53
NET FOREIGN EXCHANGE FLOW	1,301,009.41	7,771,436.22	5,292,603.94	14,595,306.55	19,598,214.61	24,934,534.78
Indirect foreign exchange inflows	0.00	0.00	0.00	0.00	0.00	0.00
Indirect foreign exchange outflows	0.00	0.00	0.00	0.00	0.00	0.00
NET FOREIGN INDIRECT EFFECTS	0.00	0.00	0.00	0.00	0.00	0.00
NET FOREIGN EXCHANGE EFFEC	1,301,009.41	7,771,436.22	5,292,603.94	14,595,306.55	19,598,214.61	24,934,534.78

NET FOREIGN EXCHANGE EFFECTS
US Dollars

	2008	2009	2010	Scrap 2011
TOTAL FOREIGN EXCHANGE INFL	125,725,443.33	136,626,471.14	149,471,764.65	42,356,762.16
Equity share	0.00	0.00	0.00	0.00
Loans	336,693.33	330,096.14	380,764.65	0.00
Subsidies, grants	0.00	0.00	0.00	0.00
Export of products	125,388,750.00	136,296,375.00	149,091,000.00	0.00
Other income	0.00	0.00	0.00	42,356,762.16
TOTAL FOREIGN EXCHANGE OUT	94,587,866.81	98,768,045.22	103,752,673.54	7,525,654.63
Fixed investments	0.00	0.00	0.00	0.00
Material input	43,617,037.14	45,841,624.04	48,403,054.10	0.00
Debt service	2,688,177.84	2,571,133.41	2,243,606.79	7,525,654.63
Wages	32,688,034.24	34,127,811.86	35,939,510.50	0.00
Equity capital refund	0.00	0.00	0.00	0.00
Dividends transfer	0.00	0.00	0.00	0.00
Others	15,594,617.60	16,227,475.90	17,166,502.15	0.00
NET FOREIGN EXCHANGE FLOW	31,137,576.52	37,858,425.92	45,719,091.11	34,831,107.54
Indirect foreign exchange inflows	0.00	0.00	0.00	0.00
Indirect foreign exchange outflows	0.00	0.00	0.00	0.00
NET FOREIGN INDIRECT EFFECTS	0.00	0.00	0.00	0.00
NET FOREIGN EXCHANGE EFFEC	31,137,576.52	37,858,425.92	45,719,091.11	34,831,107.54

EMPLOYMENT EFFECT
US Dollars

	Unskilled labour (UL)	Skilled labour (SL)	Total labour (TL)	Investment (I)	UL/I	SL/I	TL/I
Direct employment within proje	0.00	225.00	225.00	24,373,295.34	0.00	0.00	0.00
Indirect employment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total employment	0.00	225.00	225.00	24,373,295.34	0.00	0.00	0.00

EMPLOYMENT EFFECT
US Dollars

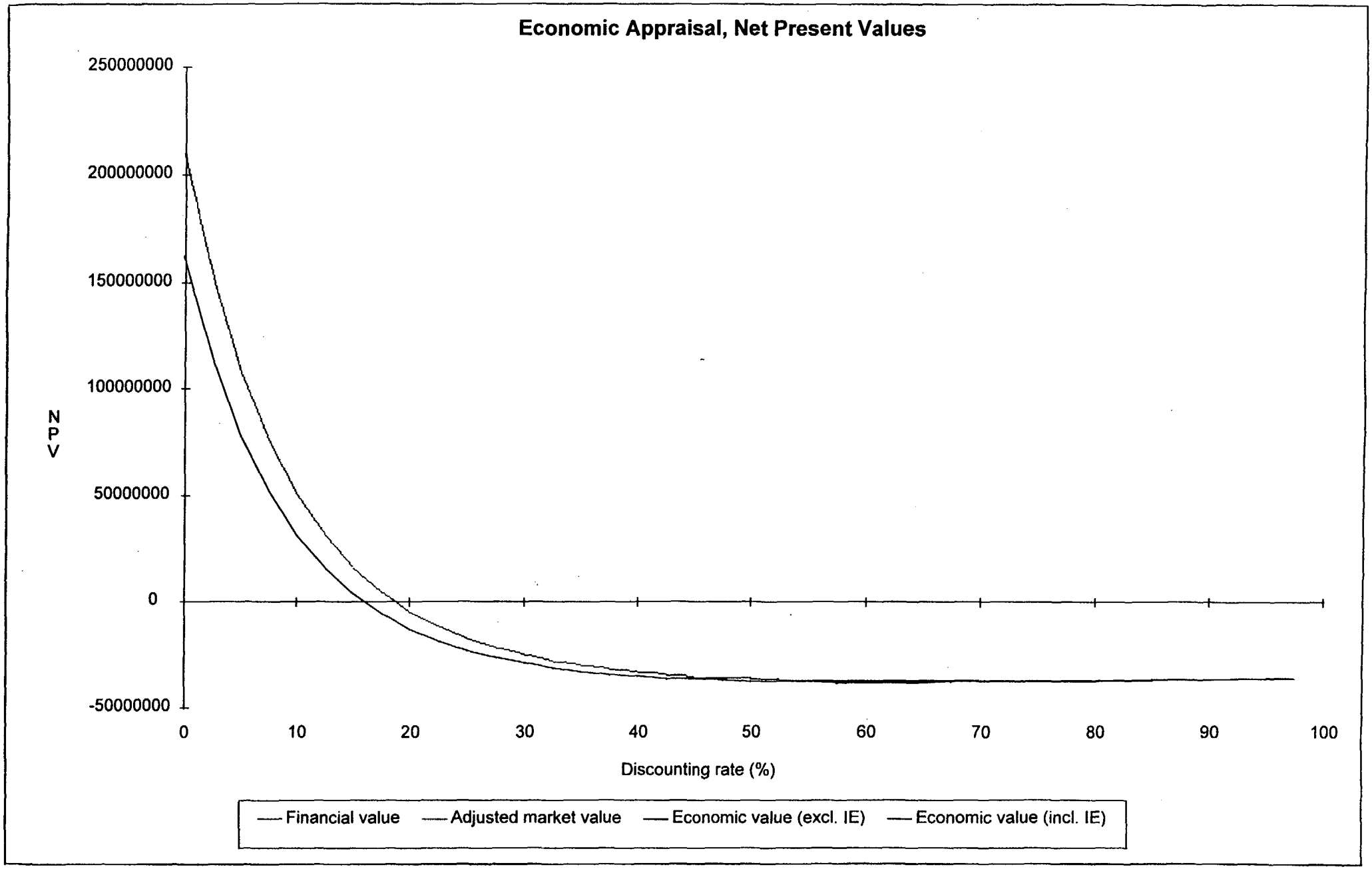
	Unskilled wages	I/Skilled wages	I/Total wages
Direct employment within proje	0.00	3.40	3.40
Indirect employment	0.00	0.00	0.00
Total employment	0.00	3.40	3.40

ECONOMIC APPRAISAL
US Dollars

	Financial value	Adjustment factor	Adjusted market value	Foreign rrency exposure	oreign exchange adjustment	Economic value NPV (excl. IE)	Indirect effect (IE)
TOTAL CASH INFLOW	563,005,550.20	1.00	563,005,550.20	99.01	0.00	563,005,550.20	0.00
Inflow operation	547,331,177.32	1.00	547,331,177.32	100.00	0.00	547,331,177.32	0.00
Other income	15,674,372.88	1.00	15,674,372.88	64.37	0.00	15,674,372.88	0.00
Foreign loans	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indirect effects	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL CASH OUTFLOW	531,587,386.67	0.96	512,339,124.06	100.00	0.00	512,339,124.06	0.00
Increase in fixed assets	50,054,146.74	1.00	50,054,146.74	100.00	0.00	50,054,146.74	0.00
Increase in net working capit	22,463,988.49	1.00	22,463,988.49	100.00	0.00	22,463,988.49	0.00
Operating costs	381,405,760.61	1.00	381,405,760.61	100.00	0.00	381,405,760.61	0.00
Marketing costs	58,415,228.22	1.00	58,415,228.22	100.00	0.00	58,415,228.22	0.00
Foreign debt services	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Income (corporate) tax	19,248,262.61	0.00	0.00	0.00	0.00	0.00	0.00
Indirect effects	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NET CASH FLOW	31,418,163.53	1.61	50,666,426.14	88.98	0.00	50,666,426.14	0.00
INTERNAL RATE OF RETU	15.98	---	18.88	---	---	18.88	---

ECONOMIC APPRAISAL
US Dollars

	Economic value NPV (incl. IE)
TOTAL CASH INFLOW	563,005,550.20
Inflow operation	547,331,177.32
Other income	15,674,372.88
Foreign loans	0.00
Indirect effects	0.00
TOTAL CASH OUTFLOW	512,339,124.06
Increase in fixed assets	50,054,146.74
Increase in net working capit	22,463,988.49
Operating costs	381,405,760.61
Marketing costs	58,415,228.22
Foreign debt services	0.00
Income (corporate) tax	0.00
Indirect effects	0.00
NET CASH FLOW	50,666,426.14
INTERNAL RATE OF RETU	18.88


Economic Appraisal, Net Present Values
250000000
200000000
150000000
100000000
50000000
0
-50000000
NPV
0
10
20
30
40
50
60
70
80
90
100
Discounting rate (%)
Financial value
Adjusted market value
Economic value (excl. IE)
Economic value (incl. IE)

APPENDICES

Appendix 1

GCC Opportunity Study Visit Listing for Field Mission in the GCC Countries - (By Sector Order)

04-Oct-95	Industrial Materials Organisation (IMO)	Saudi Arabia	Riyadh	Agent	P.J. Robson
05-Oct-95	Arab Engineers	Saudi Arabia	Riyadh	Agent	P.J. Robson
05-Oct-95	Al Musairey Trading Industrial Company	Saudi Arabia	Riyadh	Agent	P.J. Robson
05-Oct-95	Kannoo Company Limited	Saudi Arabia	Riyadh	Agent	P.J. Robson
07-Oct-95	Kuwait Engineering Bureau	Kuwait	Kuwait City	Agent	P.J. Robson
12-Oct-95	Al- Moayyed & Sons	Bahrain	Al-Manama	Agent	P.J. Robson
03-Oct-95	Riyadh Chamber of Commerce & Industry	Saudi Arabia	Riyadh	Chamber	P.J. Robson
07-Oct-95	Kuwait Chamber of Commerce & Industry	Kuwait	Kuwait City	Chamber	P.J. Robson
11-Oct-95	Chamber of Commerce & Industry	Bahrain	Al-Manama	Chamber	P.J.Robson
16-Oct-95	Chamber of Commerce & Industry	Qatar	Doha	Chamber	P.J. Robson
18-Oct-95	Dubai Chamber of Commerce	U.A.E.	Dubai	Chamber	P.J. Robson
22-Oct-95	Chamber of Commerce & Industry	U.A.E.	Abu Dhabi	Chamber	P.J. Robson
24-Oct-95	Chamber of Commerce	Oman	Muscat	Chamber	P.J. Robson
06-Oct-95	FRIDAY - VISITS NOT POSSIBLE	Saudi Arabia	Riyadh	Co-ordination	ALL
08-Oct-95	Study Team Review Meeting	Kuwait	Kuwait City	Co-ordination	P.J. Robson
13-Oct-95	FRIDAY - VISITS NOT POSSIBLE	Bahrain	Al-Manama	Co-ordination	ALL
14-Oct-95	Travel to QATAR	Qatar	Doha	Co-ordination	ALL
20-Oct-95	FRIDAY - VISITS NOT POSSIBLE	U.A.E.	Dubai	Co-ordination	ALL
04-Oct-95	Saudi Consulting House	Saudi Arabia	Riyadh	Consultancy	P.J. Robson
07-Oct-95	International Consultants	Kuwait	Kuwait City	Consultancy	P.J. Robson
15-Oct-95	Gulf Organisation for Investment Consulting (GOIC)	Qatar	Doha	Consultancy	P.J. Robson
17-Oct-95	Gulf Organisation for Investment Consulting (GOIC)	Qatar	Doha	Consultancy	P.J. Robson
18-Oct-95	Higher Colleges of Technology - Dubai & Al-Ain	U.A.E.	Dubai	Education & Training	P.D. Southward
02-Oct-95	King Abdulaziz City of Science & Technology	Saudi Arabia	Riyadh	Education & Training	P.J. Robson
03-Oct-95	General Organisation for Technical Training & Education	Saudi Arabia	Riyadh	Education & Training	P.J. Robson
08-Oct-95	Kuwait University - College of Engneering & Petroleum	Kuwait	Shuwaikh	Education & Training	P.D. Southward
08-Oct-95	College of Technical Studies - Faculty of Engineering	Kuwait	Shuwaikh	Education & Training	P.D. Southward
09-Oct-95	General Establishment for Training - Engineering Faculty	Kuwait	Shuwaikh	Education & Training	P.J. Robson
10-Oct-95	University of Bahrain	Bahrain	Al-Manama	Education & Training	P.J.Robson
10-Oct-95	Bahrain Training Institute	Bahrain	Al-Manama	Education & Training	P.J.Robson
16-Oct-95	Scientific & Applied Research Centre (SARC) - University of Qatar	Qatar	Doha	Education & Training	P.J. Robson
25-Oct-95	Sultan Qaboos University	Oman	Muscat	Education & Training	P.J. Robson
01-Oct-95	British Embassy	Saudi Arabia	Riyadh	Embassy	P.J. Robson
24-Oct-95	British Embassy	Oman	Ruwi	Embassy	P.D. Southward
02-Oct-95	Ministry of Commerce	Saudi Arabia	Riyadh	Governmental - Commerce	P.J. Robson
08-Oct-95	Ministry of Finance	Kuwait	Kuwait City	Governmental - Finance	P.J. Robson
17-Oct-95	Ministry of Finance	Qatar	Doha	Governmental - Finance	P.J. Robson
25-Oct-95	Oman Ministry of Finance & Economics	Oman	Muscat	Governmental - Finance	P.J. Robson
01-Oct-95	Ministry of Industry	Saudi Arabia	Riyadh	Governmental - Industry	P.J. Robson
08-Oct-95	Ministry of Industry	Kuwait	Kuwait City	Governmental - Industry	P.J. Robson
10-Oct-95	Ministry of Industry	Bahrain	Al-Manama	Governmental - Industry	P.J.Robson
15-Oct-95	Working lunch with Ministry of Industry - Falcon Club	Qatar	Doha	Governmental - Industry	P.J. Robson
15-Oct-95	Ministry of Industry	Qatar	Doha	Governmental - Industry	P.J. Robson
18-Oct-95	Sharjah Economic Directorate	U.A.E.	Dubai	Governmental - Industry	P.J. Robson
19-Oct-95	Ministry of Finance and Industry	U.A.E.	Dubai	Governmental - Industry	P.J. Robson
19-Oct-95	Government of Dubia - Economics Department	U.A.E.	Dubai	Governmental - Industry	P.J. Robson
21-Oct-95	Economic Directorate - Al-Fujairah	U.A.E.	Fujairah	Governmental - Industry	P.J. Robson
22-Oct-95	General Establishment for Indusrty	U.A.E.	Abu Dhabi	Governmental - Industry	P.J. Robson
24-Oct-95	Ministry of Commerce & Industry	Oman	Muscat	Governmental - Industry	P.J. Robson
22-Oct-95	Ministry of Planning	U.A.E.	Abu Dhabi	Governmental - Planning	P.D. Southward
09-Oct-95	Ministry of Planning	Kuwait	Kuwait City	Governmental - Statistics	P.J. Robson
11-Oct-95	Central Statistical Organisation	Bahrain	Al-Manama	Governmental - Statistics	P.J.Robson
15-Oct-95	Ministry of Industry - Department of Industrial Planning	Qatar	Doha	Governmental - Statistics	P.J. Robson
25-Oct-95	Ministry of Commerce & Industry	Oman	Muscat	Governmental - Statistics	P.J. Robson
03-Oct-95	Saudi Industrial Development Fund (SIDF)	Saudi Arabia	Riyadh	Investment	P.J. Robson
08-Oct-95	Kuwait Industrial Bank	Kuwait	Kuwait City	Investment	P.J. Robson
09-Oct-95	Gulf Investment Company	Kuwait	Kuwait City	Investment	P.J. Robson
12-Oct-95	Bahrain Development Bank	Bahrain	Al-Manama	Investment	P.J.Robson
19-Oct-95	Emirate Industrial Bank	U.A.E.	Dubai	Investment	P.J. Robson
22-Oct-95	Abu Dhabi Development Bank	U.A.E.	Abu Dhabi	Investment	P.J. Robson
23-Oct-95	Business Breakfast at Jebel Ali Free Zone	U.A.E.	Jebel Ali	Investment	P.J. Robson
25-Oct-95	Oman Development Bank	Oman	Muscat	Investment	P.J. Robson
18-Oct-95	Jebel Ali Free Zone	U.A.E.	Jebel Ali	Location	P.J. Robson
21-Oct-95	Fujairah Free Zone	U.A.E.	Fujairah	Location	P.J. Robson
24-Oct-95	Rusayl Industrial Zone Management Group	Oman	Rusayl	Location	P.J. Robson
07-Oct-95	Kuwait Engineering Office	Kuwait	Kuwait City	Private Sector - Contractor	P.J. Robson
04-Oct-95	Al-Rasjhi Steel Industries	Saudi Arabia	Riyadh	Private Sector - Manufacturer	I.L. Dickson
04-Oct-95	Saudi Lighting	Saudi Arabia	Riyadh	Private Sector - Manufacturer	I.L. Dickson
04-Oct-95	Al-Khorayef Webster Layne	Saudi Arabia	Riyadh	Private Sector - Manufacturer	I.L. Dickson
04-Oct-95	Molds & Spare Parts Factory	Saudi Arabia	Riyadh	Private Sector - Manufacturer	I.L. Dickson
05-Oct-95	Zamil Air Conditioners	Saudi Arabia	Dammam	Private Sector - Manufacturer	I.L. Dickson
05-Oct-95	Rashed A. Al-Rashed & Sons	Saudi Arabia	Dammam	Private Sector - Manufacturer	I.L. Dickson
05-Oct-95	Al-Rashed Fasteners	Saudi Arabia	Dammam	Private Sector - Manufacturer	I.L. Dickson
05-Oct-95	Zamil Plastics	Saudi Arabia	Dammam	Private Sector - Manufacturer	I.L. Dickson
08-Oct-95	Al-Babtain Body Manufacturing	Kuwait	Sabahn	Private Sector - Manufacturer	I.L. Dickson
08-Oct-95	Plastics & Materials Manufacturing	Kuwait	Sabahn	Private Sector - Manufacturer	I.L. Dickson
08-Oct-95	Al-Hasawi Refridgerator & Water Cooler Factory	Kuwait	Shuwaikh	Private Sector - Manufacturer	I.L. Dickson
09-Oct-95	Kuwait Furniture Manufacturing & Trading Company	Kuwait	Sabahn	Private Sector - Manufacturer	I.L. Dickson

GCC Opportunity Study Visit Listing for Field Mission in the GCC Countries - (By Sector Order)

09-Oct-95	Alam Steel Industries	Kuwait	Shuwaikh	Private Sector - Manufacturer	I.L. Dickson
10-Oct-95	Wires International	Bahrain	Al-Manama	Private Sector - Manufacturer	I.L. Dickson
10-Oct-95	NOR Factories	Bahrain	Al-Manama	Private Sector - Manufacturer	P.J.Robson
10-Oct-95	TURQ Mechanical Industries	Bahrain	Al-Manama	Private Sector - Manufacturer	P.J.Robson
11-Oct-95	Maharraq Engineering Company	Bahrain	Al-Manama	Private Sector - Manufacturer	I.L. Dickson
11-Oct-95	Shaw- Nass Middle East	Bahrain	Al-Manama	Private Sector - Manufacturer	I.L. Dickson
12-Oct-95	Ammar Store	Bahrain	Al-Manama	Private Sector - Manufacturer	P.J.Robson
16-Oct-95	Manweir & Techserv Products	Qatar	Doha	Private Sector - Manufacturer	P.J. Robson
18-Oct-95	Cleveland Bridge	U.A.E.	Jebel Ali	Private Sector - Manufacturer	P.J. Robson
19-Oct-95	Royal Palace Furniture Industry	U.A.E.	Ajjman	Private Sector - Manufacturer	P.D. Southward
19-Oct-95	Ali Steel Company	U.A.E.	Dubai	Private Sector - Manufacturer	P.J. Robson
19-Oct-95	Interplast	U.A.E.	Dubai	Private Sector - Manufacturer	P.J. Robson
19-Oct-95	Cosmoplast	U.A.E.	Dubai	Private Sector - Manufacturer	P.J. Robson
19-Oct-95	Emirate Can Company	U.A.E.	Jebel Ali	Private Sector - Manufacturer	P.D. Southward
19-Oct-95	Al-Bilad for Trading & Industry	U.A.E.	Jebel Ali	Private Sector - Manufacturer	P.D. Southward
21-Oct-95	Gulf Marine Maintenance Company	U.A.E.	Dubai	Private Sector - Manufacturer	P.D. Southward
21-Oct-95	Leader Furniture	U.A.E.	Dubai	Private Sector - Manufacturer	P.D. Southward
21-Oct-95	Precision Castings	U.A.E.	Fujairah	Private Sector - Manufacturer	P.J. Robson
21-Oct-95	Gulf Metal Craft	U.A.E.	Jebel Ali	Private Sector - Manufacturer	P.D. Southward
22-Oct-95	Precision Dies & Moulds	U.A.E.	Dubai	Private Sector - Manufacturer	P.J. Robson
24-Oct-95	Muna Noor Incorporated	Oman	Rusayl	Private Sector - Manufacturer	P.J. Robson
24-Oct-95	Voltamp Manufacturing Company	Oman	Rusayl	Private Sector - Manufacturer	P.J. Robson
24-Oct-95	Zubair Furniture Factory	Oman	Ruwi	Private Sector - Manufacturer	P.D. Southward
25-Oct-95	Bin Juma Plast	Oman	Rusayl	Private Sector - Manufacturer	P.D. Southward
25-Oct-95	Oman Water Pump Manufacturing Company	Oman	Rusayl	Private Sector - Manufacturer	P.D. Southward
25-Oct-95	Oman Cables Industry	Oman	Rusayl	Private Sector - Manufacturer	P.D. Southward
25-Oct-95	Reem Radiators & Accessories Company	Oman	Rusayl	Private Sector - Manufacturer	P.D. Southward
11-Oct-95	Arab Shipbuilding & Repair Yard Company (ASRY)	Bahrain	Al-Manama	Public Sector - Manufacturer	P.J.Robson
11-Oct-95	Bahrain Aluminium Extrusion Company (BALEXICO)	Bahrain	Al-Manama	Public Sector - Manufacturer	I.L. Dickson
12-Oct-95	Bahrain Light Industries Company (BLICO)	Bahrain	Al-Manama	Public Sector - Manufacturer	P.J.Robson
15-Oct-95	Qatar Steel Corporation (QASCO)	Qatar	Doha	Public Sector - Manufacturer	P.J. Robson
16-Oct-95	Qatar Industrial Manufacturing Company - (QIMCO)	Qatar	Doha	Public Sector - Manufacturer	P.J. Robson
17-Oct-95	Qatar Gas & Petroleum Company	Qatar	Doha	Public Sector - Manufacturer	P.J. Robson
18-Oct-95	Dubai Aluminium	U.A.E.	Dubai	Public Sector - Manufacturer	P.J. Robson
21-Oct-95	Rockwool	U.A.E.	Fujairah	Public Sector - Manufacturer	P.J. Robson
21-Oct-95	Ceramic Tiles	U.A.E.	Fujairah	Public Sector - Manufacturer	P.J. Robson
21-Oct-95	Dubai Ports Authority	U.A.E.	Dubai	Public Sector - Services	P.J. Robson
21-Oct-95	Fujairah Port Authority	U.A.E.	Fujairah	Public Sector - Services	P.J. Robson
21-Oct-95	Fujairah Industrial Engineering Company	U.A.E.	Fujairah	Public Sector - Services	P.J. Robson
01-Oct-95	GCC Headquarters	Saudi Arabia	Riyadh	Sponsor	P.J. Robson
03-Oct-95	GCC Headquarters	Saudi Arabia	Riyadh	Sponsor	K. Hagiwara
03-Oct-95	UNDP	Saudi Arabia	Riyadh	United Nations	K. Hagiwara
10-Oct-95	UNDP	Bahrain	Al-Manama	United Nations	P.J.Robson
15-Oct-95	UNDP	Qatar	Doha	United Nations	K. Hagiwara

Field Mission Organisational Visit - Modus Operandi

Overview

The organisational interviews carried out within the Gulf Co-operation Council Member states of the Kingdom of Saudi Arabia, Kuwait, Bahrain, Qatar, United Arab Emirates and Oman, were the central vehicle by which data was gathered by the Study team when in the field.

Consequently these events, (over 120) were regarded as critical to the success of the study, in that they facilitated the achievement of a number of objectives for the project:-

- The creation of a link between the Study Team and organisations from within the Public and Private sectors of the GCC marketplace, a link which will be sustain throughout the life of the project, to potentially resolve issues as they are uncovered post-field mission.
- The signposting of the study team to organisations and data sources by interviewees as a result of their local knowledge and experience.
- The gathering of a cross-spectrum of comments, both factually and anecdotally based, on the subject of the project from a host of differing viewpoints (i.e. Manufacturers, Consultants, Chambers of Commerce & Industry, Ministries and Network Organisations.
- The gathering of statistically based, micro and macro economic indicators in hard copy or digital format which could assist the study team in reaching an accurate conclusion within the final report.

The efficient handling of these interviews by the Study Team, was the key to the completion of a successful field mission. Consequently, prior to the commencement of the field mission a number of preparations were organised, that would allow each interview opportunity to be exploited to the full as follows:-

- Creation of a slide presentation (see Section 5.2) to be used to allow quick assimilation of the project concept by the interviewee from the presenter (one of the members of the Study Team)
- Procurement of a Presentation Portfolio (a table top presentational device) in conjunction with which the presentation was delivered.
- Creation of a series of questionnaires, from which all fact finding was co-ordinated within the forum of the interview. This enabled a common approach to be adopted by any of the three members of the project team, regardless of the type of organisation that they were interviewing.
- The allocation of duties to each of the Study Team members so that when necessary the three member team could break up to form three teams, and by so doing fully exploit the opportunity to interview as many relevant organisations as possible during the field mission.
- The preparation and despatch of a visit target shortlist, per country to the GCC Counterpart (Mr Ebrahim A. Al-Mannai) as an initial listing from which appointments could be made prior to the arrival of the study team within the GCC. The intention of the listing was to allow our hosts in each of the member states to have sufficient target data to allow a series of

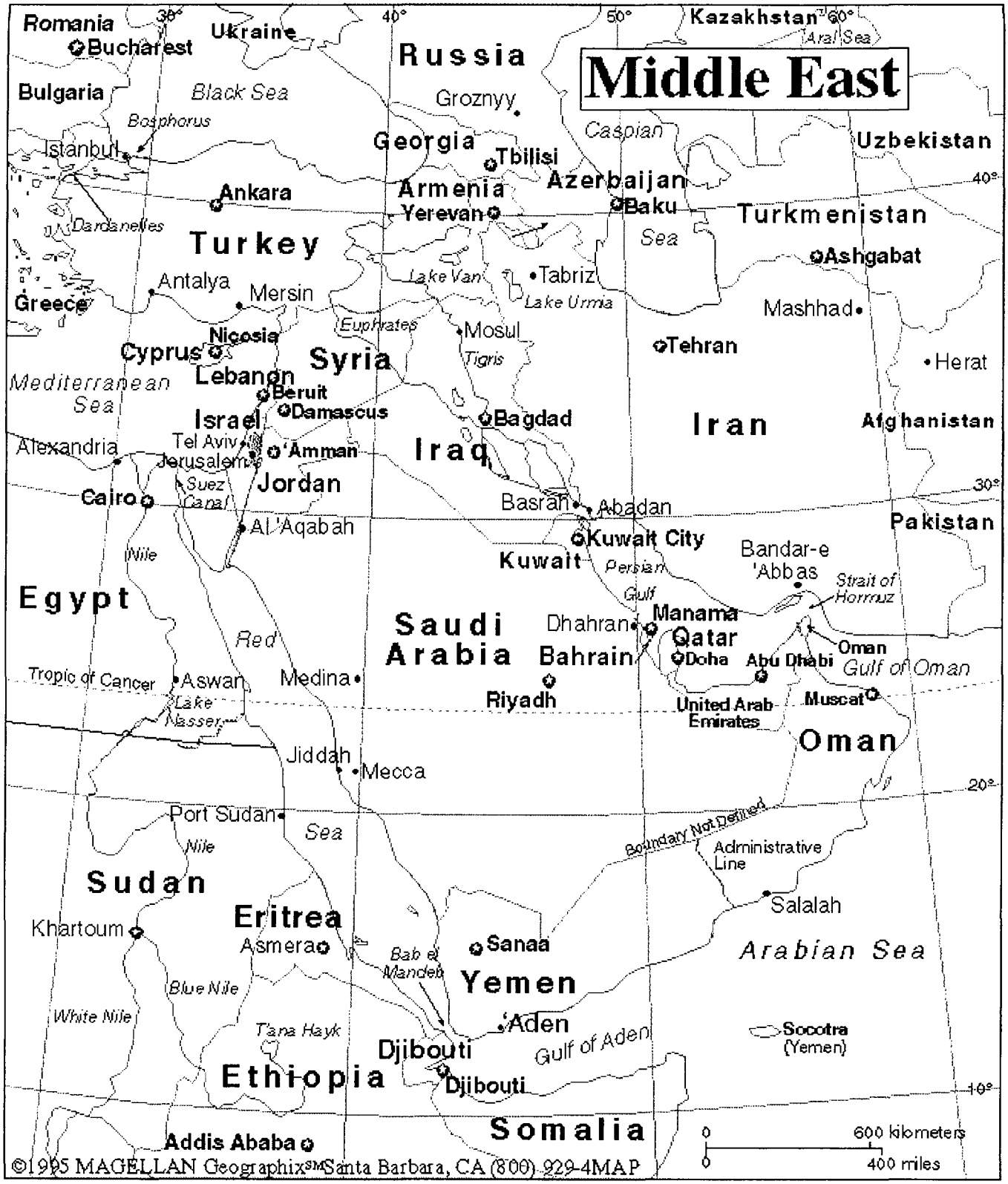
meetings to be arranged from the organisations targeted and for them to use their own local knowledge to arrange further relevant meetings for the team.

Modus Operandi

The Study Team separated into two or three teams within each of the countries visited and carried out over 120 site visits throughout the course of the filed mission. Essentially each member of the Study Team conducted the interview process by adopting a common methodology which was as follows:-

- Delivery of an initial presentation , utilising the prepared slide presentation system, to allow the interviewee a clear understanding of the goals and objectives of the project.
- Facilitation of an open, question and answer plenary session, to clear up any areas of mis-understanding and to allow valuable, unsolicited input from the interviewee/s.
- The conducting of a questionnaire-driven fact finding exercise led by the interviewer to solicit key facts and data pertinent to the project.
- Where an opportunity was available a tour of the facility was taken to view the organisation in a more detailed manner. Throughout this tour notes were taken as required to capture other relevant data as it arose.
- Finally the meeting would be concluded by the collection of any appropriate documentation (i.e. Statistics, brochures, journals, CD-Roms, Diskettes etc.)

In summary the programme of meetings arranged throughout the duration of the field mission was intensive and qualitative, and allowed an extensive gathering of data, views and first hand observations of local and regional custom and practise, invaluable to the outcome of the project.


Middle East
Romania
Bucharest
Ukraine
Russia
Kazakhstan
Aral Sea
Bulgaria
Black Sea
Groznyy
Bosphorus
Istanbul
Georgia
Tbilisi
Caspian
Uzbekistan
Armenia
Azerbaijan
Ankara
Yerevan
Baku
Turkmenistan
Dardanelles
Turkey
Sea
Ashgabat
Lake Van
Tabriz
Antalya
Mersin
Lake Urmia
Mashhad
Greece
Euphrates
Mosul
Nicosia
Cyprus
Syria
Tehran
Tigris
Herat
Lebanon
Mediterranean Sea
Beruit
Damascus
Israel
Bagdad
Iran
Afghanistan
Tel Aviv
Amman
Alexandria
Iraq
Jerusalem
Suez Canal
Jordan
Basrah
Abadan
30°
Cairo
Pakistan
Al 'Aqabah
Kuwait City
Bandar-e 'Abbas
Nile
Kuwait
Persian Gulf
Strait of Hormuz
Egypt
Manama
Saudi Arabia
Dhahran
Qatar
Red
Oman
Bahrain
Doha
Abu Dhabi
Gulf of Oman
Tropic of Cancer
Aswan
Medina
Riyadh
Muscat
Lake Nasser
United Arab Emirates
Oman
Jiddah
Mecca
20°
Port Sudan
Sea
Boundary Not Defined
Administrative Line
Nile
Salalah
Sudan
Eritrea
Khartoum
Asmera
Sanaa
Arabian Sea
Bab el Mandeb
Yemen
Blue Nile
White Nile
Aden
Tana Hayk
Socotra (Yemen)
Djibouti
Gulf of Aden
Djibouti
Ethiopia
10°
Somalia
Addis Ababa
0
600 kilometers
0
400 miles
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Saudi Arabia Contacts List

.ohammad O., Alnais
Riyadh College of Technology
Mechanical Technology Department
P.O. Box 42826, Riyadh 11551
Kingdom of Saudi Arabia
4912881 Ext. 542
0

Ahmed A., Al-Abdulwahab
General Director of Public Relations
General Organization for Tech. Ed. & Voc. Training
P.O. Box 89204, Riyadh 11682
Kingdom of Saudi Arabia
4020058
0

Saad A., Al-Kahtani
Assistant Research Professor
King Abdulaziz City for Science and Technology
.O. Box 6086, Riyadh 11442
Kingdom of Saudi Arabia
4813644
4882681

Sultan S., Al-Kurnas
Projects Department
Saudi Industrial Development Fund
P.O. Box 4143, Riyadh 11149
Kingdom of Saudi Arabia
477 4002/854
4790165

Mohammed S., Al-Muwainie
Foreign Capital Investments Bureau
Ministry of Industry & Electricity
P.O. Box 5729, Riyadh 11127
Kingdom of Saudi Arabia
4775302

Mohammed A., Al Rasheed
Electrical and Industrial and Tech. Economic Affairs
Cooperation Council for the Arab States of the Gulf
The Secretariat General, P.O. Box 7153
Kingdom of Saudi Arabia
4829378
4829089

Mohd. S., Al-Shaya
Industrial Researcher
Chamber of Commerce & Industry
P.O. Box 596, Riyadh 11421
Kingdom of Saudi Arabia
4040044 Ext. 317
4034794

Zaid R., Al-Abdullah
Acting General Manager Industrial Development Department
Saudi Consulting House
P.O. Box 1267, Riyadh 11431
Kingdom of Saudi Arabia
4484688; Direct 4489151
4481234

Ali N., Alghafis
Director General Technical Education
General Organization for Tech. Ed. & Voc. Training
P.O. Box 6041, Riyadh 11442
Kingdom of Saudi Arabia
4026255 or 4052770
4059950

Ebrahim A., Al-Mannai
Studies & Research & Planning Directorate
The Cooperation Council for the Arab States of the Gulf - Secretariat General
P.O. Box 7153, Riyadh 11462
Kingdom of Saudi Arabia
4827777 EX. 1477 Res.
4827716

Kamal A., Al-Mutlaq
Projects Department
Saudi Industrial Development Fund
P.O. Box 4143, Riyadh 11149
Kingdom of Saudi Arabia
477 4002
4790165

Abdul Aziz H., Al-Owaid
Technical Consultants Division
Saudi Industrial Development Fund
King Abdulaziz Road, Riyadh 11149
Kingdom of Saudi Arabia
4774002
4790165

Ahmed A., Al-Saleh
Chairman
Houssam Trading & Contracting Co.
P.O. Box 1826, Riyadh 11441
Kingdom of Saudi Arabia
4657777; Direct 4632811
4649597

Hassan A., Al-Shehri
Ministry of Commerce
Foreign Trade Department
P.O. Box 6031, Riyadh 11162
Kingdom of Saudi Arabia
4012222 Ext. 1152
4056420

Graeme, Thomas
Second Secretary (commercial)
British Embassy
P.O. Box 94351, Riyadh 11693
Kingdom of Saudi Arabia
4880077 Ext. 245
4882373

Abdul-Rahman A., Al-Zamil
Deputy Minister of Commerce
Ministry of Commerce
, Riyadh
Kingdom of Saudi Arabia
4022590
4026640

Hasan O., Ashour
Saudi Consulting House
Industrial Development Department
P.O. Box 1267, Riyadh 11431
Kingdom of Saudi Arabia
Direct: 4480323 & 4482092: Cent. 4484533 Ext. 693
481234

Michael, Gifford
First Secretary (Economic)
British Embassy
P.O. Box 94351, Riyadh 11693
Kingdom of Saudi Arabia
4880077
4882373

Christopher, Segar
Commercial Counsellor
British Embassy
P.O. Box 94351, Riyadh 11693
Kingdom of Saudi Arabia
4880077 Ext. 240
4882373

Mohamed A., Al Deemasi
Manager of Industrial Equ. Division
Almusairiey Trading Co.
P.O. Box 533, Riyadh 11421
Kingdom of Saudi Arabia
4486753/4483808/4468473
4469244

Adel M., Almusairiey
Assistant Manager
Almusairiey Trading Industrial Co.
P.O. Box 533, Riyadh 11421
Kingdom of Saudi Arabia
4486753/4483808
4469244

Khalid M., Al-Sulaiman
King Abdulaziz City for Science and Technology
Atomic Energy Research Institute
P.O. Box 6086, Riyadh 11442
Kingdom of Saudi Arabia
4883444
4882681

Abdulaziz A., Al-Zeyad
Admin. Dir. Foreign Affairs & Investment Encouragement
Council of Saudi Chambers of Commerce & Industry
P.O. Box 16683, Riyadh 11474
Kingdom of Saudi Arabia
4053200
4024747

Ahmed Ali, Basfar
King Abdulaziz City for Science and Technology
Institute of Atomic Energy Research
P.O. Box 6086, Riyadh 11442
Kingdom of Saudi Arabia
4883555 Ext. 648 - Direct 4813648
4882681

Emin, Kulic
King Abdulaziz City for Science and Technology
Atomic Energy Research Institute
P.O. Box 6086, Riyadh 11442
Kingdom of Saudi Arabia
488355
4882681

Mohammad A., Sendi
Director, Evaluation & Licensing of Industrial Projects Department
Ministry of Industry & Electricity
deputy Ministry of Industrial Affairs, Riyadh 11127
Kingdom of Saudi Arabia
Direct: 4775289; Central: 4776666/544
0

Ghazi, Al-Khateeb
Branch Manager
Arab Engineers
P.O. Box 88392, Riyadh 11662
Kingdom of Saudi Arabia
4633117
4652766

Sultan, Mahmood
Marketing Manager
Industrial Materials Organisation
P.O. Box 623, Riyadh 11421
Kingdom of Saudi Arabia
4028010/4052998/4030203
4037970

Javed, Khan
Machinery Division
Yusef Bin Ahmed Kanoo
.O. Box 753, Riyadh 11421
Kingdom of Saudi Arabia
4914624
(01) 4914404

M.N., Khan M.N.
General Trading Division C.P.
Yusef Bin Ahmed Kanoo
P.O. Box 753, Riyadh 11421
Kingdom of Saudi Arabia
4914624
(01) 4914404

Padmanaban, Ananth
Machinery Division
Yusef Bin Ahmed Kanoo
P.O. Box 753, Riyadh 11421
Kingdom of Saudi Arabia
4914624
(01) 4914404

A., Prashanth
Sales Manager
Yusef Bin Ahmed Kanoo
P.O. Box 753, Riyadh 11421
Kingdom of Saudi Arabia
4914624
(01) 4914404

Kuwait Contact List

bdul-Rahman A.K., Al-Mutawa
Director of Industrial Training Institute
The Public Authority for Applied Education and Training
P.O. Box 42440Al Shuwaikh 70655
Kuwait
4815665
Fax:4815669

Hisham Mohd, Juhail
General Accounts Department
Ministry of Finance
P.O. Box 9Safat 13001
Kuwait
2450503/6
Fax:2425965

Fahhad S., Al-Mutairi
Dept. of Development & Industrial Studies, Director
Ministry of Commerce & Industry
O. Box 2944Safat 13030
Kuwait
2400569/2400534
Fax:2469563

Mahmoud, Hamza
Director of Labour & Industry Dept.
Kuwait Chamber of Commerce & industry
P.O. Box 775Al Safat 13008
Kuwait
2433854, Direct:2438054, Res.:2650633
Fax:2404110

His Excelency Abdulaziz Hamad, Al-Sagar
President
Kuwait Chamber of Commerce & industry
P.O. Box 775Al Safat 13008
Kuwait
2433899
Fax:

Donna, Sultan
Chief Executive Officer
Kuwait Engineers Office
P.O. Box 3679Safat 13037
Kuwait
2438011
Fax:(965) 2443969

Hisahm H., Al-Issa
Managing Director
Burgan Equipments Est.
P.O. Box 4148Safat
Kuwait
2428730/2437670/2446832
Fax:2402294

Khalid H., Al-Sharea
General Accounts Department
Ministry of Finance
P.O. Box 9Safat 13001
Kuwait
2450503/6
Fax:2425965

Reem H., Al-Khader
General Accounts Department
Ministry of Finance
P.O. Box 9Safat 13001
Kuwait
2450503/6
Fax:2425965

Wadad, Al Suwayeh
ATO Principle Advisor
Arab Towns Organization
P.O. Box 68160Kaifan 71962
Kuwait
4849705
Fax:(965) 4849319

Rabah A., Alrabah
Director General Assistant
Kuwait Chamber of Commerce & industry
P.O. Box 775Al Safat 13008
Kuwait
2433864/6, Direct: 2464019
Fax:2404110

Ahmad R., Al-Haroun
Director General
Kuwait Chamber of Commerce & industry
P.O. Box 775Al Safat 13008
Kuwait
2433864/6, Direct: 2403683/4
Fax:2404110

Paul D., Nyhan
Executive Vice President International Business Development
Synergy
P.O. Box 5175Salmiya 22061
Kuwait
(965) 5342319
Fax:(965) 5342319

Hasn F., Sami
Projects Division
The Industrial Bank of Kuwait K.S.C.
P.O. Box 3146Safat 13032
Kuwait
2457661, Direct: 2461886, Res.: 5654933
Fax:2462057

Jasem A., Al-Ammar
Market Research Department
The Industrial Bank of Kuwait K.S.C.
P.O. Box 3146Safat 13032
Kuwait
2457661, Direct: 2461906
Fax:2462057

Rasheed, Al-Sharhan
Projects Dept.
The Industrial Bank of Kuwait K.S.C.
P.O. Box 3146Safat 13032
Kuwait
2457661, Direct: 2461771
Fax:

Mohammad, Al-Sanie
Vice President, Project Group
Gulf Investment Corporation
P.O. Box 3402Safat 13035
Kuwait
2431911 Ext. 427
Fax:(965) 2448894

Suhail, Al-Humoud
Senior Vice President, Project Group
Gulf Investment Corporation
P.O. Box 3402Safat 13035
Kuwait
2431911 Ext. 707, Direct: 2408005
Fax:(965) 2400306/ 2448894

Bahrain Contacts List

N., Natarajan
Asst. General Manager, Tylos Furniture Factory
Bahrain Light Industries Co. B.S.C.
P.O. Box 26700, Manama
Bahrain
830222
Fax: 830399

S.J., Mustafa
Technical Sales Manager
Y.K. Almoayyed & Sons W.L.L.
P.O. Box 143, Manama
Bahrain
Direct: 211882; Office: 211211 Ext. 245
Fax: (0973) 211885

Anil, Dani
Sales Engineer
Y.K. Almoayyed & Sons W.L.L.
P.O. Box 143, Manama
Bahrain
211211 Ext.249
Fax: (0973) 211885

Mahmood, Al-Soufi
General Manager
Bahrain Aluminium Extrusion Co. B.S.C.C.
P.O. Box 1053,
Bahrain
730221, Direct: 734401
Fax: 735818

Naji A., Al-Mahdi
Director of the Institute
Bahrain Training Institute
Ministry of Labour & Social Affairs, P.O. Box 32333
Bahrain
Direct: 685572, 681980 Ext. 105
Fax: 682441

Mohamed M., Al-Khateeb
Dep. Chief Exec.
Arab Shipbuilding & Repair Yard Co.
P.O. Box 501,
Bahrain
Fax:

Hans G., Frisk
Chief Executive
Arab Shipbuilding and Repair Yard Co.
P.O. Box 50110, HIDD
Bahrain
674032/671111
Fax: 670236

P.S. Syed, Sulaiman
Procurement Service Head
Arab Shipbuilding and Repair Yard Co.
P.O. Box 50110, HIDD
Bahrain
674027/675867
Fax: 670

Anthony, Antoniou
Technical & Q.A. Manager
Arab Shipbuilding And Repair Yard Co.
P.O. Box 50110, HIDD
Bahrain
674027; Res.:693703
Fax: (973) 670236

Ebrahim K., Mattar
Director of Statistics Directorate
Central Statistics Organisation
P.O. Box 5835, Manama
Bahrain
725557/725725
Fax:

A. Rahim H., Naqi
Asst. Secretary General
Bahrain Chamber of Commerce & Industry
P.O. Box 248,
Bahrain
273306/233913
Fax: (0973) 241294

D.B., Gupta
General Manager
Wires International W.L.L.
P.O. Box 32440,
Bahrain
785552 Res.:723672
Fax: (0973) 784664

Mohammed M., Fikree
Head of Project Finance
Bahrain Development Bank B.S.C.
P.O. Box 20501,
Bahrain
537007
Fax: 534005

Abdulla A., Al-Sammak
Head of Operations
Bahrain Development Bank B.S.C.
P.O. Box 20501,
Bahrain
537007
Fax: 534005

Yousef A.G., Abdalla
Chairman of Mechanical Engg. Dept.
University of Bahrain
P.O. Box 32038,
Bahrain
688314
Fax: 684844

Ahmed Botan, Dhakkar
UN Resident Coordinator
United Nations Development Programme (UNDP)
P.O. Box 26814,
Bahrain
725552, 729569 (Direct)
Fax: (973) 729922

A. Kareem A., Al Rashid
Industrial Development Directorate
Ministry of Development & Industry
P.O. Box 1435, Manama
Bahrain
Direct:525581/ 291511
Fax: (0973) 290302

Khalid R., Hussain
Industrial Development Directorate
Ministry of Development & Industry
P.O. Box 1435, Manama
Bahrain
291511, Direct:525598
Fax: (0973) 290302

Ismail M.N., Khunji
Proprietor
Noor Factories
P.O. Box 28840, Sitra
Bahrain
731220
Fax: 731020

Safwat A., Hanafi
General Manager
Turk Heavy Transport
P.O. Box 26359,
Bahrain
Newidrat: 700165/701966; Mina Sulman 729143/727081
Fax: 700164

Hanna M., Makhlouf
Dean
University of Bahrain
College of Engineering, P.O. Box 32038
Bahrain
688301/681234 - 401
Fax: 684844

Kiyoshi, Hara
Industrial Development Directorate
Ministry of Development & Industry
P.O. Box 1435, Manama
Bahrain
291511/ 525589 (Direct), Res.:690153
Fax: (0973) 290302

Abdul R.A., Fakhro
Industrial Development Directorate
Ministry of Oil & Industry
P.O. Box 1435, Manama
Bahrain
291511, Direct:525569
Fax: (0973) 290302

Abdulla A.A., Al-Thawadi
Asst. Undersecretary for Industry Affairs
Ministry of Oil & Industry
P.O. Box 1435,
Bahrain
291855
Fax: 290157

Ali A.J., Turk
Chairman
Turk Heavy Transport
P.O. Box 26359,
Bahrain
Newidrat: 700165/700166; Mina Sulman 729143/727081
Fax: 700164

Khalid A., Turk K.A.
Turk Heavy Transport
P.O. Box 26359,
Bahrain
Newidrat: 700165/701966; Mina Sulman 729143/727081
Fax: 700164

Qatar Contacts List

Ali Hussein A., Abdullateef
Head of Research & Information Section
Qatar Chamber of Commerce & Industry
P.O. Box 402, Doha
State of Qatar
425131/244
Fax:324338

Hussain Ali, Al-Abdulla
Director
Government of Qatar Investment Office
P.O. Box 83, Doha
State of Qatar
414603
Fax:432091

Hazim T., Al-Kadhi
Projects Department
Qatar Industrial Manufacturing Company (S.A.Q.)
P.O. Box 16875, Doha
State of Qatar
673555
Fax:670344

Homaid, Al-Madfa
Scientific & Applied Research Centre
University of Qatar
P.O. Box 2713, Doha
State of Qatar
869950
Fax:(0974) 860680

Jaber A., Al-Marri
Vice Chairman, Director General
Qatar General Petroleum Corporation
P.O. Box 3212, Doha
State of Qatar
831000/831166
Fax:(0974) 831831

Muin M., Badawi
Industrial & Economical Expert
Qatar Industrial Manufacturing Company (S.A.Q.)
P.O. Box 16875, Doha
State of Qatar
673555
Fax:670344

Adel Siddiq, El-Rayah
Economist
Qatar Chamber of Commerce & Industry
P.O. Box 402, Doha
State of Qatar
425131/245, Res.: 353806
Fax:(974) 324338

M. Hanafy, Ahmed
Expert, Eng. Industries
Gulf Organisation for Industrial Consulting
P.O. Box 5114, Doha
State of Qatar
858812/858888
Fax:(0974) 831465

Yousef A., Al-Emadi
Industrial Engineer
Ministry of Energy & Industry
P.O. Box 2599, Doha
State of Qatar
832067
Fax:832024

Ali M.R., Al-Khater
Assistant Secretary General
Gulf Organisation for Industrial Consulting
P.O. Box 5114, Doha
State of Qatar
831234, Direct:831722
Fax:(0974) 831465, Direct: 831723

Saleh Ali, Al-Mannai
Asst. Director Industrial Studies & Planning Dept. of Industrial Development
Ministry of Energy & Industry
P.O. Box 2599, Doha
State of Qatar
837474, Direct:837474
Fax:832024

Mohammed Amin, Baban
Director, Projects Dept.
Gulf Organisation for Industrial Consulting
P.O. Box 5114, Doha
State of Qatar
858888, Direct:831729
Fax:(0974) 831465

Habib G., Bassoul
Chief Technical Adviser
United Nations Development Programme
P.O. Box 3233, Doha
State of Qatar
441666 Ext. 395, Direct: 427577, Res.: 683207
Fax:

Talaat, Elsahn
Gulf Organization for Industrial Consulting
P.O. Box 5114, Doha
State of Qatar
831234
Fax:(0974) 831465

Alan C., Gowers
Senior Expert
Gulf Organisation for Industrial Consulting
P.O. Box 5114, Doha
State of Qatar
858888
Fax:(0974) 831465

James, Hay
Manager
Manweir And Techserv (Products)
P.O. Box 8958, Doha
State of Qatar
Direct: 602701, 602700/602094, Res.:418641
Fax:602755

Evelyn V., Martis
Programme Officer
United Nations Development Programme
P.O. Box 3233, Doha
State of Qatar
863451/2/3, Res.: 861720
Fax:861552

Aly M., Nawwar
, Doha
State of Qatar
Fax:

G.R.N., Sastry
Chief Technical Adviser
United Nations Industrial Development Organisation
P.O. Box 2599, Doha
State of Qatar
832076/832121, Res.: 420895
Fax:832024

Ismail A., Tag
Dean of Engineering
University of Qatar
P.O. Box 2713, Doha
State of Qatar
892107, Res.:831095
Fax:(974) 892491

United Arab Emirates Report

Mohamed A.R., Al Asoomi
Economic Research
Emirates Industrial Bank
P.O. Box 5454, Dubai
U.A.E.
211300
Fax: 232320

Salem A., Khalil
Technical Advisor
Government of Fujairah
P.O. Box 1, Fujairah
U.A.E.
Mobile: 050840006; Res: 223164
Fax: (9714) 222174

Fatma M., Al-Marzooqi
Executive Customer Services
Dubai Ports Authority
P.O. Box 17000, Dubai
U.A.E.
(9714) 8040333, 815000, 816048
Fax: 9714816271

G., Selvaraju
Centre Director
Singapore Trade Development Board
P.O. Box 14970, Dubai
U.A.E.
(9714) 229789
Fax: (9714) 231515

K.K., Bansal
ASSAB
Precision Dies & Tools Mnfg. Co.
P.O. Box 8597, Dubai
U.A.E.
971-4-480989
Fax: 971-4-480128

Sheik Hamed Bin Tahnou, Al-Nhyan
General Industry Corporation
P.O. Box 4499, Emirate of Abu Dhabi
U.A.E.
214900
Fax: 325034

Abdul R.G., Al Mutaiwee
Director General
Dubai Chamber of Commerce & Industry
P.O. Box 1457, Dubai
U.A.E.
(9714) 237533/224651
Fax: (9714) 211646

Ezzat K., Fahmy
Head of Planning
General Industry Corporation
P.O. Box 4499, Abu Dhabi
U.A.E.
214900
Fax: 325034

A. Mahdi, Ahmed
Head of Economic Studies Dept.
General Industry Corporation
P.O. Box 4499, Abu Dhabi
U.A.E.
214900
Fax: 325034

Abdel-Megied, Ginena
Economic Affairs
General Industry Corporation
P.O. Box 4499, Abu Dhabi
U.A.E.
213729/214900
Fax: 325034

Souhail, Hamade
Economic Research & Studies Department
Abu Dhabi Chamber of Commerce & Industry
P.O. Box 45838, Abu Dhabi
U.A.E.
971-2-214000 Ext. 284
Fax: 971-2-215867

Abdullah M., Al-Suwaidi
Abu Dhabi Investment Authority
Projects Department
P.O. Box 3600, Abu Dhabi
U.A.E.
213100; Direct 323319
Fax: 324605

Khalfan, Al Marar
Abu Dhabi Investment Authority
Projects Department
P.O. Box 3600, Abu Dhabi
U.A.E.
2113100; Direct 262554
Fax: 324605

, Maqsoodullah
Abu Dhabi Investment Authority
Projects Department
P.O. Box 3600, Abu Dhabi
U.A.E.
213100
Fax: 324605

Shahid, Ahmed S.
Economist Researcher
Emirates Industrial Bank
P.O. Box 5454, Dubai
U.A.E.
211300
Fax: 232320

Khalid, Al-Aghbari
Government of Dubai
P.O. Box 1565, Dubai
U.A.E.
Office: 522993/521882/521987. Home: 852905. Pager: 9761450
Fax:

Humayun, Akhtar
Plant Manager
Interplast Co. Ltd
P.O. Box 4679, Sharjah
U.A.E.
(971-6) 339090
Fax: (971-6) 336905

Abdulrahman Y., Albigishi
General Manager
Fujairah Industrial Engg. Co.
P.O. Box 211, Fujairah
U.A.E.
222257/222426/223995
Fax: (09) 222583

Abrahim O., Al-Tinai
Economic Department
Federal Government of Sharjah
P.O. Box 4011, Sharjah
U.A.E.
Office: 549212, Res. 549212
Fax:

Capt. Ali, Mohammed
Asst. Manager Customer Service
Dubai Ports Authority
P.O. Box 17000, Dubai
U.A.E.
Res. 459188
Fax:

Essa A., Kazim
Government of Dubai
The Economic Department
P.O. Box 13223, Dubai
U.A.E.
(9714) 229922
Fax: (9714) 225577

Sharief H., Alawadhi
Director
Fujairah Free Zone Authority
P.O. Box 1133, Fujairah
U.A.E.
(971-9) 228000
Fax: 228888

Walid, Najjar
Plant Manager
Cosmoplast Industrial Co. (W.L.L.)
P.O. Box 6032, Sharjah
U.A.E.
(06) 331264
Fax: (06) 331917

Farhat, Kiwan
Administrator
Interplast Co. Ltd
P.O. Box 4679, Sharjah
U.A.E.
(971-6) 339090
Fax: (971-6) 336905

Savvas A., Lardis
General Manager
Interplast Co. Ltd
P.O. Box 4679, Sharjah
U.A.E.
(971-6) 339090
Fax: (971-6) 336905

Nabil George, DahDah
Government of Dubai
The Economic Department
P.O. Box 13223, Dubai
U.A.E.
(9714) 2020242
Fax: (9714) 225577

Ahmed Butti, Ahmed, A.B.
Assistant Managing Director, Corporate Affairs
Dubai Ports Authority
P.O. Box 17000, Dubai
U.A.E.
(971-4) 816154, Port Rashid: (971-4) 450055
Fax: (971-4) 815549

S.K., Ahuja
Director
Quality Castings Ltd
P.O. Box 1361, Fujairah
U.A.E.
(00971-9) 228782/225469. Mobile: 050-841246
Fax: (00971-9) 228783/225469

Ahmed, Al Banna
Director, Research & Studies Department
Dubai Chamber of Commerce & Industry
P.O. Box 1457, Dubai
U.A.E.
(9714) 2028270/2028470
Fax: (9714) 211646

Yousuf G., Bastaki
Plant Electrical Engineer
Dubai Aluminium Company Limited
P.O. Box 3627, Dubai
U.A.E.
+(971-4) 8042656
Fax: +(971-4) 846292

Moosa A.R.M., Ismail
Manager Operation Power
Dubai Aluminium Company Limited
P.O. Box 3627, Dubai
U.A.E.
+(971-4) 8042588
Fax: +(971-4) 845075

Abdulla J.K., Al Gaizi
Directorate of Industrial Development
Ministry of Finance & Industry
P.O. Box 1565, Dubai
U.A.E.
522996
Fax: 511055

D.M., Beveridge
General Manager
Cleveland Bridge & Engineering Middle East (Private) Ltd
P.O. Box 16765, Dubai
U.A.E.
(971-4) 835551, Res: 382576
Fax: (971-4) 835416

M.Anis, Kharwar
Finance & Administration Manager
Cleveland Bridge & Engineering Middle East (Private) Limited
P.O. Box 16765, Dubai
U.A.E.
(971-4) 835551, Res: 480858
Fax: (971-4) 835304

P.E., Fletcher
Chief Metallurgist
Dubai Aluminium Company Limited
P.O. Box 3627, Dubai
U.A.E.
(+971-4) 846666
Fax: (+971-4) 846934

Musabeh M.S., Al Suwaidi
Head of Industrial Licencing Section
Mininstry of Finance & Industry
P.O. Box 1565, Dubai
U.A.E.
521987/522993
Fax: 511055

Iqbal, Ahmed I.
Factory Adminstrator
Ahli Steel Company
P.O. Box 2302, Dubai
U.A.E.
852288, Res. 371649
Fax: 850295

Mohammed O.B., Majed
Department of Industry & Economy
Government of Fujairah
P.O. Box 1, Fujairah
U.A.E.
222409/224102, Direct: 231777
Fax: 222174

Oman Contacts List

John A., Turner
Dean
Sultan Qaboos University
P.O. Box 33, Al-Khod 123
Sultanate of Oman
Office: 515300, Res. 514191
Fax: 513416

Ahmed H., Aldaib
Estate Director
Public Establishment foe Industrial Estates
P.O. Box 2, Rusayl 124
Sultanate of Oman
626080, Res. 601663
Fax: 626053

Ali B.S., Al-Hadi
Industrial Pollution Inspector
Ministry of Commerce & Industry
P.O. Box 550, Muscat 113
Sultanate of Oman
774379
Fax: 794238

Haider A.R., Dawood
Public Relations Director
Oman Chamber of Commerce & Industry
P.O. Box 1400, Ruwi 112
Sultanate of Oman
707674/84/94, Direct: (00968) 701698
Fax: (00968) 708497

Murtadha M., Fadhil
General Manager
Oman Development Bank S.A.O.G.
P.O. Box 309, Muscat 113
Sultanate of Oman
738021, Direct: 738577
Fax: 738026

Mohammed, Al-Mahrooki
Economic Relations Dept.
Ministry of Finance & Economy
P.O. Box 896, Muscat 113
Sultanate of Oman
(968) 736373, Res: 696052
Fax: 737028

Adel A., Al-Raisi
Director of Economic Relation
Ministry of ~Finance & Economy
P.O. Box 896, Muscat 113
Sultanate of Oman
740071, Res. 697220
Fax: 737028

Manl M., Abdwani
Dir. Industrial Relations & Information
Ministry of Commerce & Industry
P.O. Box 550, Muscat
Sultanate of Oman
774361
Fax: 794238

Soud M., Al-Habsy
General Manager
Reem Radiators & Accessories Company L.L.C.
P.O. Box 62, Rusayl 124
Sultanate of Oman
626134/626640
Fax: 626135

Vijaya, Kumar
Chief Plant Engineer
Oman Cables Industry (SAOG)
P.O. Box 25, Rusayl 124
Sultanate of Oman
626454
Fax: 626096/707282

S., Chakraborty
Senior Production Engineer
Oman Cables Industry (SAOG)
P.O. Box 25, Rusayl 124
Sultanate of Oman
626464
Fax: 626096/707282

Mir M., Hussain
Operations Manager
Oman Cables Industry (SAOG)
P.O. Box 25, Rusayl 124
Sultanate of Oman
626464
Fax: 626096

V.V., Lagu
Plant Manager
Oman Water Pumps Mfg. Co. (SAOG)
P.O. Box 3227, Ruwi 112
Sultanate of Oman
626099/626098
Fax: 626230

A.J., Alexander
Finance Manager
Oman Water Pumps Mfg. Co. (SAOG)
P.O. Box 3227, Ruwi 112
Sultanate of Oman
626098/626099
Fax: 626230

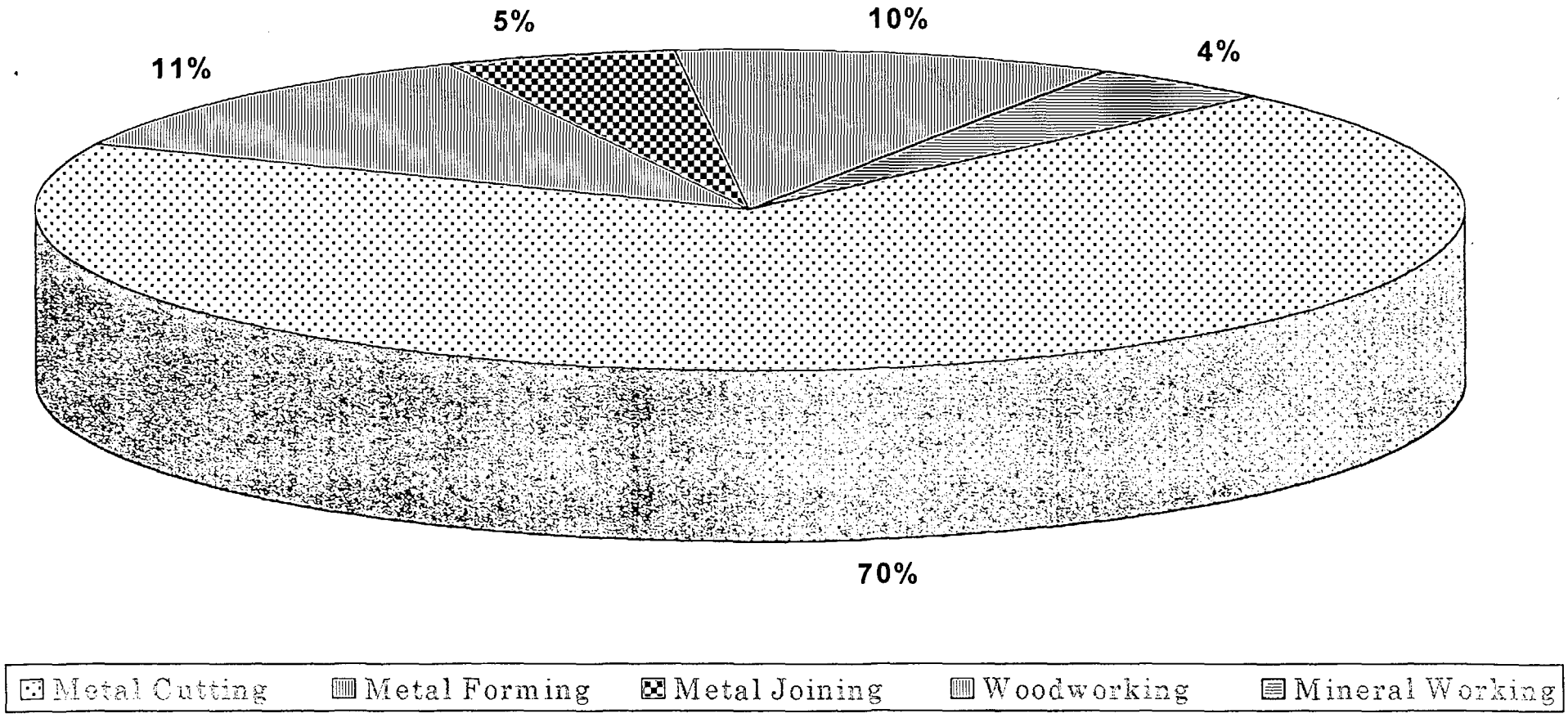
Ahmed B.N., Al-Balushi
Industril Development Researcher
Ministry of Commerce & Industry
P.O. Box 550, Muscat 113
Sultanate of Oman
774109/707832
Fax:

, Hariz
Plastic Household Industrial Division
Hussain Bin Juma Baqir Trading Estate
P.O. Box 94, Rusayl 124
Sultanate of Oman
626545/626544
Fax: 626544

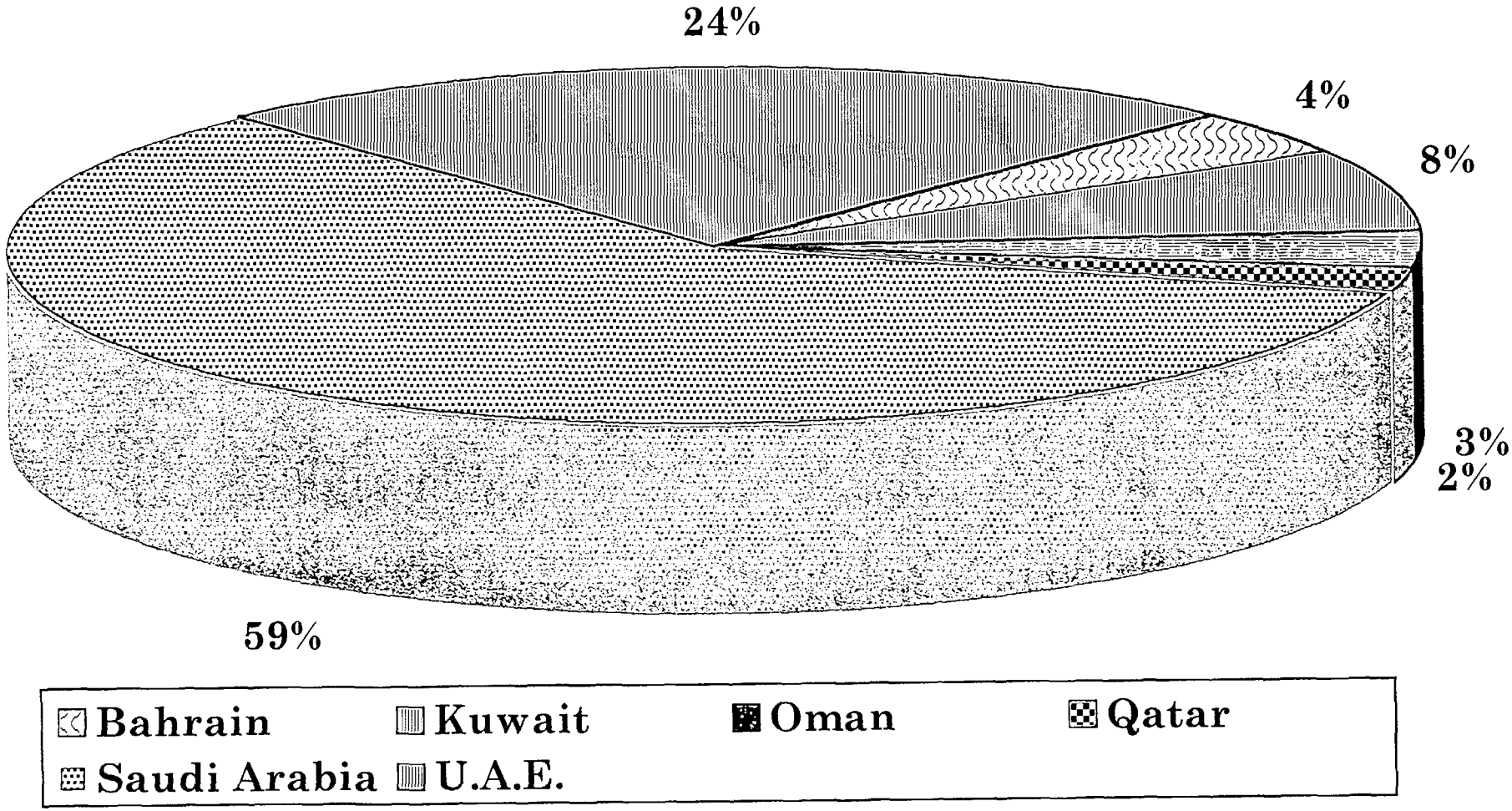
Peter W., Lynn
Vice President Operations
Zubair Furniture Factory L.L.C.
P.O. Box 2107 C.P.O., Postal Code 111
Sultanate of Oman
590134/590466/590495
Fax: 591782

Paul, Williams
Second Secretary (Commercial)
British Embassy
P.O. Box 3898, Ruwi 112
Sultanate of Oman
693086/693112
Fax: 693088

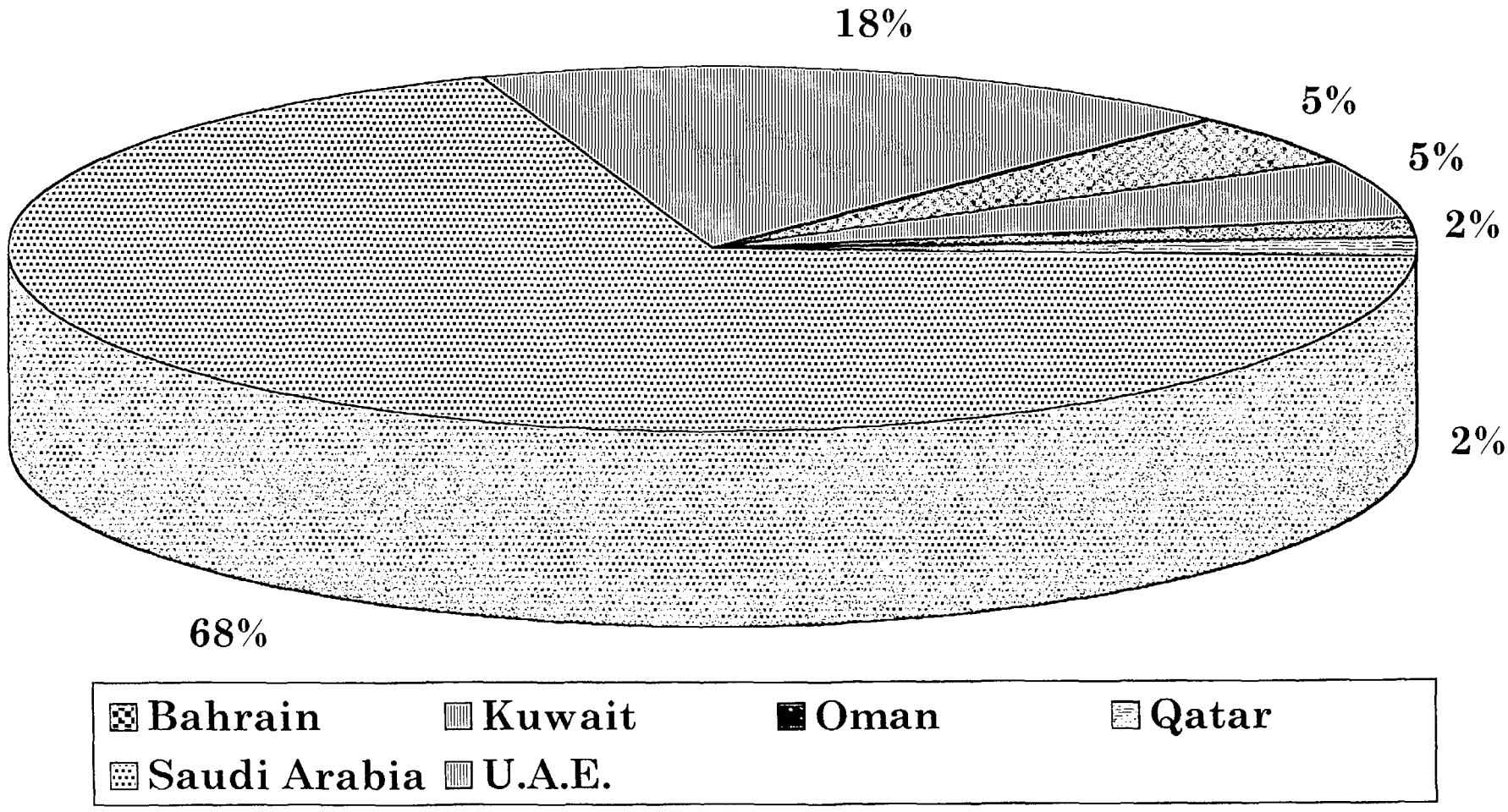
Machine Tool Analysis - By Project Sector Grouping
(Import Spend (US$) by all GCC countries : Source UN Statistics Database)



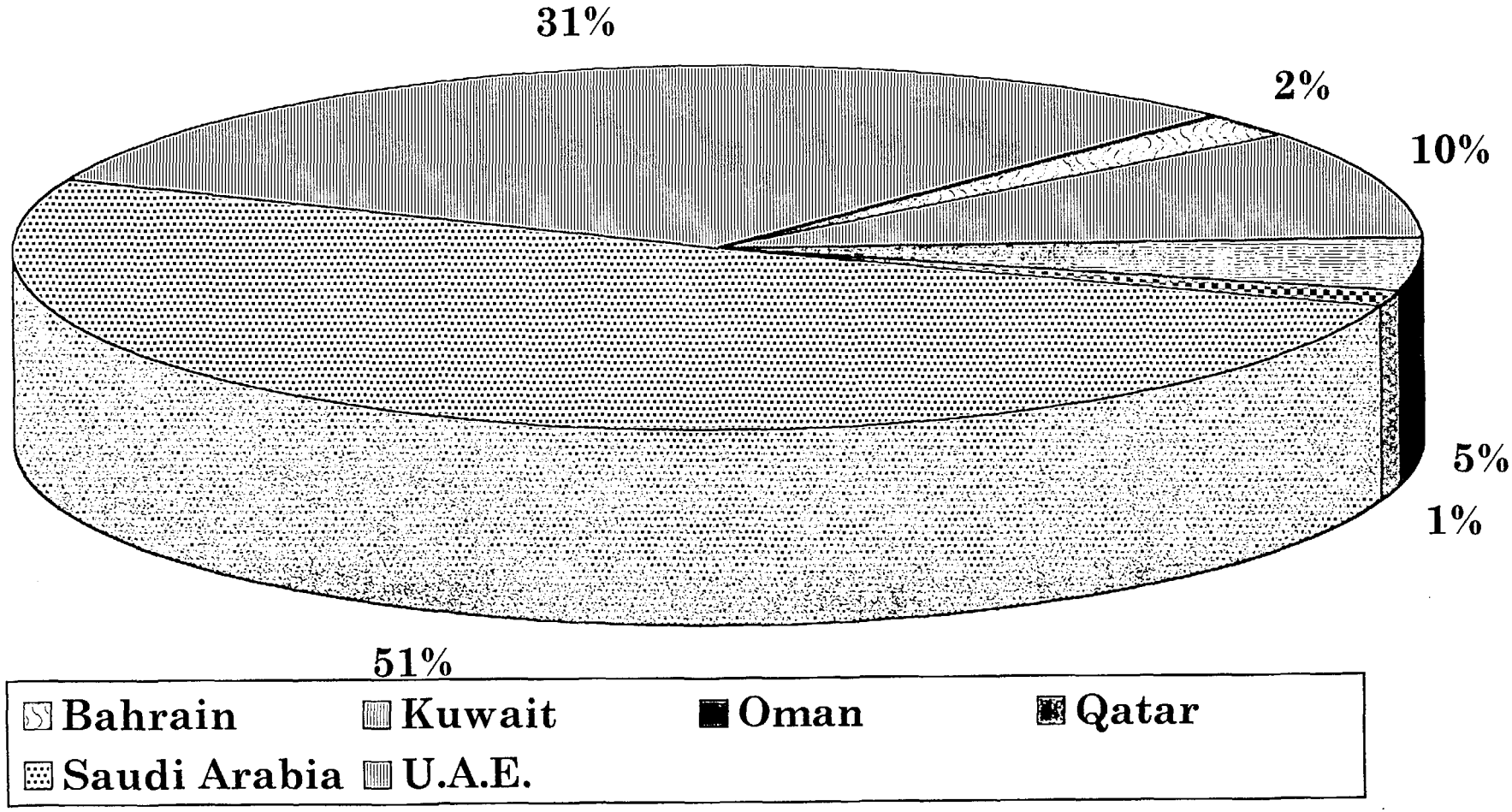
Machine Tool Analysis - by Metal Cutting (Import Spend (US$) by All GCC Countries : Source UN Statistics Database



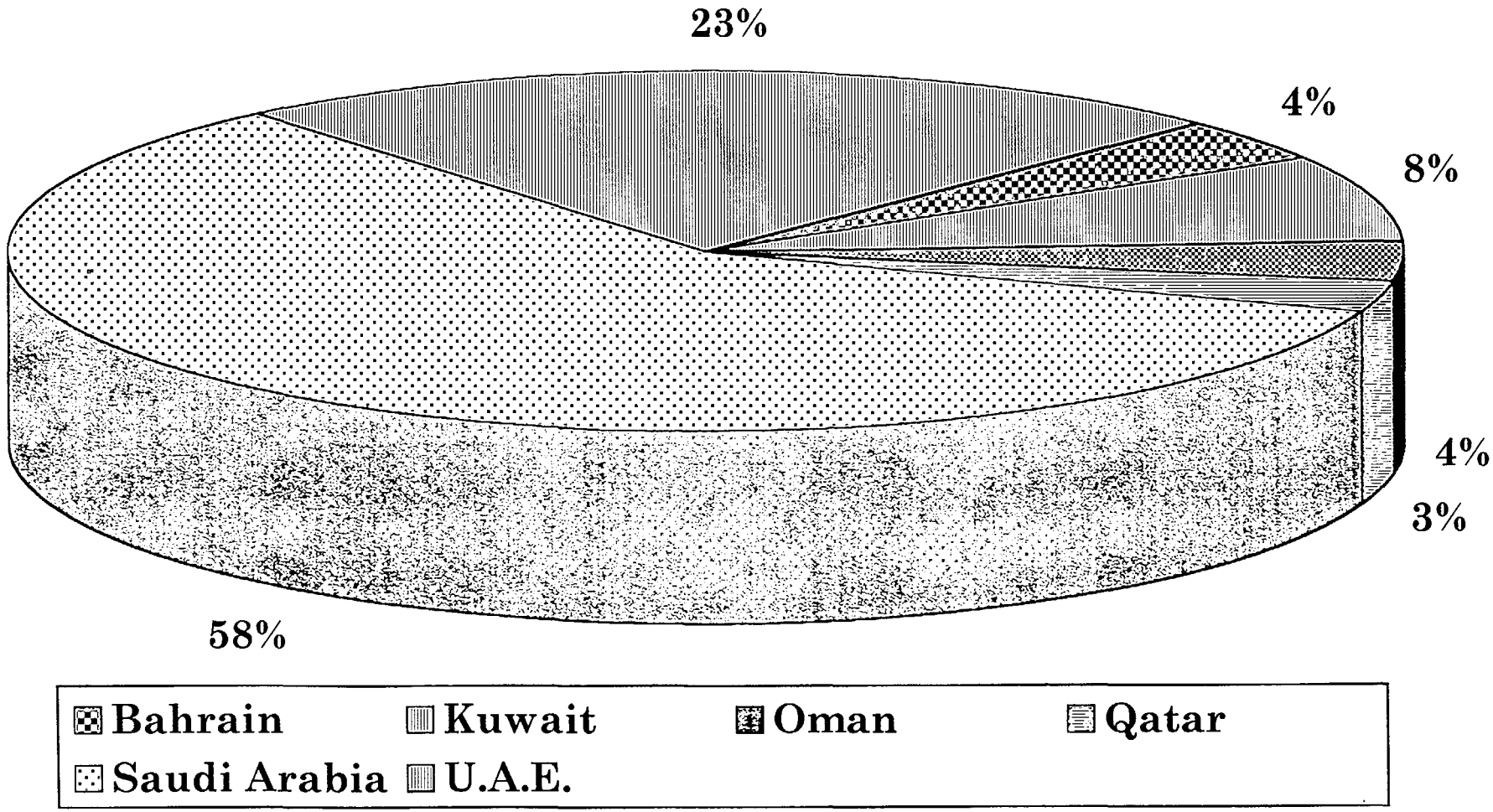
Machine Tool Analysis - by Metal Forming (Import Spend (US$) by all GCC Countries : Source UN Statistics Database



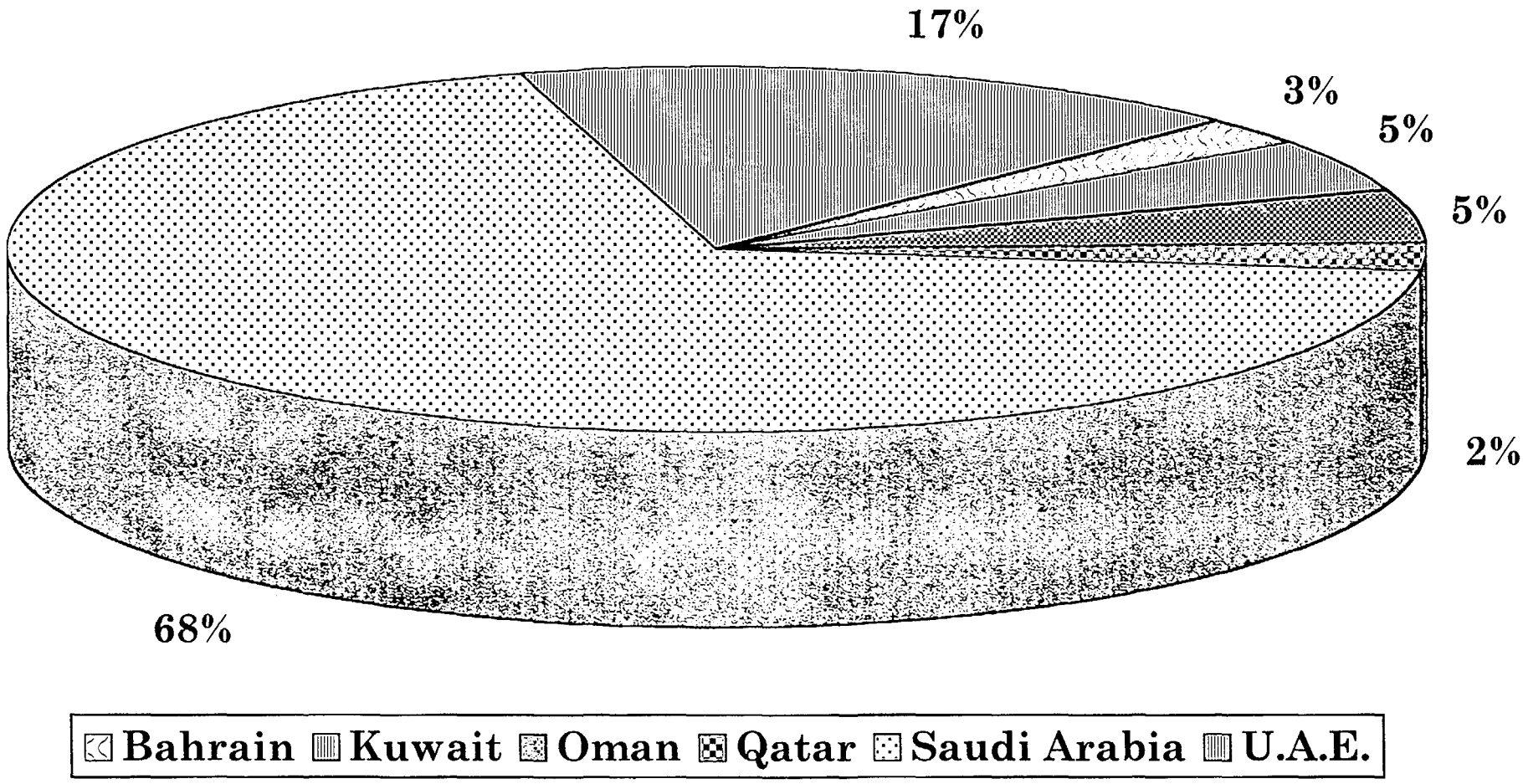
Machine Tool Analysis - by Metal Joining
(Import Spend (US$) by all GCC Countries : Source UN Statistics Database



Machine Tool Analysis - by Woodworking (Import Spend (US$) by all GCC Countries : Source UN Statistics Database



Machine Tool Analysis - by Mineral Working (Import Spend (US$) by all GCC Countries : Source UN Statistics Database



SECTION	BOOK TITLE	AUTHOR	PUBLISHER
REFERENCE	1994 STATISTICS		
BROCHURES	A GUIDE TO INDUSTRIAL INVESTMENT	SCH	SCH
INVESTMENT OPPORTUNITIES& INDUSTRIAL DATA	A GUIDE TO INVESTMENT OPPORTUNITIES	RESEARCH DEPARTMENT	CHAMBER OF COMMERCE & INDUSTRY, RIYADH-KINGDOM OF SAUDI ARABIA
REFERENCE	A TRIBUTE TO OMAN		APEX PUBLISHING
SAUDI C.C.I. MEMBERS' BROCHURES	A'ALAM SAUDI FURNITURE FACTORY		
BROCHURES	A.H. AL-ZAMIL GROUP OF COMPANIES	A.H. AL-ZAMIL GROUP OF COMPANIES	A.H. AL-ZAMIL GROUP OF COMPANIES
SAUDI C.C.I. MEMBERS' BROCHURES	ABDUL KADIR AL MUHAIDIB & SONS		
SAUDI C.C.I. MEMBERS' BROCHURES	AL MUSAIRIEY METALLIC INDUSTRIES CO.		
REFERENCE	AL TA'AWON AL SINA'E - INDUSTRIAL COOPERATION IN THE ARABIAN GULF (JANUARY 1995)	GOIC	GOIC
REFERENCE	AL TA'AWON AL SINA'E - INDUSTRIAL COOPERATION IN THE ARABIAN GULF (JULY 1995)	GOIC	GOIC
OFFSET & KACST BROCHURES	AL YAMAMAH OFFSET		
SAUDI C.C.I. MEMBERS' BROCHURES	AL YAMAMAH STEEL INDUSTRIES COMPANY LTD		
BROCHURES	AL-BILAD TRADING & INDUSTRIES F.Z.E. (BIT)	AL-BILAD TRADING & INDUSTRIES F.Z.E. (BIT)	AL-BILAD TRADING & INDUSTRIES F.Z.E. (BIT)
REFERENCE	AL-MERSA NEWLETTER	ARAB SHIPBUILDING AND REPAIR YARD CO.	ARAB SHIPBUILDING AND REPAIR YARD CO.
SAUDI C.C.I. MEMBERS' BROCHURES	AL-OWAIDAH INDUSTRIAL COMPANY		
SAUDI C.C.I. MEMBERS' BROCHURES	AL-RAJHI STEEL INDUSTRIES		

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
BROCHURES	AL-SANAI'YAH - INDUSTRIAL BULLETIN	SCH	SCH
SAUDI C.C.I. MEMBERS' BROCHURES	AL-SULTAN SOCKS FACTORY		
BROCHURES	ALAM STEEL	ALAM STEEL	ALAM STEEL
SAUDI C.C.I. MEMBERS' BROCHURES	ALBAZ CONTEMPORY FURNITURE		
BROCHURES	ALFA FASTENING SYSTEM		
SAUDI C.C.I. MEMBERS' BROCHURES	ALHAMRANI GROUP OF COMPANIES		
SAUDI C.C.I. MEMBERS' BROCHURES	AMAJED FACTORY FOR REFRIDGERATORS AND AIR DUCT		
REFERENCE	ANNUAL BULLETIN OF FOREIGN TRADE STATISTICS 1994	CENTRAL STATISTICS OFFICE	MINSTRY OF PLANNING
REFERENCE	ANNUAL COURSES CATALOG 1995/1996	CENTER FOR COMMUNITY SERVICE AND CONTINUING	KUWAIT UNIVERSITY
REFERENCE	ANNUAL ECONOMIC REPORT 1992	GENERAL PLANNING DEPARTMENT	MINISTRY OF PLANNING, U.A.E.
REFERENCE	ANNUAL ECONOMIC REPORT 1993	GENERAL PLANNING DEPARTMENT	MINISTRY OF PLANNING, U.A.E.
REFERENCE	ANNUAL ECONOMIC REPORT 1994	GENERAL PLANNING DEPARTMENT	MINISTRY OF PLANNING, U.A.E.
REFERENCE	ANNUAL REPORT (1992)	RESEARCH & STATISTICS DEPARTMENT	SAUDI ARABIAN MONETARY AGENCY
REFERENCE	ANNUAL STATISTICAL ABSTRACT 1993	CENTRAL STATISTICAL DEPARTMENT	MINISTRY OF PLANNING, U.A.E.
REFERENCE	ANNUAL STATISTICAL ABSTRACT 1994	CENTRAL STATISTICAL OFFICE	MINISTRY OF PLANNING
REFERENCE	ANNUAL STATISTICAL ABSTRACT 1995	CENTRAL STAISTICAL ORGANISATION	PRESIDENCY OF THE COUNCIL OF MINISTERS

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
PERIODICAL	ARAB NEWS (SAUDI ARABIA)		
REFERENCE	ARAB SHIPBUILDING AND REPAIR YARD CO. - ANNUAL REVIEW 1994	ARAB SHIPBUILDING AND REPAIR YARD CO.	ARAB SHIPBUILDING AND REPAIR YARD CO.
BROCHURES	ARAB SHIPBUILDING AND REPAIR YARD CO. - BROCHURE	ARAB SHIPBUILDING AND REPAIR YARD CO.	ARAB SHIPBUILDING AND REPAIR YARD CO.
PERIODICAL	ARAB TIMES (KUWAIT)		
REFERENCE	BAHRAIN ALUMINIUM EXTRUSION CO. B.S.C.C. - ANNUAL REPORT 1993	BALEXCO	BALEXCO
REFERENCE	BAHRAIN ALUMINIUM EXTRUSION CO. B.S.C.C. - ANNUAL REPORT 1994	BAHRAIN ALUMINIUM EXTRUSION CO. B.S.C.C.	BAHRAIN ALUMINIUM EXTRUSION CO. B.S.C.C.
REFERENCE	BAHRAIN CHAMBER OF COMMERCE & INDUSTRY DIRECTORY 1995-1996	BAHRAIN CHAMBER OF COMMERCE & INDUSTRY	BAHRAIN CHAMBER OF COMMERCE & INDUSTRY
REFERENCE	BAHRAIN DEVELOPMENT BANK - ANNUAL REPORT 1992	BAHRAIN DEVELOPMENT BANK	BAHRAIN DEVELOPMENT BANK
REFERENCE	BAHRAIN DEVELOPMENT BANK - ANNUAL REPORT 1993	BAHRAIN DEVELOPMENT BANK	BAHRAIN DEVELOPMENT BANK
REFERENCE	BAHRAIN DEVELOPMENT BANK - ANNUAL REPORT 1994	BAHRAIN DEVELOPMENT BANK	BAHRAIN DEVELOPMENT BANK
COUNTRY	BAHRAIN IN FIGURES 1994	CENTRAL STATISTICS ORGANISATION	DIRECTORATE OF STATISTICS
REFERENCE	BAHRAIN TRAINING INSTITUTE - I.T. TRAINING DIRECTORY	BAHRAIN TRAINING INSTITUTE	MINISTRY OF LABOUR & SOCIAL AFFAIRS
BROCHURES	BALEXCO	BALEXCO	BALEXCO
REFERENCE	BTEC FIRST DIPLOMA IN ENGINEERING	BAHRAIN TRAINING INSTITUTE	MINISTRY OF LABOUR & SOCIAL AFFAIRS
REFERENCE	BTEC NATIONAL DIPLOMA - ELECTRICAL AND ELCTRONIC TECHNOLOGY	BAHRAIN TRAINING INSTITUTE	MINISTRY OF LABOUR & SOCIAL AFFAIRS
REFERENCE	BTEC NATIONAL DIPLOMA - MECHANICAL & PLANT ENGINEERING	BAHRAIN TRAINING INSTITUTE	MINISTRY OF LABOUR & SOCIAL AFFAIRS

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
REFERENCE	BUSINESS DUBAI	DUBAI CHAMBER OF COMMERCE AND INDUSTRY	DUBAI CHAMBER OF COMMERCE AND INDUSTRY
REFERENCE	BUSINESS SUPERVISORY MANAGEMENT TRAINING - DIRECTORY OF COURSES AND SERVICES	BAHRAIN TRAINING INSTITUTE	MINISTRY OF LABOUR & SOCIAL AFFAIRS
REFERENCE	BUSINESS TELEPHONE DIRECTORY 1994	MINISTRY OF COMMUNICATIONS	MINISTRY OF COMMUNICATIONS
BROCHURES	COLLEGE OF TECHNOLOGICAL STUDIES	CTS	CTS
REFERENCE	COMMERCIAL & INDUSTRIAL DIRECTORY OF QATAR 1995	QATAR CHAMBER OF COMMERCE	QATAR CHAMBER OF COMMERCE
REFERENCE	COMMERCIAL DIRECTORY 1995	ABU DHABI CHAMBER OF COMMERCE AND INDUSTRY	ABU DHABI CHAMBER OF COMMERCE AND INDUSTRY
REFERENCE	COUNCIL OF MINISTERS' DECISION No. 694 - THE OFFICIAL DOCUMENTS ESTABLISHING THE COUNTER-TRADE OFFSET PROGRAM OF THE STATE OF	COUNTER TRADE OFFSET PROGRAM EXECUTIVE OFFICE	MINISTRY OF FINANCE
BROCHURES	DECOFORM - CUPS AND CONTAINERS	INTERPLAST CO LTD	INTERPLAST CO LTD
REFERENCE	DESK TOP VIDEO CONFERENCING - PRODUCT & RESELLER PROFILE	MENTEC LTD	MENTEC LTD
REFERENCE	DESK TOP VIDEO CONFERENCING - PRODUCT GUIDE	MENTEC LTD	MENTEC LTD
REFERENCE	DESTRUCTION AND RECONSTRUCTION	PUBLIC AUTHORITY FOR APPLIED EDUCATION &	PAAET
REFERENCE	DEVELOPMENT OF SMALL AND MEDIUM SIZED INDUSTRIES IN BAHRAIN - PROGRESS REPORT	DIRECTORATE OF INDUSTRIAL DEVELOPMENT	MINISTRY OF OIL AND GAS
BROCHURES	DISCOVER THE MYSTIQUE OF MUSANDAM	DIRECTORATE GENERAL OF TOURISM	MINISTRY OF COMMERCE AND INDUSTRY
REFERENCE	DR & MC DEPT - MIDREX SALUTES QASCO DIRECT REDUCTION PLANT		
REFERENCE	DUBAI - GATEWAY TO THE GULF		MOTIVATE PUBLISHING
BROCHURE	DUBAI ALUMINIUM COMPANY LTD - THE UNIQUE SMELTER	DUBAL	DUBAL

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
COUNTRY	DUBAI FACTS & FIGURES	DUBAI CHAMBER OF COMMERCE AND INDUSTRY	DUBAI CHAMBER OF COMMERCE AND INDUSTRY
COUNTRY	DUBAI IN FIGURES 1995	DUBAI COMMERCE & TOURISM PROMOTION BOARD	DUBAI COMMERCE & TOURISM PROMOTION BOARD
BROCHURES	DUBAI MEANS TRANSPORT AND DISTRIBUTION	DUBAI COMMERCE AND TOURISM PROMOTION BOARD	DUBAI COMMERCE AND TOURISM PROMOTION BOARD
BROCHURES	DUBAI: THE GREAT INCENTIVE	DUBAI COMMERCE AND TOURISM PROMOTION BOARD	DUBAI COMMERCE AND TOURISM PROMOTION BOARD
REFERENCE	EDUCATION AND VOCATIONAL TRAINING SYSTEMS IN BAHRAIN - WHAT CAN JAPAN DO?	DIRECTORATE OF INDUSTRIAL DEVELOPMENT	MINISTRY OF OIL AND INDUSTRY, BAHRAIN
REFERENCE	EMIRATE OF ABU DHABI GENERAL INDUSTRY CORPORATION	GENERAL INDUSTRY CORPORATION	GENERAL INDUSTRY CORPORATION
REFERENCE	EXCLUSIVE HOTELS OF THE WORLD DIRECTORY 1995	FORTE HOTELS	FORTE HOTELS
REFERENCE	FOREIGN TRADE STATISTICS 1992	CENTRAL STATISTICAL DEPARTMENT	MINISTRY OF PLANNING, U.A.E.
REFERENCE	FOREIGN TRADE STATISTICS FOR 1993	DIRECTORATE OF STATISTICS	CENTRAL STATISTICS ORGANISATION
DIRECTORY	FUJAIRAH COMMERCIAL DIRECTORY	FUJAIRAH CHAMBER OF COMMERCE, INDUSTRY AND	UAE
REFERENCE	FUJAIRAH, U.A.E.	FUJAIRAH FREE ZONE AUTHORITY	FUJAIRAH FREE ZONE AUTHORITY
SAUDI C.C.I. MEMBERS' BROCHURES	GALVANCO - NATIONAL COMPANY FOR GALVANIZING AND STEEL POLES LTD		
REFERENCE	GCC BUSINESS & FINANCE GUIDE 1993	GULF INVESTMENT CORPORATION & GULF	GULF INVESTMENT CORPORATION & GULF INTERNATIONAL BANK B.S.C.
BROCHURES	GDS	GDS	GDS
BROCHURES	GENERAL INDUSTRY CORPORATION	GENERAL INDUSTRY CORPORATION	GENERAL INDUSTRY CORPORATION
REFERENCE	GENERAL OUTLINE OF THE FIRST FIVE YEAR PLAN FOR ECONOMIC AND SOCIAL DEVELOPMENT 1981-1985	GENERAL PLANNING DEPARTMENT	MINISTRY OF PLANNING, U.A.E.

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
STATISTICS	GLANCE ON INDUSTRY IN OMAN TIL JUNE 1995 - FACTS AND FIGURES	INDUSTRIAL STATISTICS CENTRE	MINISTRY OF COMMERCE & INDUSTRY
BROCHURES	GMMOS	GULF MARINE MAINTENANCE & OFFSHORE SERVICE	GMMOS
REFERENCE	GOIC INVESTMENT PROFILES FOR QATAR	GOIC	GOIC
PERIODICAL	GOIC MONTHLY BULLETIN	GOIC	GOIC
BROCHURES	GOIC PUBLICATIONS	GULF ORGANISATION FOR INDUSTRIAL CONSULTING	GOIC
GOTEVT BROCHURES	GOTEVTSTATISTICAL REPORT FOR THE YEAR 1993/94	PUBLIC RELATIONS DEPARTMENT	GOTEVT
REFERENCE	GUIDE DE L'INVESTMENT INDUSTRIEL	BUREAU SAOUDIENNE D'ETUDES ET DE CONSEILS 1985	SCH
REFERENCE	GUIDE TO INDUSTRIAL ESTABLISHMENTS APPROVED FOR FINANCING BY IBK DURING 1974-1994	THE INDUSTRIAL BANK OF KUWAIT K.S.C.	THE INDUSTRIAL BANK OF KUWAIT K.S.C.
INVESTMENT OPPORTUNITIES& INDUSTRIAL DATA	GUIDE TO INDUSTRIAL LOANS	SAUDI INDUSTRIAL DEVELOPMENT FUNDS	MINISTRY OF FINANCE & NATIONAL ECONOMY
FINANCE DATA	GUIDE TO SAUDI ARABIAN MANUFACTURED PRODUCTS	SAUDI INDUSTRIAL DEVELOPMENT FUND	MINISTRY OF FINANCE & NATIONAL ECONOMY
FINANCE DATA	GUIDE TO THE LICENSING OF FOREIGN INVESTMENT IN THE KINGDOM OF SAUDI ARABIA	FOREIGN CAPITAL INVESTMENT BUREAU, RIYADH	MINISTRY OF INDUSTRY AND ELECTRICITY
BROCHURES	GULF METAL CRAFT	GMC	GMC
REFERENCE	GULF STATISTICAL PROFILE	GULF ORGANISATION FOR INDUSTRIAL CONSULTING	GOIC
REFERENCE	IMPORTS AND EXPORTS CLASSIFIED ACCORDING TO MAJOR ORIGIN AND DESTINATION COUNTRIES DURING THE YEAR OF 1991		
GOTEVT BROCHURES	IMPROVED OZONE RESISTANCE OF STYRENE-BUTADIENE RUBBER CURED BY A COMBINATION OF SULFUR AND IONIZING RADIATION	A.A.BASFAR & J.SIVERMAN	ELSEVIER SCIENCE LTD
BROCHURES	IN THE WORLD OF PLASTICS... COSMOPLAST	COSMOPLAST	COSMOPLAST

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
REFERENCE	INDUSTRIAL DEVELOPMENT IN QATAR	DEPT. OF INDUSTRIAL DEVELOPMENT	MINISTRY OF ENERGY AND INDUSTRY
REFERENCE	INDUSTRIAL DEVELOPMENT IN QATAR 1995	DEPARTMENT OF INDUSTRIAL DEVELOPMENT	MINISTRY OF ENERGY AND INDUSTRY
REFERENCE	INDUSTRIAL DIRECTORY 1992	INDUSTRIAL DEPARTMENT	MINISTRY OF FINANCE AND INDUSTRY
SAUDI C.C.I. MEMBERS' BROCHURES	INDUSTRIAL DIRECTORY OF RIYADH	RIYADH CHAMBER OF COMMERCE AND INDUSTRY (C.C.I.)	GCC - GOTEVT BROCHURES
REFERENCE	INDUSTRIAL OPPORTUNITIES IN SAUDI ARABIA	MINISTRY OF INDUSTRY AND ELECTRICITY & SAUDI	MINISTRY OF INDUSTRY AND ELECTRICITY & SAUDI CONSULTANCY
REFERENCE	INDUSTRIAL STATISTICS BULLETIN	INDUSTRIAL STATISTICS DEPARTMENT	MINISTRY OF INDUSTRY AND ELECTRICITY
REFERENCE	INDUSTRIAL SURVEY RESULTS	DIRECTORATE OF STATISTICS	CENTRAL STATISTICS ORGANISATION
REFERENCE	INDUSTRY AND ELECTRICITY - PROGRESS AND ACHIEVEMENTS 1994-95		
BROCHURES	INTERPLAST CO LTD BROCHURES	INTERPLAST CO LTD	INTERPLAST CO LTD
FINANCE DATA	INVESTING IN SAUDI ARABIAN INDUSTRY	SAUDI CONSULTING HOUSE	SAUDI CONSULTING HOUSE
BROCHURES	INVESTMENT HORIZON IN OMAN CONFERENCE	MUSCAT SECURITIES MARKET	MUSCAT SECURITIES MARKET
REFERENCE	INVESTORS' GUIDE TO BAHRAIN	UNIDO & THE GOVERNMENT OF THE STATE OF BAHRAIN	UNIDO
BROCHURES	JEBEL ALI FREE TRADE ZONE AUTHORITY	JEBEL ALI FREE TRADE ZONE AUTHORITY	JEBEL ALI FREE TRADE ZONE AUTHORITY
OFFSET & KACST BROCHURES	KING ABDULAZIZ CITY FOR SCIENCE & TECHNOLOGY - A BROCHURE		
SAUDI C.C.I. MEMBERS' BROCHURES	KING FAHD UNIVERSITY OF PETROLEUM & MINERALS - RESEARCH INSTITUTE		
REFERENCE	KINGDOM OF SAUDI ARABIA - MINISTRY OF INDUSTRY AND ELECTRICITY	MINISTRY OF INDUSTRY AND ELECTRICITY	MINISTRY OF INDUSTRY AND ELECTRICITY

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
REFERENCE	KUWAIT		SHERATON KUWAIT
BROCHURES	KUWAIT CHAMBER OF COMMERCE AND INDUSTRY	KUWAIT CHAMBER OF COMMERCE AND INDUSTRY	KUWAIT CHAMBER OF COMMERCE AND INDUSTRY
REFERENCE	KUWAIT INCOME TAX DECREE NO. 3 FOR 1995	MINISTRY OF FINANCE & OIL	
REFERENCE	KUWAIT INDUSTRIAL GUIDE 1994-95		
BROCHURES	KUWAITI ENGINEER' OFFICE	KEO	KEO
SAUDI C.C.I. MEMBERS' BROCHURES	L'AZURDE		
FINANCE DATA	LAW FOR THE PROTECTION AND ENCOURAGEMENT OF NATIONAL INDUSTRIES	INDUSTRIAL AFFAIRS AGENCY	MINISTRY OF INDUSTRY AND ELECTRICITY
REFERENCE	LIST OF ESTABLISHMENTS REGISTERED AND LICENSED (UP TO END 1991)	MINISTRY OF INDUSTRY AND PUBLIC WORKS	MINISTRY OF INDUSTRY AND PUBLIC WORKS
SIDF & COC BROCHURES	LIST OF FIRMS ACCORDING TO ACTIVITY FROM 01/01/1995 TO 03/10/1995 - INDUSTRIAL MACHINES & EQUIPMENTS W&R	RIYADH CHAMBER OF COMMERCE & INDUSTRY	RIYADH CHAMBER OF COMMERCE & INDUSTRY
BROCHURES	LIST OF INVESTMENT OPPORTUNITIES	SCH	SCH
SAUDI C.C.I. MEMBERS' BROCHURES	MADDRA FACTORY		
BROCHURES	MANNAI CORPORATION	MANNAI CORPORATION	MANNAI CORPORATION
BROCHURES	MANWEIR LTD - OILFIELD, MARINE & INDUSTRIAL ENGINEERING SERVICES	MANWEIR LTD	MANWEIR LTD
REFERENCE	MIDDLE EAST AND NORTH AFRICA MARKET ATLAS	THE ECONOMIST INTELLIGENCE UNIT	THE ECONOMIST INTELLIGENCE UNIT
SAUDI C.C.I. MEMBERS' BROCHURES	MIDDLE EAST CICUIT BREAKER CO.		
REFERENCE	MILESTONES - CELEBRATING OMAN'S COMING OF AGE		FIRST PUBLISHING

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
SAUDI C.C.I. MEMBERS' BROCHURES	MOLDS & SPARE PARTS FACTORY		
FINANCE DATA	MONEY AND BANKING STATISTICS	RESEARCH AND STATISTICS DEPARTMENT	SAUDI ARABIAN MONETARY AGENCY
BROCHURES	MUHARRAQ ENGINEERING CO.	MUHARRAQ ENGINEERING CO.	
BROCHURES	MUSCAT TOURIST GUIDE	DIRECTORATE GENERAL OF TOURISM	MINISTRY OF COMMERCE AND INDUSTRY
REFERENCE	NATIONAL ACCOUNTS FOR U.A.E. 1988-1993	PLANNING DEPARTMENT	MINISTRY OF PLANNING, U.A.E.
OFFSET & KACST BROCHURES	OFFSET NEWSLETTER - SABIC CHOOSES CYCLAR	BRITISH OFFSET OFFICE	BRITISH OFFSET OFFICE
REFERENCE	OMAN '95 - A CELEBRATION OF 25 GLORIOUS YEARS 1970-1995	MINISTRY OF INFORMATION	MINISTRY OF INFORMATION
FINANCE DATA	OMAN DEVELOPMENT BANK SAOG - ANNUAL REPORT 1994	OMAN DEVELOPMENT BANK SAOG	OMAN DEVELOPMENT BANK SAOG
REFERENCE	OMAN STATISTICAL YEARBOOK 1994	INFORMATION AND DOCUMENTATION CENTRE	THE SULTANATE OF OMAN
REFERENCE	OMAN TODAY - AUGUST/SEPTEMBER 1995		APEX PUBLISHING
BROCHURES	OMAN/MUSCAT RUSAYL INDUSTRIAL ESTATE DETAILS	MINISTRY OF COMMERCE & INDUSTRY	MINISTRY OF COMMERCE & INDUSTRY
REFERENCE	OPEN FOR BUSINESS - A GUIDE TO FOREIGN INVESTMENT IN INDUSTRY & TOURISM IN THE SULTANATE OF OMAN	MINISTRY OF COMMERCE AND INDUSTRY	MINISTRY OF COMMERCE AND INDUSTRY
REFERENCE	PAAET BROCHURES 1995	PAAET	PAAET
REFERENCE	PRESENTATION ON SMALL AND MEDIUM ENTERPRISE DEVELOPMENT CENTRE (SMEDC)	JAPANESE ACTION TEAM	INDUSTRIAL DEVELOPMENT DIRECTORATE
REFERENCE	PRESENTATION TO H.E. MINISTER OF OIL AND INDUSTRY ON THE ESTABLISHMENT OF SMALL AND MEDIUM ENTERPRISE DEVELOPMENT	JAPANESE ACTION TEAM	MINISTRY OF OIL & INDUSTRY
BROCHURES	PROFILES AND OUTLINES OF PROJECTS WHICH REPRESENT REASONABLE INVESTMENT OPPORTUNITIES WITHIN THE GIC	GENERAL INDUSTRY CORPORATION	GENERAL INDUSTRY CORPORATION

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
REFERENCE	QATAR GENERAL PETROLEUM CORPORATION - ACHIEVEMENTS & PROJECTS 1988-1994	QGPC	QGPC
COUNTRY	QATAR IN FIGURES	CENTRAL STATISTICAL ORGANISATION	PRESIDENCY OF THE COUNCIL OF MINISTERS
REFERENCE	QATAR INDUSTRIAL MANUFACTURING CO. (S.A.Q.) - ANNUAL REPORT 1994	QATAR INDUSTRIAL MANUFACTURING CO. (S.A.Q.)	QATAR INDUSTRIAL MANUFACTURING CO. (S.A.Q.)
BROCHURES	QATAR STEEL COMPANY LTD	QATAR STEEL COMPANY LTD	QATAR STEEL COMPANY LTD
GOTEVT BROCHURES	RADIATION PROCESSING OF POLYMERS - INNOVATIVE TECHNOLOGY	Dr AHMED ALI BASFAR-ATOMIC ENERGY RESEARCH	KING ABDULAZIZ CITY FOR SCIENCE AND TECHNOLOGY
BROCHURES	RASHED ABDUL RAHMAN AL-RASHED & SONS	RASHED ABDUL RAHMAN AL-RASHED & SONS	RASHED ABDUL RAHMAN AL-RASHED & SONS
SAUDI C.C.I. MEMBERS' BROCHURES	RIYADH C.C.I. BROCHURE	RIYADH CHAMBER OF COMMERCE AND INDUSTRY (C.C.I.)	RIYADH CHAMBER OF COMMERCE AND INDUSTRY (C.C.I.)
SIDF & COC BROCHURES	RIYADH CHAMBER OF COMMERCE & INDUSTRY	RIYADH CHAMBER OF COMMERCE & INDUSTRY	RIYADH CHAMBER OF COMMERCE & INDUSTRY
BROCHURES	RUSAYL INDUSTRIAL ESTATE GUIDE	RUSAYL INDUSTRIAL ESTATE AUTHORITY	MINISTRY OF COMMERCE AND INDUSTRY
SAUDI C.C.I. MEMBERS' BROCHURES	SALUMCO - THE SAUDI ALUMINIUM INDUSTRIES COMPANY		
FINANCE DATA	SAUDI ARABIA - THE FISCAL BUDGET 1994	THE SAUDI BRITISH BANK	THE SAUDI BRITISH BANK
FINANCE DATA	SAUDI BUSINESSMEN DELEGATION TO REPUBLIC OF SOUTH AFRICA		COUNCIL OF SAUDI CHAMBERS OF COMMERCE AND INDUSTRY
SAUDI C.C.I. MEMBERS' BROCHURES	SAUDI CERAMICS		
BROCHURES	SAUDI CONSULTING HOUSE	SCH	SCH
SAUDI C.C.I. MEMBERS' BROCHURES	SAUDI CRAWFORD DOORS FACTORY LTD		
SAUDI C.C.I. MEMBERS' BROCHURES	SAUDI GOLD		

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
FINANCE DATA	SAUDI INDUSTRIAL DEVELOPMENT FUND - GUIDE TO INDUSTRIAL LOANS		MINISTRY OF FINANCE & NATIONAL ECONOMY
SAUDI C.C.I. MEMBERS' BROCHURES	SAUDI PREINSULATED PIPES INDUSTRIES		
GOTEVT BROCHURES	SECONDARY AGRICULTURAL EDUCATION	PUBLIC RELATIONS DEPARTMENT	GOTEVT
GOTEVT BROCHURES	SECONDARY COMMERCIAL EDUCATION	PUBLIC RELATIONS DEPARTMENT	GOTEVT
GOTEVT BROCHURES	SECONDARY INDUSTRIAL EDUCATION	PUBLIC RELATIONS DEPARTMENT	GOTEVT
REFERENCE	SERVICES AND ACTIVITIES DIRECTORY	QATAR CHAMBER OF COMMERCE AND INDUSTRY	QATAR CHAMBER OF COMMERCE AND INDUSTRY
BROCHURES	SERVICES PROVIDED TO INDUSTRY BY SCH	SCH	SCH
SAUDI C.C.I. MEMBERS' BROCHURES	SFFECO CARBON DIOXIDE MOBILE FIRE EXTINGUISHERS		
REFERENCE	SHARJAH FOREIGN TRADE 1995	GOVERNMENT OF SHARJAH FOREIGN TRADE	GOVERNMENT OF SHARJAH FOREIGN TRADE
BROCHURES	SHAW-NASS MIDDLE EAST - PREFABRICATED PIPING SYSTEMS FOR THE GULF REGION.	SHAW-NASS	SHAW-NASS
SAUDI C.C.I. MEMBERS' BROCHURES	SHEET METAL FORMATION FACTORY		
REFERENCE	SOME ASPECTS OF JOINT VENTURES AND EC-GCC JOINT VENTURES IN THE GCC MANUFACTURING SECTOR - PRESENTATION NOTES	GOIC	GOIC
FINANCE DATA	SPECIAL REPORT - THE PRIVATE SECTOR OF SAUDI ARABIA	CAROLINE MONTAGU	COMMITTEE FOR MIDDLE EAST TRADE
REFERENCE	STATE OF KUWAIT GUIDELINES FOR THE COUNTER-TRADE OFFSET PROGRAM	COUNTER TRADE OFFSET PROGRAM EXECUTIVE OFFICE	MINISTRY OF FINANCE
REFERENCE	STATISTICAL ABSTRACT 1993	DIRECTORATE OF OF STATISTICS	CENTRAL STATISTICS ORGANISATION
REFERENCE	STATISTICS 1994		

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
BROCHURES	SULTANATE OF OMAN	DIRECTORATE GENERAL OF TOURISM	MINISTRY OF COMMERCE AND INDUSTRY
DIRECTORY	SULTANATE OF OMAN BUSINESS DIRECTORY		APEX PUBLISHING
SAUDI C.C.I. MEMBERS' BROCHURES	TABUK CEMENT CO.		
GOTEVT BROCHURES	TECHNICAL EDUCATION & VOCATIONAL TRAINING - THE PAST AND THE PRESENT (1994)	PUBLIC RELATIONS DEPARTMENT	GOTEVT
GOTEVT BROCHURES	TECHNICAL ELECTRONICS INSTITUTE IN RIYADH	PUBLIC RELATIONS DEPARTMENT	GENERAL ORGANIZATION FOR TECHNICAL EDUCATION AND VOCATONAL TRAINING
REFERENCE	TECHNOLOGY & INDUSTRY		
BROCHURES	THE 3RD MUSCAT INTERNATIONAL FAIR 1995 - A CELEBRATION OF 25 YEARS OF COMMERCE AND INDUSTRY	OMAN CHAMBER OF COMMERCE	MINISTRY OF COMMERCE AND INDUSTRY
REFERENCE	THE FOREIGN CAPITAL INVESTMENT LAW	MINISTRY OF COMMERCE AND INDUSTRY	MINISTRY OF COMMERCE AND INDUSTRY
REFERENCE	THE GULF DIRECTORY 1994-95		TELE-GULF DIRECTORY PUBLICATIONS WLL
REFERENCE	THE INDUSTRIAL BANK OF KUWAIT K.S.C. - ANNUAL REPORT 1994	THE INDUSTRIAL BANK OF KUWAIT K.S.C.	THE INDUSTRIAL BANK OF KUWAIT K.S.C.
REFERENCE	THE PUBLIC AUTHORITY FOR APPLIED EDUCATION & TRAINING - KUWAIT 1994/95	PAAET	PAAET
SIDF & COC BROCHURES	THE SAUDI INDUSTRIAL DEVELOPMENT FUND - ANNUAL REPORT 1994	SAUDI INDUSTRIAL DEVELOPMENT FUND	MINISTRY OF FINANCE AND NATIONAL ECONOMY
BROCHURES	TOWARDS COMMON INTEREST AND MUTUAL CO-OPERATION - 3RD GCC-EU INDUSTRIAL CONFERENCE	MINISTRY OF COMMERCE & INDUSTRY	MINISTRY OF COMMERCE & INDUSTRY
PERIODICAL	TRADE & INDUSTRY		RESEARCH & STUDIES DEPT. OF THE CHAMBER OF COMMERCE & INDUSTRY
REFERENCE	TRADE EXCHANGE 1994	CENTRAL STATISTICAL ORGANIZATION	PRESIDENCY OF THE COUNCIL OF MINISTERS
STATISTICS	UAE SHARJAH STAT PACK		

SECTION	BOOK TITLE	AUTHOR	PUBLISHER
REFERENCE	UNDERGRADUATE BULLETIN 1995-1997	COLLEGE OF ENGINEERING AND PETROLEUM	KUWAIT UNIVERSITY
BROCHURES	UNITED ENTERPRISES - GROUP OF COMPANIES	UNITED ENTERPRISES	UNITED ENTERPRISES
STATISTICS	VISION FOR OMAN'S ECONOMY - TOWARDS A BETTER ECONOMIC FUTURE	MINISTRY OF DEVELOPMENT	MINISTRY OF DEVELOPMENT
REFERENCE	WHO IS IN THE JEBEL ALI FREE ZONE	JEBEL ALI FREE ZONE AUTHORITY	JEBEL ALI FREE ZONE AUTHORITY
STATISTICS	YEARLY INDUSTRIAL STATISTICAL BOOK 1993		
BROCHURES	YUSEF BIN AHMED KANOO	YUSEF BIN AHMED KANOO	YUSEF BIN AHMED KANOO

WORLD MACHINE TOOL INDUSTRY RESEARCH SYNOPSIS

A market analysis of the World Machine Tool Industry is being carried out in order to establish trends in demand by geographical user groups and technology developments in the industry.

Ultimately the data will be used to formulate conceptual plans for the establishment of machine tool manufacturing plants in GCC countries.

The research will be broadly based and will include machine tools in the following categories:-

1. Metal Cutting
2. Metal Forming
3. Metal Jointing
4. Woodworking
5. Mineral Working

Initially, however, analysis has focused on machine tools in the metal working industries i.e. categories 1 to 3.

Each category will be sub divided into specific machine types i.e. milling machines lathes, shaping/broaching machines and grinding machines. To facilitate comparative analysis each machine will be classified with regard to make, size, power, type of control and price.

Analysis of The Machine Tool Sector will establish:

- World wide sales by classification weight and value (US$ dollars).
- Country profile by demand.
- Technology development - current status.
- Technology development - trends.

Data Source

A listing of international organisations machine tool institutes and associations and machine tool manufacturers that can provide statistical data in being compiled.

Agencies and Institutes

Data from the following organisations is currently being collated.

- United Nations International trade statistics data base.
- OECD
- AMTRI
- Fraunhaufer Institute
- Cranfield Institute of Technology

- VDMA (Association of Machine Tool Manufactures, Germany)

Machine Tool Companies

Machine tool companies that have R & D Divisions providing data include:-

-	Cincinati Milacron	USA
-	Komatsu MTD	Japan
-	Fanuc	Japan

Extracts and Papers - Technology Developments

Extracts and papers from trade journals and specialist reference centres concerning current and forecast machine tool technology developments are under review, some examples are given:-

General

- Engineering Index Inc. General Reference

- Amercian Machinist. General Reference

- Manufacturing Engineering. Technical papers as follows:-

  * Trends in machine tool developments.
  * Bases and Ways
  * Spindles and Motors
  * Tools and Holders
  * Controls
  * Machine Server
  * Machine Tools of the Future

SUBJECT SPECIFIC

TITLE	NAME	PUBLICATION
Turnkey solutions for mixed batches (machining centres)	Holland T.	Metalworking Production
Machining Centres - The True Cost of Quality	Sandford A	Metalworking Production
Digital Read Outs	Holland T.	Metalworking Production
Machine 'Add-Ons' Bring Benefits	Miller G	Machinery
Increased Productivity Turns Heads at EMO.	Allock A	Machinery
Low Cost Breakthrough in Single Spindle Turning.	Powley C	Machinery
High Speed Machining Goes Mainstream	Ashley S	Mechanical Engineering
Machining with Superfast Spindles.	O'Connor L	Mechanical Engineering
Milling's Speed Limited	Noaker P M	Manufacturing Engineering
With "Simultaneous Engineering" to a Flexible Machining Centre.	Bergmann K et al	European Production Engineering.
Tapping the Deep Hole	Carroll L	Cutting Tool Technology
Thread Rolling on CNC	McBride A	Cutting Tool Technology
Manufacturing System Helps BAE Reach for The Sky.	Miller G	Machinery and Production Engineering
Advanced Linear Motors and Advanced Profile Control		Metalworking Third Quarter 1995.

TITLE /Continued....	NAME	PUBLICATION
A Magnetic Bearing Spindle Doubling Allowable RPM	Sciki M	Metalworking
Emo Milano Steps up Europes Revitalisation.	Higuchi H et al	Metalworking
Lathes Powered by market Forces	Excell M	Metalworking Production
Tool Technology Keeps on Moving	Brookes K	Metalworking Production
Specify The Right Toolchanger	Koelsch J	Manufacturing Engineering
Toolmaking in the Fast Lane	Excell M	Metalworking Production
What Laser Units Want	Owen J	Manufacturing Engineering
Spindle Adaptor Promises Precise Concentricity	Manji J	Amercian Machinist
Quick Change Turns to Lathes	Castner M et al	Amercian Machinist
The Art of Turning Square Holes	Raymond M	Amercian Machinist
Turning Centre Alternatives Bring Vertical Versatility	Miller G	Machinery and Production Engineering
Machining Centres	Powley C	Machinery
Machine Tool Spindles	Aronson R B	Manufacturing Engineering
Barefeeding Advances	Poling D	Cutting Tool Engineering
Rotary Transfer Machines	Mason F	Manufacturing Engineering
Micromachine		Metalworking Engineering and Marketing

TITLE/Continued....	NAME	PUBLICATION
Chip Processing Gets New Life (Elimination of Manual Chip Handling).	Mason F	Manufacturing Engineering
EDM Conquers Copper	Sherman J	Cutting Tool Engineering
Optimal Automation (Die-Sinker EDM Operations)	Utterstrom A	Cutting Tool Engineering

Base Data for the Plastics Industry Synthetic

Market Research has been carried out into the structure of the Plastics Industry.

This research has been carried out by consultation with NEPPCO, the North of England Plastic Producers Consortium, a well recognised and credible Plastics Special Interest Group of manufacturers, including small, medium and large companies.

The results, detailed in the following document, attempt to describe a typical plastics manufacturer, which will be used as a model organisation from which assumptions can be made to arrive at the impact that the plastics industry of the GCC will have on tool and die manufacturing organisations and to understand whether there is an opportunity within the GCC for such an industry, which would be completely complementary to the Machine Tools plant project.

1.0 The Market for Moulded Plastics Products and Components

The market into which plastic products are sold can be roughly divided up into four segments as follows:-

- Group A : Low Technology Commodity Products Market
- Group B : Building & Construction Market
- Group C : Automobile Components Market
- Group D : Medical & Under Bonnet High Temperature Market

A typical product from Group A would be household products such as washing up bowls, bins, bottles, containers etc.

Typical products from Group B might be rawlplugs, joints etc.

The automobile component market (Group C) is essentially made up of panels and fittings, normally requiring high quality aesthetics, but not requiring the ability of the part to withstand a thermodynamic shock, (i.e. not under the bonnet applications in general).

Group D is a highly specialised market segment, requiring the parts to meet, precision standards and in many cases to withstand thermodynamic shock, chemical erosion and in medical applications, the product must deliver accurate amounts of fluids and gases. Products range from medical syringes to engine seals and high temperature housings.

The moulds required to produce products throughout the range of the segments as defined above are all precision tools, however the lifetime of the tools and the amount of repairs carried out upon the tool, vary dependant upon the segment within which the tool is used.

2.0 Costs of New Tooling and Costs of Repair

Tooling lifetimes are extremely difficult to predict accurately, however from our research the following table has been used as the basis from which assumption can be made re tooling and repair costs:-

Group Description	Estimated Tooling Lifetimes
Commodity Products	15-20 Years
Building & Construction Products	12-15 Years
Automotive Panels & Enclosures	7-10 Years
Medical & Hi Temp Auto Applications	3-6 Years

The model organisation that is to be used within this synthetic has the following profile:

- An annual sales turnover of £200 Million
- An annual cost of raw materials of £100 Million
- Sells to all Groups as previously defined above

The table below shows the key base data that has been collated for an organisation such as this :-

Description of Data Category	Value
Total Annual Cost of Tooling on £200 Million Sales Turnover	£4,000,000
Total Annual Expenditure on New Tooling	£1,750,000
Total Annual Expenditure on Tooling Repairs	£2,250,000
Cost of Mix/Tonne for Group A Products	£ 500/Tonne
Cost of Mix/Tonne for Group B Products	£ 600/Tonne
Cost of Mix/Tonne for Group C Products	£1000/Tonne
Cost of Mix/Tonne for Group D Products	£2000/Tonne

Tooling costs are expressed and calculated normally as a % of the budgeted production expected from the tool. When calculated Groups A and B are normally approximately 10%, whilst Group C is estimated at between 15%-20% and Group D can be as much as 25%.

3.0 Estimated size of Machine Shop to support the Organisation as Modelled Above

To support the new tooling requirements and tooling repair requirements for an organisation with a profile as defined above, it has been necessary to interview a number of organisations, whose membership operate directly within this sector.

Consequently, three organisations have been interviewed as follows:-

- The North of England Plastics Producers Consortium
- The British Plastics Federation
- The Gauge & Toolmakers Association

As a consequence of this exercise the following mould manufacturing organisational profile has been created.
The profile that follows is that required within a tool and die manufacturing organisation to support the new tool and die requirements and told and die repair requirements a moulded plastics producer as defined earlier within this document.

The organisation will have the following profile:-

- A workforce of approximately 80 employees
    - 36 Direct Labour
    - 18 Indirect Labour
    - 26 Staff & Management
- A range of Capital Plant
    - 5 DNC Machining Centres (Approx 0.25 Tonne Capacity)
    - 1 DNC Machining Centre (Approx 5 Tonne Capacity)
    - 10 Grinding Machines
    - 6 DNC Spark Erosion Machines
    - 8 DNC Wire Erosion Machines
- Operate on a 24 hour 3 shift basis - 7 days per week
- Operate a fully DNC CAD/CAM network system (7 Stations)

GCC Country Profiles Glossary

As reported within the First Interim Report, GCC Country Profiles exist for all countries of the GCC and for the GCC as an overall entity in its own right.

The profiles were taken to the Field Mission to assist the Study Team in the form of working files, containing useful data about the economic structure, business infrastructures and customs and practices existing within each country visited.

These information portfolios have been updated by data collected on the field mission and research carried out during the field mission by the research team at the UK home offices of NIS Invotec. As a consequence the profiles for each country and for the GCC as a whole will now form the basis for the data analysis exercise which is now in process in preparation for the creation of the Final Draft Report.

Whilst the data within each of the profiles is different the composition of the sources and categorisation of data is similar in nature, and a typical glossary of data sources found within each of the country profiles will include the following references:-

- UNIDO Country Programming Brief
- NIS Invotec Country Profile
- Industrial Development Review Information Base
    - Share in developing countries area, population and national accounts in current US$
    - Share in developing countries exports in current US$
    - Share in global area, population and national accounts in current US$
    - Share in global imports in current US$
    - Total debt in millions of current US$
    - Trade data in thousand of current US$
    - Trade data in millions of current US$
    - Employment by sector of economic activity
    - National accounts data in constant 1980 US Dollars
    - Yearly change in total GDP in current market prices and sector GDP in factor prices
    - Yearly and annual average growth in per-cent of selected variables.
- Country visit target listing
- Middle East Review country profile
- Economist Intelligence Unit country report
- DTI - Doing Business in Saudi Arabia
- Saudi British Bank - What does Saudi Arabia buy from the rest of the world?
- Price Waterhouse - Doing Business in Saudi Arabia
- Ernst & Young - Doing Business in Saudi Arabia
- Directory of British Companies resident in Saudi Arabia
- Barclays Bank Country Report
- A guide to Investment Opportunities

- Directory of Saudi Industries
- Industrial Directory
- A guide to Industrial Investment
- Industry & Electricity - "Progress & Achievements"
- The Private Sector of Saudi Arabia
- Guide to Saudi Arabian Manufactured Products
- Technical Education & Vocational Training "The past and the present"
- Saudi Arabian Monetary Agency Annual Report
- Al-Yammamah Economic Offset Programme
- Guide to Industrial Loans
- The Saudi Industrial Development Fund
- Annual Abstract of National Statistics
- Annual Abstract of Foreign Trade Statistics

SAUDI ARABIA

OFFICIAL TITLE:	Kingdom Of Saudi Arabia
HEAD OF STATE:	The Custodian of the Two Holy Mosques, King Fahd bin Abdul Aziz.
CURRENCY:	Riyal (SR) = 100 halalas.
EXCHANGE RATE:	3.75 SR per US$ (ABECOR Country Report - 14 July 1994).
CAPITAL CITY:	Riyadh.
TIME:	GMT +3hrs.

Main Cities:

Riyadh (population 1.8m in 1991), Jeddah (1.2m), Dammam, Dhahran, Al Khobar, Makkah, Medina, Hofuf, Taif, Jubail, Yanbu and Abha.

Entry Requirements

Entry requirements are subject to change periodically. Passports are needed and must extend at least 6 months beyond proposed stay. Certain seamen and pilgrims (with passes) do not need their passport. A visa is required except for bona fide passengers in transit through Jeddah airport. Visas are required for all visitors except GCC nationals. Visitor must have a letter of invitation from a Saudi sponsor, a visa number from the Ministry of Foreign Affairs and a No Objection Certificate. A certificate of religion is not required, but atheism and Judaism are not accepted as a statement of belief. Visitors with residence permits may need an exit visa. Passports should not be surrendered to a Saudi sponsor unless a valid reason is given. Entry is denied for anyone with evidence in their passport also all Israeli nationals are prohibited entry. People with evidence of inebriation may be liable to deportation or arrest.

The import of anything alcoholic and all pork based products are strictly prohibited, as are pornographic material, censored literature, dogs (except guide dogs, hunting dogs and seeing-eye dogs), drugs and other controlled substances. Prescription drugsshould be carried in their containers and in small amounts. The duty on goods starts at 12% and rises to 20% for goods usually manufactured in Saudi Arabia, Small quantities of samples do not have duty on them. Foreign nationals' wages and salaries are not taxed.

Health Precautions

Mandatory:- if travelling from infected areas, then certificates of vaccination for yellow fever and cholera are required.

Advisable:- vaccination for hepatitis, polio, typhoid and tetanus, also anti-malarial precautions are advised.

Social Customs

In public places women should wear long dresses, long sleeved shirts and high collars. Men should wear shirts and trousers. Normal forms of western address and greeting are normal, except when addressing members of the Saudi Royal Family. At business meetings it is not unusual for several people to be present. If coffee is offered it is courteous to accept it, cups are usually re-filled

automatically unless the cup is shaken from side to side when it is returned to the server. Photographs should not be taken without permission, also photographs of airports, military installations and certain other buildings are prohibited. Non-Muslims are not allowed to travel to the holy cities of Medina and Makkah.

Public Holidays

There are no official public holidays although activities generally cease on the Muslim feasts:-

Eid al Fitr	Usually in February (variable).
Eid al Adha	In April (variable).
The Hajj	The annual pilgrimage.
Al Hijra	

Political Systems

The Saudi political system is absolute monarchy with King Fahd as the prime minister, and the crown prince as the deputy prime minister. The executive power rests with the council of ministers. Local government is administered through municipal councils, district councils and tribal and village councils.. The King appointed 60 citizens to the Majlis al-Shura, a consultative body with no legislative powers. Also King Fahd has ruled that no minister may retain their post for more than four years. There has been calls for political change along the lines of Saudi Arabia's neighbouring GCC states. Shariah is the legal system with a more sophisticated legal system to cope with the complexities of the business world

Political Stance

Despite all the changes there is still political unrest and calls for a change in the monarchical system. Hard line religious groups call for a more theocratic state and are opposing modernisation. The other groups are calling for more modernisation and political freedoms. Both groups of viewpoint have been publicly and privately warned to desist in their activities. Saudi Arabia has been in dispute with Yemen and UAE over boundaries. Saudi Arabia has also mediated in other border disputes e.g. between Qatar and Bahrain.

Telecommunications

Telephone: IDD access code +966 followed by the area code (3 for Al-Khobar/Dhammam/Dhahran, 2 for Jeddah/Makkah/Taif and 1 for Riyadh), followed by subscriber's number. The system is based on satellite, cable and microwave.

Telex: Available at most good hotels and PTT offices.

Postal Service

There is no home delivery, delivery is to post office boxes. A system of five digit postal code and automatic mail sorting are being introduced, until this process is completed there will be a mixture of PO Box numbers and postal codes with town names. Air mail to Europe takes about five days, surface mail takes three to five months. SNAS-DHL courier service operates door to door

shipment of documents and small packages to Europe and locally (overnight to Europe). Delivery to USA takes 48 hours.

Electricity

127 or 240V AC supply at 60 cycles (Hertz), using a two pin European type plug. In industry 380V AC, 60 Hz supply is used.

Media

Press: Arab News, Riyadh Daily and Saudi Gazette are the English daily newspapers. The weekly ones are Al Yamama, Igraa and Saudi Economic Survey in English.

Radio: In English The Saudi Arabian Broadcasting stations at Jeddah, Riyadh and Dammam; and at Dhahran Aramco transmits in English.

Population

The population was 17.12 million in 1993 (mid year estimate - ABECOR country report July 1995).

Economy

The Saudi economy is the strongest in the Arabian Peninsula, Saudi Arabia has the second highest GNP per capita figure in the World. Saudi Arabia also has the largest oil reserves in the World, a quarter of all the world's oil reserves are in Saudi's borders. A strong growth in GDP is expected, but a fall in oil revenue has meant cuts and Delays in government spending.

Oil

Saudi Arabia has a quarter of all oil reserves and is the largest oil exporter. Oil refineries at Yanbu, Jabail and at Rabegh on the Red Sea coast has a capacity of 25000 b/d each. There are also gas deposits of 5200 bn m^3.

Ways Of Doing Business

Although there is no legal requirement for foreign companies to use an agent, the Saudi government only purchase goods by local tender, often foreign companies will only be considered through a local agent. As with most Arab states it is usual to employ an agent in order to make more than the occasional sales. It is unusual for consultants to win government work without operating through a Saudi joint venture. Also it is best to make regular visits as Saudis prefer to do business with a recognisable person from the company, rather than by sending a fax message or a letter.

Contacts In Saudi Arabia

British Embassy (Commercial Section)
PO BOX 94351
RIYADH 11693
TEL. 01488 0088
FAX 01488 2373

Council Of Saudi Chambers Of Commerce And Industry
PO BOX 16683
RIYADH 11474
TEL. 014053200
FAX 01 402 9781

Riyadh Chamber Of Commerce
PO BOX 596
RIYADH 11474
TEL. 01 404 0300/3373/0044
FAX 01 402 1103

Contacts In Britain

Royal Embassy Of Saudi Arabia
15 Curzon Street
London
W1Y 7FG
TEL. 0171 917 3000

Consular Section (For Visas)
Royal Embassy Of Saudi Arabia
30 Charles Street
London
W1X 7PM
TEL. 0171 917 3251
FAX 0171 917 3255

Commercial Section
Royal Embassy Of Saudi Arabia
30 Charles Street
London
W1X 7PM
TEL. 0171 917 3441/2
FAX 0171 917 3161

Arab British Chamber Of Commerce
6 Belgrave Square
London
SW1X 8PH

KUWAIT

OFFICIAL TITLE:	State of Kuwait
HEAD OF STATE:	Sheikh Jaber al-Ahmad
CURRENCY:	Dinar (KD) = 1000 fils
EXCHANGE RATE:	0.292 KD per US$ (1992 average, Economist Intelligence Unit).
CAPITAL CITY:	Kuwait City
TIME:	GMT +3hrs

Main Cities:

Kuwait City (est. population 800,000), Hawalli, Al Ahmadi, Al Jahrah, Al Farawaniya, Salmiya, Abraq, kheetan.

Entry Requirements:

Visa is required for all except GCC member nationals, sponsorship needed to obtain visa. Prohibited imports include:- alcoholic beverages, all items required for the production of alcoholic drinks, pornographic and/or politically subversive material, pork products in any form, goods of Israeli origin. Alcohol prohibition is strictly enforced.

Health Precaution

Mandatory:- international vaccination certificates for cholera and yellow fever if travelling from infected areas.
Advisable:- TAB vaccination.

Social Customs:

The Islamic week runs from Saturday to Wednesday. Strong Islamic influence. Visitors should respect religious customs. Avoid the use of the term 'Mohammedan' and eating or smoking in front of Moslems in daylight hours during Ramadan. It is best to avoid Kuwait during Ramadan Never refuse refreshment when first offered. Alcohol is strictly forbidden. Be careful when taking photographs.

Public Holidays:

New Year's Day	1 January
National Day	25 February
Liberation Day	26 February

Political System:

Executive power with the Amir, who appoints a prime minister and a 75 member consultative council established in 1990.

Political Stance:

Prior to the 1990 GULF WAR Kuwait had remained neutral, carrying out a balancing act between it's powerful neighbours. Since the war Kuwait changed its position to a definite pro west stance. The government started to undergo reform and has been exercising its new power as a series of financial

scandals hit the financial community. Kuwait is still effectively a monarchical government.

Telecommunications:

Telephone:- IDD access code +965 followed by subscriber's number (only 235 numbers in 1986). Mobile cellular system in operation. Kuwait has a ground link to ARABSAT Telecommunications system IDD access code for international calls from Kuwait is 00 followed by national code.
Telex at good hotels.
Telefax is available.
Telegram available 24 hours a day at the Ministry of Post and Telegraph Main Offices, Abdulla Al Salem Square.

Postal Service:

P.O.BOX numbers used as few house-to-house deliveries. Avoid surface mail for international post. Postal codes are now used.

Electricity:

240V AC three flat pins as in UK.

Media:

Publications guided by government include:- New Arabia (in English, published in London every fortnight).
Radio includes:- Channel 2 (in English)

Population:

Now stable at 1.7 million, of whom 650,000 are Kuwaitis (DTI Overseas Trade Services August 1995). A departure of 500,000 Palestinians (due to their countries support of Iraq) from mainly the professional classes means consumer market is reduced and many small businesses fail.

Economy:

The outlook is uncertain. A soft price in oil has reduced earnings so the government has reduced spending in defence and oil to key contracts. The main opportunities could be in overseas companies willing to take up offset opportunities or in participating in the privatisation of state-owned companies.

Oil:

The country is a one product country - OIL - prior to the Iraqi invasion oil accounted for 80% of Kuwait's total income and 45% of the GDP. There are many projects in the pipeline, with plans to increase production to 3mbpd (pre-war it was 2.5mbpd, now it is at these levels and the quota is up to 2mbpd as set by OPEC).

Electricity:

There is a modern power network with transmission lines at 300KV and 132KV to substations near consumption centres. The generation capacity is expected to reach 6898MW and the peak requirement at 4000MW. The

Ministry of Electricity and Water controls generation using mainly oil-fired stations and some gas turbine stations. Work has started on a 2400MW power station at Subiya after being delayed by the war.

Fresh Water:

Water is produced by distillation or desalination of brackish water fields, capacity is above pre-war levels and demands are well catered for.

Ways Of Doing Business:

All foreign businesses are subject to several laws which are used to ensure Kuwaiti control of domestic commerce. These laws basically mean that all businesses wishing to trade in Kuwait must be either 51% owned by Kuwaiti nationals or do business through a Kuwaiti agent. These agents are well protected by law.

Consultants should register with the Consultants and Physical Plan Department of the Ministry of Planning especially if dealing with government department

Business Visits:

Entry permits are required by British passport holders, but do not require a sponsor just a letter from their company stating that they are travelling on business.

Offset Programme:

The offset programme is used to stimulate growth and diversification, it only affects government contracts to supply goods and services with a value of KD 1m (£2.22m) or more.

Construction:

The reconstruction is now complete with regards to the infrastructure

Contacts In Kuwait:-

British Embassy (Commercial Section)
PO BOX 300
13003 Safat
KUWAIT
TEL. 010 965 240 3334/5/6
FAX 010 965 240 7395

Kuwait Chamber Of Commerce & Industry
PO BOX 775
Safat 13008
KUWAIT
TEL. 010 965 243 3864
FAX 010 965 240 4110

Contacts In Britain:-

Kuwait Embassy
45-46 Queens Gate
London
SW7
TEL. 0171 589 4533
FAX 0171 225 0716

Arab British Chamber Of Commerce
6 Belgrave Square
London
SW1X 8PH
TEL. 0171 235 4363
FAX 0171 245 6688

BAHRAIN

OFFICIAL TITLE:	State of Bahrain.
HEAD OF STATE:	Shaikh Isa bin Sulman al-Khalifa.
CURRENCY:	Bahraini Dinar (BD) = 1000 fils.
EXCHANGE RATE:	0.3760 BD per US$ (ABECOR Country Report - 11 February 1994.
CAPITAL CITY:	Manama.
TIME:	GMT +3hrs.

Main Cities:

Manama (capital, population of 144343 in 1991), Muharraq, Jidhafs, East and West Rifa'a, Isa Town, Madinat, Hamad, Hidd, Al Budayyi and Awali.

Entry Requirements

Passports required except certain seamen. GCC and British citizens do not need a visa, all others should get a visa in countries where there is a consulate. For travellers in transit there is a transit visa obtainable in Bahrain provided they have onward reservations, These last for 72 hrs but are extendible. Oil rig workers and seafarers need not obtain these, but a letter from their employer is required. Journalists are required to make arrangements with the Ministry of Information. Israeli citizens and anyone with evidence of travel to Israel (e.g. an Israeli visa) are not allowed entry. Pornographic & obscene material; arms & ammunition and cultured or undrilled pearls are all prohibited.

Health Precautions

Mandatory:- certificate of vaccination for yellow fever and cholera if travelling from infected areas.
Advised:- TAB vaccination.

Social Customs

Women should dress conservatively, because sun-dresses, shorts and tight jeans are likely to attract unwelcome attention and may offend Islamic codes. It is polite not to smoke or drink before Muslims during Ramadan, it is illegal to do so in public. Eating or drinking with your left hand is considered unclean and pointing the sole of your shoe at people. If tea or coffee is offered it is considered polite to accept.

Public Holidays

New Year's Day	1 January
National Day	16 December

Political System

Executive power with the Amir, assisted by a cabinet of ministers appointed by the Amir under the premiership of Shaikh Khalifa bin sulman al-Khalifa.

Political Stance

Bahrain is politically stable, but there is a border dispute with Qatar over a group of islands close to Qatar. These islands are rich in oil and gas. The International Court of Justice was expected to rule on the issue in February 1994.

Telecommunications

There are excellent cable and satellite services using digital exchange technology. The three satellite ground stations (two on Intelsat, one on ARABSAT) and submarine cable to UAE and Qatar.

Telephone:- IDD code + 973 followed by subscriber's six digit number (no area code as there are only 140000 telephones in use). To call out of Bahrain use IDD access code for international calls from Bahrain followed by the country code.

Telex:- good service, telex booths at Bahrain International Communications (Batelco).

Telegrams:- Both Arabic and English telegrams can be sent.

Others:- A fax can be sent from Bureaufax international facsimile transmission service, IDAS and Reuters. Mobile Automatic Telephone Services (MATS) provides full telephone services for private cars.

Postal Service

Most business mail is delivered to private box numbers rented from the main Post Offices.

Electricity

230V AC everywhere except Awali (110V AC) using various plugs, mainly three pin flat plugs.

Media

The state owned Bahrain Broadcasting Station provides an English radio service. It is possible to receive Capital Radio, the Voice of America, BBC World Service and services from Oman, Qatar, Abu Dhabi and the Aramco service from Dhahran. There are a few English television Channels.

Population

The population was 0.52 million (1991 estimated) - ABECOR country report February 1994.

Economy

The Bahrain economy is heavily dependant on the production of oil. Other industries exist with the largest being state owned. ALBA is the other main industry which is state owned and produces aluminium. Several incentives for foreign investment have been provided by the government, including allowing 100% foreign ownership. Diversification has also been encouraged.

Oil

Hydrocarbons provide one sixth of the country's GDP, 60% of government revenues and 70% of export revenues. The oil is expected to run out in 1998, the gas reserves are estimated to last for 35 years.

Ways Of Doing Business

UK companies are not required to appoint an agent, but need to have an import permit. It may be advantageous to have some form of local representation. The Ministry of the Interior are not keen on using agents and in the case of arms manufacture it is illegal to have an agent acting on their behalf. Caution is recommended when appointing an agent as termination of the agreement, once registered with the Ministry of Commerce and Agriculture, is difficult. A company is only allowed to have one agent handling any one product type.

Contacts In Bahrain

British Embassy (Commercial)
Manama
Bahrain
TEL. +973 534404 (7 LINES)
FAX +973 531273

Contacts In Britain

Embassy Of The State Of Bahrain
98 Gloucester Avenue
London
SW7
TEL. 0171 370 5132

DTI - Bahrain Desk
Bay 747
Kinggate House
66-74 Victoria Street
London
SW1P 6SW
TEL. 0171 215 4961 (GENERAL ENQUIRIES)
TEL. 0171 215 8281 (BAHRAIN DESK OFFICER)

QATAR

OFFICIAL TITLE:	State of Qatar
HEAD OF STATE:	Sheikh khalifa bin Hamad al-Thani
CURRENCY:	Rial (QR) = 100 Dirhams
EXCHANGE RATE:	3.64 QR per US$ (11 February 1994 - ABECOR Country Report).
CAPITAL CITY:	Doha
TIME:	GMT +3hrs

Main Cities:

Doha, Al Wakrah, Al Khuwayr, Dukhan, Umm Said.

Entry Requirements:

A visa is not needed for persons born and resident in the UK for stays up to 30 days. Others require visas, obtained from Qatar representatives overseas. If staying for more than 72 hours a 'No Objection Certification' (NOC) applies in some cases if obtained before arrival. Pork, pork products, goods from Israel, cultured pearls and obscene or seditious literature are all prohibited. All foodstuffs have to be labelled in Arabic. The Israeli boycott is strictly enforced. Israelis and anyone with evidence of travel to Israel in their passport are prohibited entry to Qatar. Importers must register with the Controller of Companies and appear in the Chamber of Commerce's register of importers. Firearms, ammunition, drugs and alcohol must be imported under licence. There is no personal income tax.

Health Precaution

Mandatory: Vaccination certificates against yellow fever and cholera if travelling from infected areas.
Advisable: TAB vaccination.

Social Customs

It is not advisable to wear shorts or sleeveless dresses in public. Avoid eating, drinking or smoking in front of Muslims during daylight hours in Ramadan; showing the soles of your feet; and using the term Mohammedan. Photography may be impolite or illegal in some circumstances.

Public Holidays

Independence Day 3 September
Eid al-Fitr
Eid al-Adha

Political System

Qatar is an independent sovereign state with executive power belonging to the Emir. As an independent state since 1971, the Emir is assisted in his duties by the Council of Ministers appointed by the Emir. An advisory council of 30 people is also appointed to discuss legislation before it comes into force.

Political Stance

Qatar and Bahrain are currently in dispute over control of a group of islands off the Qatari coast, the dispute began when Qatari army troops landed on a set of disputed reefs where the Bahrainians were building a coast guard station. In July 1991 Qatar approached the world court unilaterally to settle the arguments. The cause of the confrontation came about in the 1930s when the foreign affairs of both states were handled by the British Government. Britain set the border demarcation between the two governments. Since then potentially rich oil and gas field have been found under the reefs and islands.

Telecommunications

Communications are via satellite, microwave radio (to SAUDI ARABIA) and submarine cable links (to BAHRAIN and the UAE). Qatar is building facilities to use the ARABSAT system.

Telephone:- IDD access code +974 followed by the subscriber's number (no area code is needed). International direct dialling is in operation. Car telephones can be used.

Telex and Telegram:- Available 0600-2300 at Cable & Wireless office, and at good hotels.

Other:- Several private couriers operate in Doha.

Postal Service

P.O. Box Numbers are used.

Electricity

220/240 V AC supply with three-pin flat plugs are most common.

Media

Press:- This is Qatar (quarterly) and Gulf Times (daily) are published in English.

Radio:- 19 hours a day in English, on stereo, medium wave and short wave.

Television:- Channel 37 (in English).

Population

Estimated to be 504,000 (DTI Overseas Trade Services August 1995), mainly located in Doha. There is a large number of expatriates from Asia and the Middle East. From Europe and America there are 3500 expatriates, 2500 are British.

Economy

Poor natural resources apart from oil and gas means that Qatar is reliant on oil exports. Qatar is developing its markets for gas and manufactured goods, although the government has cut some spending resulting in the postponement of some schemes which are not essential. The construction sector has been active, as a result of the North Field gas development.

Oil

In a typical year oil accounts for 75% of the GDP, 80% of government revenue and 90% of export earnings (from 87% of 1991 total exports). The oil reserves are small, and is expected to last about 26 years. Qatar has the largest single gas deposit in the world and it is being developed to fulfil the country's fuel requirements. Heavy industry has been geared towards using gas as an alternative to oil. Oil has been used to produce the required gas for industry, although production has been irregular, the North Field is needed to come on-line as soon as possible.

Electricity

A 600 MW power generation plant and 33m gallon per day desalination plant is being constructed next to the Ras Abu Fontas power/water plant. The Qatar Electricity and Water Company (QEWC) expects to meet all the country's expected demand by mid 1995.

Fresh Water

The QEWC is expected to fill all the demand required by mid 1995 due to the new power/desalination plant being built (see above section). All water comes from desalination plants which produce good drinking water.

Ways Of Doing Business

All foreign firms wishing to bid for a Qatari government tender must do so through a local agent. Under existing agency law Qatari ministers are required to buy through the local agents. In 1985 Law No.3 bans all non-Qataris from owning any trading, importing or contracting company. Foreign capital up to 49% is allowed for larger industrial or agricultural companies. Under present commercial law it is difficult to be released from an agency agreement as Qatari law is heavily in favour of local companies. As with all the Arab counties the Qataris prefer to do business personally i.e. face-to-face with a company representative.

Contacts In Qatar:-

British Embassy (Commercial Section)
P.O. BOX 3
Doha
QATAR
TEL. 010 974 421991
FAX 010 974 438692

Qatar Chamber Of Commerce
PO BOX 402
Doha
QATAR
TEL. 010 974 425131

Contacts In Britain:-

Qatar Embassy
1 South Audley Street
London
W1Y 5DQ
TEL. 0171 493 2200
FAX 0171 493 2661

Arab British Chamber Of Commerce
6 Belgrave Square
London
SW1X 8PH
TEL. 0171 235 4363
FAX 0171 245 6688

UNITED ARAB EMIRATES

OFFICIAL TITLE:	UNITED ARAB EMIRATES
HEAD OF STATE:	President Sheikh Zayed bin Sultan al Nahayan (ruler of Abu Dhabi)
CURRENCY:	Dihram (Dh) = 100 fils
EXCHANGE RATE:	3.671 Dh per US$ (1992 average, Economist Intelligence Unit).
CAPITAL CITY:	Abu Dhabi
TIME:	GMT +4hrs

Main Cities:

Abu Dhabi, Dubai, Sharjah, Fujairah, Umm al-Qaiwain, Ajman and Ras Al Khaimah which make up the Emirates.

Entry Requirements:

Visas required for all visitors except UK nationals with full right of abode in Britain. All visitors with evidence in their passports of travel to Israel will be denied entry.

Personal effects are duty free. All products from Israel are prohibited as are all goods originating there. Imports of the following need a special licence:- Pork products, alcoholic beverages, firearms and ammunition.

Health Precaution:

Mandatory:- certificates of vaccination for Cholera and Yellow Fever if travelling from infected areas.

Advisable:- Cholera, Polio, Tetanus and Typhoid vaccinations and anti-malaria precautions.

Social Customs:

Religious customs and practises must be respected. There are strict controls on the sale of alcohol which is banned under Sharjah law. Avoid giving, eating or passing with left hand; sitting with the soles of the feet facing anyone; eating, drinking or smoking in front of Moslems in daylight hours during Ramadan. Photographers should be careful when taking pictures of women and should obtain permission before taking photographs of bridges, oil installations, etc. Clothes worn in public places such as markets should not reveal too much bare flesh.

Public Holidays:

Ascension of Prophet	12 January
Eid al-Fitr (end of Ramadan)	2-4 March
Eid al-Adha (Feast of Sacrifice)	9-12 May
Islamic New Year	2 June
Prophet's Birthday	22 August
UAE National Day	2 December

Political Systems:

The emirates making up the UAE - as listed in the main cities section - formed the present federation in 1971 and were joined by Ras Al Kaimah a year later. The Supreme Council is the highest government authority, which consists of the rulers of the seven emirates. The Supreme Council elects a president; he in turn appoints the Council of Ministers, which exercises executive authority. The 40 members of the Federal National Council are drawn proportionally from each emirates and are appointed by the rulers. The Emirates have a great degree of autonomy. The President is the ruler of Abu Dhabi, the largest emirate, and the Prime Minister is the ruler of Dubai, Sheikh Maktoum Bin Rashid al Maktoum.

Political Stance:

Since having been forced into a pro-west stance during the Gulf War disillusionment has set in and the UAE sees the UN as an instrument of US policy. There is disappointment that a similar vigour has not been exercised in enforcing UN resolutions against Serbia and Israel.

Telecommunications:

The UAE subscribe to the ARABSAT satellite communications system and the service is entirely digital.

Telephone:- IDD access code +971 followed by area code (2 for Abu Dhabi; 4 for Dubai; 70 for Fujairah; 77 for Ras al Khaimah; 6 for Ajman, Sharjah and Umm al Qaiwain). Dubai number which started 42 or 43 now start 52 or 53. Approximately 43% are in n Dubai, 30% are in Abu Dhabi, and 13% in Sharjah. All calls within each emirate are free.

Telex:- facilities are available in Abu Dhabi , Dubai at Etisalat and in all main post offices.

Telegram:- there are facilities in all main centres.

Other:- Telefax services are at Etisalat offices in all main centres.

Electricity:

240/415 V AC(Abu Dhabi) and 220/380 V AC (Northern Emirates), with three-pin round or flat plug type fittings.

Media:

Press: Emirate News is published in English by Al Itihad.

Radio: Extensive national broadcasts including in English and French.

Population:

The population is currently estimated at 2.46 million, of which 42% are located in Abu Dhabi, 20% are in Dubai and 15% are in Sharjah. The past decade has seen a 100% increase in the population, caused by the inflow of labour and a rise in the birth rate, about on third of the population is now under fifteen years old. The UAE has registered 70% of its population as expatriates due to the rapid expansion of its non-oil sector and the limited size of its indigenous population.

Economy:

In spite of the world recession the UAE economy looks good, higher than expected oil prices led to a current account surplus f $1.7 bn in 1992. Oil accounts for one third of the GDP, but the non-oil sector has grown by over 4% in 1993 and is expected to continue as the emirates increase diversification of economic activity. Dubai's status as the leading entrepot for the region and the favourable trading conditions within the emirates prove the UAE's commitment to long term security after the oil runs out. Abu Dhabi accounts for two-thirds of the GDP, with Dubai at around one quarter. Sharjah is establishing itself as the third main contributor to the UAE's economy, as it has rapidly increased its manufacturing sector, and now accounts for half the UAE's total manufacturing sector. The other emirates are mainly supported by the two big emirates.

Oil:

The main sector is in the oil and gas production, accounting for about a third of the GDP. Production is increasing, from 1.4 mb/d of crude oil in 1987 to 2.4 mb/d in 1991

Ways Of Doing Business:

The UK has had a good relationship with the UAE, it is the UK's second biggest market in the region. The UK is the second biggest supplier to the emirates in 1994, behind Japan and ahead of the USA. About 40% of Britain 's exports are in manufacturing, which is the emirates' fastest growth area. As in other Middle East countries there needs to be a continual presence in the market as the Arab businessman prefers to deal with someone he knows face to face. This personnel approach is essential if a company is to succeed in the emirates.

there are two ways of establishing representation in UAE; through commercial agents or by a representative office in the emirates. By law a commercial agent must be a UAE national or a company wholly owned by a UAE national. If a commercial agent is used, it is advisable to appoint an agent for each region. For public sector tenders an agent is required, there can only be one agent per product per emirate. It is advisable to have an agent for Abu Dhabi and Dubai, but an agent is only required for the other regions if the volume of business warrants it. Agents for Dubai also generally represent the northern emirates. An agent from Dubai can legally operate in Abu Dhabi, it is usually local agents that receive the government and oil company contracts. Most oil companies are based in Abu Dhabi as are all government departments.

The other method is to set up a representative office in the UAE. A foreign owned company may do this, but requires a UAE national or a company wholly owned by a UAE national to be it's sponsor.

Business Visits:

No visas are necessary for British citizens, although a second passport is required if the original has evidence of a visit to Israel. If a visa is necessary because the visitor is subject to immigration control (despite holding a British passport) then a 30 day visa is obtained from the UAE embassy, visitors can

usually extend their stay by two 30 day periods without requiring residence/work permits. If the visitor needs a work permit because residency is required (i.e. if the stay is a long one), a local sponsor is required.

Contacts In Uae:

British Embassy (Commercial Section)
PO BOX 248
Khalid Bin Walid Street
Abu Dhabi
UAE
TEL. 00 9712 326600
FAX 00 9712 341744

British Embassy (Commercial Section)
Al Seef
PO BOX 65
Dubai
UAE
TEL. 00 9714 521893
FAX 00 971 527095

Contacts In Britain:

Embassy Of The UAE
30 Princess Gate
London
SW7 1PT
TEL. 0171 581 1281

Arab British Chamber Of Commerce
6 Belgrave Square
London
SW1X 8PH
TEL. 0171 235 4363
FAX 0171 245 6688

OMAN

OFFICIAL TITLE:	Sultanate of Oman.
HEAD OF STATE:	Sultan Qaboos bin Said.
CURRENCY:	Rial (RO) = 1000 baiza.
EXCHANGE RATE:	0.3845 RO per US$ (Oman Country Report - ABECOR 11 February 1994).
CAPITAL CITY:	Muscat.
TIME:	GMT + 4 hrs.

Main Cities

Muscat/Ruwi/Muttrah/Qurum (est. population 325000), Salalah, Nizwa, Sohar, Rustaq and Sur.

Entry Requirements

A passport is needed by every visitor. Visas are necessary except for nationals of Kuwait, Saudi Arabia, UAE, Bahrain and Qatar. Since 1990 it has been possible to get visas from the embassy in the country of origin. Israelis are prohibited as are anyone with visas for Israel and Libya. Goods originating from Israel are prohibited as is Alcohol. The import of arms, ammunition, certain motor vehicles and dangerous drugs are controlled. Video cassettes are temporarily impounded to allow police inspection. All imports need to have a certificate of origin and a commercial invoice, which must be certified by an Omani consulate or representative abroad. Documents must be in Arabic and English.

Health Precautions

Mandatory:- Vaccination certificates are required for yellow fever and cholera if travelling from infected areas.
Advisable:- TAB vaccinations and anti-malarial precautions.

Social Customs

It is considered impolite to drink, eat or smoke in front of a Muslim during Ramadan in daylight hours. Women should wear skirts of a reasonable length and avoid sleeveless dresses. Men should wear trousers and shirt to work and in public (never shorts or sleeveless shirts). Swim wear should only be worn in hotel swimming pools and on the beach. It is polite to accept refreshments customarily offered to visitors.

Public Holidays

National Day	18 November
Official Birthday of Sultan Qaboos bin Said	19 November
Several variable days	

Political System

Absolute monarchy where executive power, held by the council of ministers, is derived from the Amir. A 55 member State Consultative Council, formed

in 1981, has increased the participation of the Omani peoples. This was replaced in 1990 by the Majlis al Shura. The Majlis al Shura is a non-governmental advisory council nominated by the people of the 59 wilayets.

Political Stance

Oman has settled all border disputes as of 1993, when the dispute with Yemen was settled. Although one of the largest countries on the Arabian Peninsula, Oman is a small, sparsely populated nation with a small economy. Despite these problems Oman is undergoing a period of development and increased prosperity.

Telecommunications

Telephone:- IDD code is + 968 followed by the subscriber's number. Oman has recently changed all the numbers (during 1993/94).
Telex:- Available at good hotels. The areas covered with both the Arab and the English telex network include the Capital area and Salalah.
Telegram:- Available through the telecommunications company Omantel.
Other:- A mobile telephone network is available in the Capital Area, Batinah Coast and Salalah.

Electricity

220/240V AC, the plugs are either three pin (round and flat) or two pin.

Media

The English newspapers are Times of Oman and the Oman Daily Times. There are 15 hours of English speaking radio a day.

Population

The population was 1.56 million in 1991 (estimated) and rapidly growing - it was estimated to be at 2 million people in 1993.

Economy

The economy is heavily dependant on oil, which provides 40% of the GDP, 90% of government revenue and 60% of total export earnings. The country's infrastructure is being improved in an attempt to encourage growth and diversification of the nation's economy. The outlook is good as there are agricultural, fisheries and mineral resources which many in the region do not have. The future of the Oman economy is one which is not totally oil dependant.

Ways Of Doing Business

In Oman foreign companies may have up to 75% of the equity in local joint ventures. All businesses wishing to do business in Oman must have a local agency to represent their interests. It is advised to regularly visit Oman as an Omanis agent is unlikely to be interested in representing a company from a distance.

Contacts In Bahrain

British Embassy (Commercial)
PO BOX 6898
Ruwi
Muscat
Sultanate Of Oman
TEL. 00 968 693086/693112
FAX 00 968 693088

Oman Chamber Of Commerce And Industry
PO BOX 1400
Ruwi
Post Code 112
Sultanate Of Oman
TEL. 00 968 707674
FAX 00 968 708497

Contacts In Britain

Embassy Of The Sultanate Of Oman
167 Queen's Gate
London
SW7 5HE
TEL. 0171 589 2840 (VISAS)
TEL. 0171 589 0001 (OTHER ENQUIRIES)
FAX 0171 589 2505

Arab British Chamber Of Commerce
6 Belgrave Square
London
SW1X 8PH
TEL. 0171 235 4363
FAX 0171 245 6688

COUNTRY:OMAN	UNIDO PROJECT NO: US/RAB/93/096
QUESTIONNAIRE: No 1. G	
Title: INDUSTRY	Page: 1 of 4

Q1.1
National Statistical data upon manufacturing output, can we secure data for the past 5 years ?

A1.1. ***Outcome:-***

Q1.2.
Has the Ministry of Industry a forward plan for state projects in the manufacturing sector of the company ?

A1.2 ***Outcome:-***

Q1.3.
(i) Has the Government go an incentive programme for private sector inward investors in high technology areas of manufacturing ?
(ii) Has the government got an incentive programme for domestic private sector investors ?

A1.3. ***Outcome:-***

(i)

(ii)

Q1.4.
What does the Government forsee to be the corporation tax (on profits) to be during the years
)5 - 2005 ?

A1.4. ***Outcome:-***

Q1.5.
What is the Government's view of the potential priority area of machine tool types for the development of the engineering sector in general ?

A1.5. ***Outcome:-***

Q1.6
Is the Government aware of any existing domestic machines tool production activity past or present ?

A1.6. ***Outcome:-***

Q1.7.
What is the Government's view of a potential machine tool project in terms of ownership ? i.e. public sector, private sector or mixed.

A1.7. ***Outcome:-***

Q1.8.
What would the Ministry of Industries position be with respect to the creation of trade regulations for the benefit of the project ? i.e. GCC collective trade control of imports, beneficial terms for GCC users of projects products etc.,

A1.8. ***Outcome:-***

Q1.9.
What involvement would the Ministry of Industry wish to have with this project ?

A1.9. ***Outcome:-***

Q1.10
Can the Ministry of Industry point to other projects or companies within the state and GCC that could have a beneficial relationship with this project ? i.e. foundries, precision machine shops, research institutions etc.,

A1.10. ***Outcome:-***

Q1.11
Can the Ministry of Industry point to the projected growth statistics for the manufacturing sector of the economy for the next five years (1995 - 2005)?

A1.11. ***Outcome:-***

Q1.12
Does the Ministry of Industry have any particular contact that they believe we should hold discussions with upon this project (besides those already targeted - discuss list)?

A1.12. ***Outcome:-***

Q1.13
Does the Ministry of Industry believe that such a project is of strategic importance to the state and GCC members ? and why ?

A1.13 ***Outcome:-***

Q1.14.
When considering the potential location of such a project within the GCC what is the Ministry of Industries view ?
(i) which state ?
(ii) what site available ?
(iii) what price of land ?

A1.14 ***Outcome:-***

(i)

(ii)

(iii)

Q1.15.
Can the Ministry provide data upon labour availability, skills available and projected labour movement trends between 1995 and 2005 ?

A1.15 ***Outcome:-***

Q1.16
What would be the Ministry of Industries position with respect to exports of project's products/services outside of GCC ?
(i) - other Arab states
(ii) - non Arab states
(iii) - states to which export controls exist via the use of sensitive technologies

A1.16. Outcome:-

(i)

(ii)

(iii)

COUNTRY:OMAN	UNIDO PROJECT NO: US/RAB/93/096
QUESTIONNAIRE: No 2.G	
Title: TRADE	Page: 1 of 2

Q2.1.
National statistical data upon past 5 years imports and any re-exports of machine tools (SITC categories agreed in Vienna) ?

A2.1. ***Outcome:-***

Q2.2. Government position with respect to special trade agreements i.e. (i) import tarrifs, (ii) GCC agreements, (iii) Arab league agreements, (iv) GATT Uraguay round signatory ?

A2.2. ***Outcome:-***
(i)

(ii)

(iii)

(iv)

Q2.3.
Government position with respect to any special 'Offset' agreements in place that might aid project implementation or technology transfer with Western or Far Eastern companies/Governments or third party investors ?

A2.3. ***Outcome:-***

Q2.4. Government position with respect to future trade growth forecasts, does the Ministry of Trade hold such statistics ?

A2.4. ***Outcome:-***

Q2.5.
Any Government proposals with respect to future trade development plans that might be put forward to GCC for implementation during the period 1995 - 2000 ?

A2.5. ***Outcome:-***

Q2.6.
Ministry of Trade view of the potential for the application of special trade measures for the benefit of the project i.e. Import Controls from non GCC sources of the project's products (market protection), against other Arab but non GCC states or any non GCC source ?

A2.6. ***Outcome:-***

Q2.7.
Intertrading between this country and other GCC states, (i) statistical data upon past/present trade flows, particularly in manufactured goods but not restricted to these ? (ii) Ministry forecast for next 5 - 10 years ?

A2.7. ***Outcome:-***
(i)

(ii)

Q2.8.
Ministry of Trade view :- (i) of potential location within GCC of such a project ? (ii) any precidents (iii) any trade agreements for joint GCC project ? (iv) Trade Ministry view of private versus public versus mixed sector solutions ?

A2.8. ***Outcome:-***
(i)

(ii)

(iii)

(iv)

Q3.1.
Can we have access/copies of the :- (i) current state plan with respect to the manufacturing sector of the economy ? (ii) what period of time does this cover ? (iii) timing of next iteration of the same plan ?

A3.1. ***Outcome:-***

(i)

(ii)

(iii)

Q3.2.
Is the Ministry aware of any country proposals to GCC programmes for future GCC manufacturing/high technology /education proposals for collaborative developments that might influence this project.

A3.2. ***Outcome:-***

Q3.3.
Machine tools require supplies from certain other industries, principally - cast iron (SG), steel (high tensile). precision machined parts, gears, electronics, electrical equipment and heat treatment facilities for hardening tool steels. Can the Ministry direct us to details of existing or proposed private or public sector activities in these areas ?

A3.3. ***Outcome:-***

* Cast Iron Foundries
* Steel Production (Rud/bar/sheet/plate):-
* Precision Machined Parts
* Gears
* Electronics
* Electrical Equipment
* Heat Treatment

Q3.4.
Energy provision within the state, what is the electricity supply side status ?
(i) cost per K W per hour ?
(ii) distribution/availability ?
(iii) future planned capacities ?
(iv) any GCC joint developments ?

A3.4. ***Outcome:-***
(i)

(ii)

(iii)

(iv)

Q3.5.
What is the status of the provision of land for manufacturing sector projects ? (I) land cost per hectare for industrial sites ? (ii) availability of sites ? (iii) any preferred locations in view of state plans ? (iv) demographic details with respect to (iii) and (ii).

A3.5. *Outcome:-*
(i)

(ii)

(iii)

(iv)

Q3.6.
Environmental programmes/legislation from state with respect to:- (i) emissions ? (ii) waste management facilities ? (iii) state services provision ? (iv) human factors consideration ?

A3.6. *Outcome:-*

(i)

(ii)

(iii)

(iv)

Q3.7.
Local provision of other utilities - water - water waste treatment - telephone network. Any data/information for special consideration with respect to locations or sites identified ?

A3.7. *Outcome:-*

(i) Water

(ii) Water treatment

(iii) Telecommunications
(including relevant legislation or controls).

Q.3.8.
How might this project proposal fit with objectives and priorities for the state planning ministry ?

A3.8. ***Outcome:-***

Q3.9.
What role does state planning play with respect to policy fusion between - Trade - Industry - Education ministries for example:- provision of skilled labour ?

A3.9. ***Outcome:-***

Q3.10.
State position with respect to skilled and unskilled labour ?
(i) Employment Statistics ?
(ii) Skill availability ?
(iii) Unskilled labour market ?
(iv) Shortages ?

A3.10. ***Outcome:-***
(i)

(ii)

(iii)

(iv)

Q3.11.

(i) Ministry of planning view of this project proposals ?
(ii) Views upon location within GCC ?
(iii) Views upon impact project would have upon existing state /GCC objectives ?

A3.11. *Outcome:*

(i)

(ii)

(iii)

Q4.1
Can the Ministry please provide us with details of:

(i) State/private education system? (Secondary - higher education)
(ii) Any state technology/research institutes influential upen machine tool technologies?
(iii) Status of any state Universities with influence upon these technologies?

A4.1 ***Outcome:-***

(i)

(ii)

(iii)

Q4.2
Can we access statistics with respect to the outputs (graduates) from state Universities/higher education for technologies and management issues relevant to the studies focus?

A4.2 ***Outcome:-***

Q4.3
Can the Ministry please provide details of any future plans within higher education that may impact the studies focus?

A4.3 ***Outcome:-***

Q4.4
In the Ministry's view, which is the country's key centre of excellence with respect to machine tool technologies and manufacturing technology?

A4.4 ***Outcome:-***

Q4.5
What in the Ministry's view, would be the status of understanding and teaching in Quality Assurance and Total Quality Management (QA and TQM) within the stated education and training systems?

A4.5 ***Outcome:-***

Q4.6
Can the Ministry supply statistics upon the level and output of training for skilled labour, either direct post education for (i) school leavers and (ii) for mature students?

A4.6 ***Outcome:-***

(i)

(ii)

Q4.7
Can the Ministry supply statistics upon the available labour force at levels indicated as:
(i) skilled technicians
(ii) unskilled workers

A4.7 ***Outcome:-***

(i)

(ii)

Q4.8
Can the Ministry point to existing or planned collaborations with (i) other GCC Higher Education establishments/systems or (ii) non-GCC collaborations with Universities on Research Institutions that could prove beneficial to the focus of this project?

A4.8 ***Outcome:-***

(i)

(ii)

Q4.9
What plans do the Ministry hold that the execution of the project would help for the future development of both technologies and manufacturing within:
(i) The state?
(ii) GCC?

A4.9 ***Outcome:-***

(i)

(ii)

Q4.10
Does the Ministry have a view as to the most relevant location within:
(i) the state?
(ii) the GCC for the establishment of the project?

A4.10 ***Outcome:-***

(i)

(ii)

Q5.1.
Can the Ministry please provide statistics upon the economies manufacturing sector performance (i) over the past 5 years ? (ii) projected over the next 5 years ?

A5.1. ***Outcome:-***

(i)

(ii)

Q5.2.
Can the Ministry please supply details of (i)GDP over the last 5 years and (ii) predicted over the next five years?

A5.2. ***Outcome:-***

(i)

(ii)

Q5.3.
Can the Ministry please indicate the consumer price index over (i) the last five years ? and (ii) predicted over the next five years ?

A5.3. ***Outcome:-***

Q5.4.
Can the Minsitry please provide data upon the exchange rates applying to the local currency over (i) the past 5 years and (ii) the projected position over the next 5 years ?

A5.4. ***Outcome:-***

(i)

(ii)

Q5.5.
Can the Ministry please indicate the key plans for the economy with respect to industrial development projected for the next 5 years (i) and (ii) any plans that may influence GCC policies during the same time period ?

A5.5. ***Outcome:-***

(i)

(ii)

Q5.6.
Can the Ministry indicate to what extent the Government would (i) provide investment in such projects ? (ii) may offer tax relief to private investors ? (iii) may provide tax holidays ? (iv) Could provide land ? (v) What is the current price of land per hectare for industrial development ? (vi) Any specific sites for development area status ?

A5.6. ***Outcome:-***

(i)

(ii)

(iii)

(iv)

(v)

(vi)

Q5.7.
Can the Ministry please indicate the current (i) and projected for the next 5 years ? (ii) labour rates for skilled technicians (a) professional engineers (b) unskilled labour (c) ?

A5.7. ***Outcome:-***

(i)

a
b
c

(ii)

a
b
c

.8.
Can the Ministry please indicate (i)the income tax levels prevailing ?(ii) and forecast for next 5 years ?

A5.8. ***Outcome:-***

(i)

(ii)

Q5.9.
Can the Ministry please indicate the corporation tax on profits climate (i)at present ? (ii) during the next 10 years ?

A5.9. ***Outcome:-***

(ii)

Q5.10.
Can the Ministry indicate the key regional investor groups with whom they believe the study team should have exploratory discussions ?

A5.10. ***Outcome***

Q5.11.
Can the Ministry please indicate any past precedents for GCC collaboration in similar projects that could be studied as a model ?

A5.11 ***Outcome:-***

Q5.12.
Can the Ministry indicate what it believes to be the primary barriers to development of such projects in the GCC ?

A5.13. ***Outcome:-***

Q5.14.
Would the Ministry believe (i) that the Government might be in a position to take an equity stake in such a project ? (ii)any past precedents ? (iii) what size of stake ? (iv) what terms and conditions would apply ? (iv)

A5.14 ***Outcome:-***

(i)

(ii)

(iii)

Q6.1.
What is the nature of the local commercial banking systems ?

A6.1. ***Outcome:-***

Q6.2.
Does a local stock exchange exist ? (i)How does it operate ? (ii)

A6.2. ***Outcome:-***

Q6.3.
Can the Central Bank please indicate the local (i)and regional (ii) key investor groups ?

A6.3. ***Outcome:-***

(i)

(ii)

Q6.4.
Can the Central Bank please indicate the past (i)and projected (ii) national inflation statistics ?

A6.4. ***Outcome:-***

Q6.5.
What do regional (GCC) investors expect by way of any I.R.R. from collaborative projects of this types ?(I) do projects that enable further development of the economy hold any different I.R.R. expectations i.e. does a climate of patience exist for the improvement of future developments ? (ii)

A6.5. ***Outcome:-***

(i)

(ii)

Q.6.6.
Can the Central Bank point to local on GCC projects that might act as a model for analysis for regional ›nomic developments ?

A6.6. ***Outcome:-***

Q6.7.
Can the Central Bank please direct us to key customers or customer groups that we should expose the study objectives and and identify regional investors ?

A6.7. ***Outcome:-***

Q7.1.
Can the Chamber please provide a summary of its operations, membership and duties/responsibilities ?

A7.1. ***Outcome:-***

Q7.2.
Can the Chamber provide targeted members that may be useful machine tool users for the team to visit for details discussions ?

7.2. ***Outcome:-***

Q7.3.
Can the Chamber please point to key local and GCC investor's/investor groups with whom we should discuss the project proposal ?

A7.3. ***Outcome:-***

7.4.

Can the Chamber please provide details of any past project that in its view might aid the team as a model or past precedent for GCC collaboration in manufacturing development ?

A7.4. ***Outcome:-***

Q7.5.
What in the Chamber's view is the most important group of machine tool types for development and manufacture in the GCC ?

A7.5.
Outcome:-

Q7.6.
Can the Chamber please point out, in its opinion, the most likely sectors to grow in the local manufacturing economy ?

A7.6.

Q7.7.
Machine tools enable production of many if not all down stream products to be made, what in the Chambers view will be the priority down stream manufacturing development, - (i)locally ? (ii) in GCC ?

A7.7. *Outcome:-*

(i)

(ii)

7.8.
(i)Can the Chamber indicate who, from its membership we should speak to as local import agents for machine tools ? (ii) Additionally what in the Chambers view has been the % commission taken by such agents ?

A7.8. ***Outcome:-***

(i)

(ii)

Q7.9.
What would be the Chambers view of special import measures to protect domestic or GCC production of machine tools ?

A7.9. ***Outcome:-***

Q7.10.
Can the Chamber indicate which local/GCC suppliers should be contacted for potential supply partnership with this project ?

(i) Foundries For Cast Iron (SG)
(ii) Forges
(iii) Gear Makers
(iv) Electric Motors
(v) Electronics
(vi) Precision machine shops
(vii) Fabricators
(viii) Sheet Metal Suppliers
(ix) Heat Treatment
(x) Steel Stock (Bar/Plate)

A7.10 ***Outcome:-***

(i)

(ii)

(iii)

(iv)

(v)

A7.10 *Outcome: con'd...*

(vi)

(vii)

(viii)

(ix)

(x)

Q7.11
Can the Chamber please indicate labour availability ? (i)skilled, (ii) unskilled, (iii) professional - its costs, and forecast movements ?

A7.11. ***Outcome:-***

(i)

(ii)

(iii)

Q7.12.
Can the Chamber please indicate the presence of training establishment for workers -(i) either private sector (ii)or public sector (iii) and in the Chamber view its effectiveness ?

A7.12. ***Outcome:-***

(i)

(ii)

Q7.13.
What in the chamber membership is the depth of understanding (i)and accreditation (ii) to Quality Assurance standard ISO9000 ?

A7.13. ***Outcome:-***

(i)

(ii)

Q7.14
Could the Chamber indicate what are the transport arrangements, typically, for the workers of such an enterprise, and costs ?

(e.g) a) Transport is provided by the organisation.
b) Transport is not provided

A7.14. ***Outcome:-***

(a)

(b)

Q8.1.
What in the users view, is the principle machine tool type that the GCC should develop locally ?

A8.1. ***Outcome:-***

Q8.2.
From who does the user buy machine tools at present ?

(i) Agents locally ?
(ii) Direct from supplier ?
(iii) Typical price for each type ?

A8.2. ***Outcome:-***

(i)

(ii)

(iii)

Q8.3.
Does the user adopt QA ISO9000 ? (i)if so who accredits ? (ii) and to what extent does the users believe ISO 9000 prevails in the local manufacturing industry ?

A8.3. ***Outcome:-***

Q8.4.
What would the user believe to be the key purchase considerations for his machine tool buying ?

A8.4. ***Outcome:-***

Q8.5.
Would the users buy a GCC made machine tool ?

(i) What conditions should apply ?
(ii) Importance of "trade name" ?
(iii) Quality ?
(iv) Service ?
(v) Training
(vi) Spares ?
(vii) Pre sale trials ?

A8.5. ***Outcome:-***

(ii)

(iii)

(iv)

(v)

(vi)

(vii)

Q8.6.
Who does the user believe to be the key supplier (agent) locally, with the best service ?

A8.6. ***Outcome:-***

Q8.7.
Who are the users key customers ?

(i) By industrial sector ?
(ii) By type of work ?
(iii) Are they growing ?
(iv) Any exports ?
(v) Any GCC trade of importance ?

A8.7. ***Outcome:-***

(i)

(ii)

(iii)

(iv)

Q8.8.
What proportion of manual versus NC machine (i) is presently used ? (ii) over the next 10 years ? (iii) present capital plant list please, by type/make ?

A8.8. ***Outcome:-***

(i)

(ii)

(iii)

Q8.9. Users Costs ?

(i) Labour- skilled/unskilled ?

(ii) Professional engineer / manager ?

(iii) Material, i.e. tool steel price/tonne ?

(iv) Taxes - income and corporate ?

(v) Any incentives given to users for capital machine purchase ?

A8.9. ***Outcome:-***

(i)

(ii)

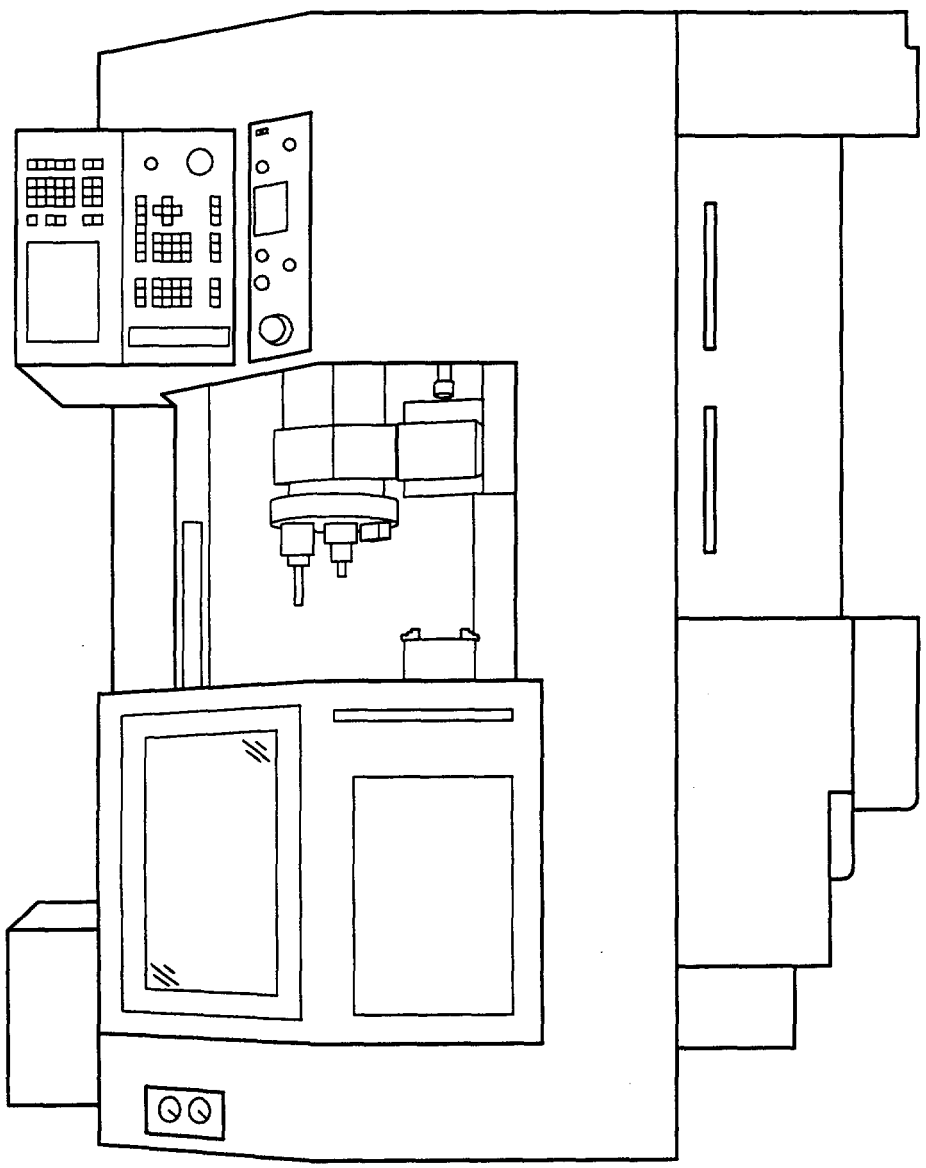
(iii)

(iv)

(v)

Q8.10
Can users point to any potential suppliers to such a project locally i.e. foundries, forges, precision parts suppliers, electronics etc., ?

A8.10 ***Outcome:-***



CNC TURNING CENTRE