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PRE-FEASIBILITY STUDY FOR THE DEVELOPMENT OF A REGIONAL EXISTING TRANSPORT EQUIPMENT PLANT

ZIMCO - ZIMBABWE

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PROJECT N° DU/RAF/89/850

CONTRACT N° 93/026

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FINAL REPORT

October 1993

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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SIGLES ET ABREVIATIONS

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ABB	ASEA BROWN BOVERI
EIS	Export Incentive Scheme
ERS	Export Retention Scheme
IRR	Internal Rate of Return on total investment
IRRE 1	Return on equity
MRL	Malawi Railways Ltd
NRZ	National Railways of Zimbabwe
OGIL	Open General Import Licence
PTA	Preferential Trade Area for Eastern and Southern Africa States
R.S.A.	Republic of South Africa
SATS (now SPOORNET)	South Africa Transport Services
TAZARA	Tanzania/Zambia Railway Authority
UNTACDA	United Nation Transports and Communications Decade for Africa
ZECO	Zimbabwe Engineering Company
ZISCO	Zimbabwe Iron and Steel Corporation
ZR	Zambia Railways

FOREWORD

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PRE-FEASIBILITY STUDY FOR THE DEVELOPMENT OF A REGIONAL EXISTING TRANSPORT EQUIPMENT PLANT

The present study was carried out within the framework of UNTACDA's objective for the promotion of an African industry in the field of transport equipment.

A first survey was performed in the middle of 1991 and lead for the Southern Africa sub-region to the selection of the company ZECO in Zimbabwe.

The present report comprises the pre-feasibility study of the company ZECO.

This study was awarded by UNIDO to the French Consulting company SOFRECO located in Paris through contract N° 93/026 of February 16, 1993 (project N° DU/RAF/89/850). It was performed by the experts of SOFRECO from April to July 1993 including a journey in Zimbabwe from May 11th to May 21st, 1993.

During this study, we met many persons involved in the project, chiefly in the following organisations :

- UNIDO in Vienna and Harare
- Ministry of Industry
- Government of Zimbabwe
- ZECO (Zimbabwe Engeneering Company) in Bulawayo
- Confederation of Zimbabwe Industries
- Zimtrade
- French Trade Commission Central Statistical Office.

We thank them for their participation.

IMPORTANT NOTE

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The first diagnostic survey was performed in the middle of 1991.

Upon arriving at the site in May 1993, the SOFRECO's experts discovered that ZECO was already implementing a new expansion project with a value of about 5 million US$, that is approximately 20 % of the company's turnover.

The project is the expansion of the rolling stock production capacity.

In May 1993, financing was approved with 50 % through shareholders' funds and 50 % through a commercial bank loan.

- the equipment was ordered,
- the civil works had begun, including increasing the length of the existing bays.

The beginning of operations with the new facilities is planned for the 4th quarter of the current year (1993).

Moreover, taking into account the present and future status of the accessible market for ZECO, it appears that the present expansion will allow ZECO to be well adapted to its market for several years.

Therefore, no other project could be suggested and studied.

Consequently, the present study is more a post justification of ZECO's expansion project than a real pre-feasibility study.

SUMMARY

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ZECO is an important public company, incorporated in Zimbabwe and located in Bulawayo.

The main business is manufacturing of rolling stock, fabrication engineering and erection contracting .

The current manpower is about 1 000 persons and the turnover approximatively 17 million US dollar, of which more than 50 % in rolling stock.

From 1968 (date of the first orders of ZECO in the rolling stock field) to 1982, the company worked almost exclusively for NRZ (National Railways of Zimbabwe).

On the contrary, from 1986 to 1992, following a sharp reduction of investments of NRZ, the activity was reassigned to the regional market (Botswana, Uganda, Tanzania, Tazara, Malawi, Madagascar).

The average sales were about 200 wagons per year.

Recently, thanks to the dynamisms of the company, ZECO was able to double its market, to 400 wagons per year, towards new countries like Ethiopia, Burkina-Faso, Malaysia.

Moreover, NRZ has a new important five years restructuration program.

Consequently, ZECO decided to implement an expansion of the rolling stock plant, with an investment of about 5,5 million US$ including expansion of about 30 % of the existing buildings.

The investment will allow :

- quantitatively, to double the rolling stock production,
- qualitatively, to access to the complete fabrication of coaches, with a much higher value added.

According to the computation of SOFRECO in the present feasibility study, this investment has a high profitability with an IRR on investment of 35 %, an IRR on capital of 61 % (these figures being anyhow compared to an inflation of 20 %).

The pay back period is 3 years.

The break-even point of 45 %.

This investment will still increase the profitability of ZECO, which is a sound and well managed company.

Moreover, with its sales mainly oriented towards the export market, ZECO fully benefits of the Government's action to the promotion of investments and development of export.

In short, the profitability of the project and its interest for the sub-region shows that the selection of ZECO by UNIDO was judicious.

We think that UNIDO could assist ZECO in the search of an industrial partner to allow the company to progress into higher valued added activities, for example, complete construction of coaches.

We think also that UNIDO could help ZECO for the search of subcontractors and the conclusion of orders for its equipments.

Key words :

- Zimbabwe
- ZECO
- rolling-stock
- coaches
- expansion
- profitability

CHAPTER I

EXECUTIVE SUMMARY

1. THE ENTERPRISE : PRINCIPAL POSITION AND INTERRELATIONS WITH THE BUSINESS ENVIRONMENT

ZECO is an important mechanical manufacturing company in Zimbabwe, located in Bulawayo.

It is a public company * incorporated in Zimbabwe. The current manpower is about 1000 persons and the turnover in 1992/93 (fiscal year ending 28th of February) was approximately 100 million Zimbabwean dollars (equivalent to 16,7 million US$).

The main business of ZECO is distributed among 3 divisions :

1) manufacturing of railway rolling stock, steam, diesel electric and electric locomotive rehabilitation and assembly,
2) fabrication and structural engineering,
3) erection contracting.

The railway division contributes to about 50 % of the turnover.

In each division, the orders are subject to wide variations. However, the existence of three activities allows the company to regularize its annual turnover.

According to the loads, ZECO makes transfers of unskilled or semi-skilled personnel from one sector to another.

Futhermore, for erection contracting, it is possible to hire temporary manpower.

The present study is relative only to the railway division.

ZECO was founded in 1948 by JOHNSTON and FLETCHER, another manufacturing company in Zimbabwe, which is still an important shareholder of ZECO. The rolling stock activity began in 1964. Up to 1985, ZECO's activity was oriented almost entirely towards the local market, particularly for National Railway of Zimbabwe (NRZ).

From 1986 to 1992, however, an average of over 90 % of the rolling stock was exported to other African countries, namely Botswana, Ethiopia, Tanzania (plus Tazara), Malawi, Mozambique, Madagascar, and Uganda.

In the regional market, the sales of ZECO are also made easier by the fact that NRZ track is laid to a 1 067 mm gauge, the standard gauge for Southern Africa, which is also used by the railways systems in Zambia, Zaire, Mozambique, Botswana,

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* Private sector

Angola, Swaziland, Tanzania/Zambia Railway Authority (TAZARA) and RSA in an inter-connected regional system.

For the near future, in the rolling stock field, the local market for ZECO will become significant again, thanks to an important restructuring program of National Railways of Zimbabwe (NRZ), but the output will remain heavilly export oriented.

The main shareholders of ZECO are the following :

- Meikles Group controls about 45 % of the shares,
- Other private owners 25 %,
- Nominee companies (pension Funds, Brokers, etc ...) : 10 %,
- Foreign owners (non-resident) : 25 % (mainly Barclay's Bank and 4 other companies).

The main competitors of ZECO are the following :

On the local market, one company only, MOREWEAR, located in Harare.

On the international market, numerous and very active companies, principally :

- Daewoo (South Korea),
- PEC (Projects and Equipment Cy) (India),
- SEMAF (Egypt),
- Cobrasma (Brasil),
- TAFESA (Spain).

2. GENERAL INDICATORS : BUSINESS OBJECTIVES AND CORPORATE STRATEGIES ; GENERAL STRENGTHS AND WEAKNESSES

From an operation's point of view, the following table gives the main indicators.

	1991 $000		1992 $000		1993 $000
Sales	74 623		61 447		101 374
Sales Tax	1 237		1 099		
	75 860	100 %	62 546	100 %	
Less : Cost of materials and services purchased	56 001	74 %	42 231	68 %	
Difference	**19 859**	26 %	**20 315**	32 %	
Value added per employee	18.9		26.2		
Distributed to :					
Employees					
Salaries, wages and benefits	13 356	67 %	9 457	47 %	
Government taxes	1 237	6 %	1 099	5 %	
Re-invested in the company	2 739	14 %	4 846	24 %	
Depreciation	**767**		**1 499**		
Retained profits	**1 972**		**3 347**		**3 973**
Providers of capital	2 527	13 %	4 913	24 %	
Dividend to shareholders	**1 915**		**3 351**		**4 010**
Interest paid	**612**		**1 562**		**1 760**
	19 859	**100 %**	**20 315**	**100 %**	

The main comments could be the following :

1) The ratio between value added and turnover is in the range of 30 %. This shows that the manpower factor is important in ZECO's business.

2) The ratio between income (retained profit plus dividend) was 5 % in 1991, 11 % in 1992 and 8 % in 1993. This shows that the commercial performance of ZECO is quite satisfactory.

From the shareholders' point of view the main indicators are the following :

	1991	1992	1993
Turnover	74 523	61 447	101 374
Profit after taxation	3 887	6 698	7 983
Total assets	87 0741	126 110	
Shareholders' funds	54 908	64 096	
Return on shareholders' funds	10.4 %	10.5 %	
Earning per share - cents	9.5	11.2	13.3
Dividend per share - cents	4.7	5.6	6.7
Dividend cover - times	2	2	2

The main comments could be the following :

1) The return on shareholders' funds is in the range of 10 %.
2) The board maintains a ratio of two to one between earnings and dividends. This shows concern for giving a normal remuneration to the shareholders while keeping a significant part of the earnings in retained profits for the company.

Regarding the strengths of the company,

in the previous diagnostic survey performed in 1991 by UNIDO experts, the ranking of the companies visited was made through criteria of various weights.

For all six criteria having a factor weight of 10, representing 60 % of the total, ZECO obtained the highest grades. These criteria were the following :

- Technology level
- Product design
- Engineering capability
- General organisation
- Quality and quantity of manpower
- Location and proximity to market centre.

We generally agree with this evaluation.

Regarding the weaknesses, the following points could be mentioned :

- The market for rolling stock fluctuates greatly. ZECO is therefore obliged to maintain a strong commercial action in Zimbabwe and even more so on the export market. This involves the Managing Director himself for high-level discussions with customers, chiefly the railways companies.

  This could be a prcblem, as there is a large concentration of responsibility in one person.

- ZECO is well adapted to the fabrication of wagons. The construction of coaches could necessitate additional expertise.

- The complete construction of high technology equipment is not foreseeable for ZECO.

3. MARKETING CONCEPT

In Zimbabwe, the main customer is of course National Railways of Zimbabwe (NRZ).

Within the framework of its restructuring program, implemented with the help of the World Bank, NRZ will invest in the following components :

- procurement of 25 new main line locomotives,
- repowering of 43 shunting locomotives,
- provision of locomotive spare parts,
- procurement of about 520 dropsided and about 500 highsided wagons,
- procurement of 50 passenger coaches,
- rehabilitation of coaches.

The programme is to be implemented over a six-year period.

ZECO could of course participate in the repowering of the shunting locomotives, the complete fabrication of the wagons, and the rehabilitation of the coaches.

In the sub-region, the situation is difficult. None of the national railways companies is commercially viable.

In Zambia, with efficient operation and reasonable utilisation levels, Zambia Railways (ZR) requires no additional locomotives or rolling stock.
In Tanzania, in the market accessible to ZECO, there will be a rehabilitation of 27 coaches over two years.

In Malawi, the new investments in rolling stock are very small and efforts are mainly oriented towards the improvement of tracks.

In Mozambique, due to the 17-year civil war, the reopening of routes is slow and current main efforts of the Mozambique Ports and Railways (CFM) are oriented to the rehabilitation of tracks.

In Bostwana, the situation is better, but the activity of the national railway company is small.

In short, the expected orders to ZECO from the sub-region are very small in the short and medium term.

Fortunately, thanks to, according to ZECO, untighted credits allowed mainly by Japan. The situation is better in other African countries in the accessible market for ZECO.
Moreover, ZECO will probably get an important order in Malaisia.

To summarize, the present sales forecast of ZECO, in the short term, is the following :

- **Wagons**

CLIENT	QUANTITY		YEARLY AVERAGE
NRZ	400	4 years	100
MALAISIA	500	2 years	250
GHANA	100	1 year	100
OUGANDA	100	1 year	100
SUDAN	100	1 year	100
BURKINA FASO	50	1 year	50
ETHIOPIA	100	2 years	50
TOTAL	**1 350**		**750**

ZECO considers that the probability for getting the orders is 50 % of the total. The annual amount of orders in the short term is therefore 375 wagons per year, for a present capacity of 200 wagons per year.

This shows the urgent need for an expansion of the rolling stock production facilities.

Additional orders in production or rehabilitation of coaches could be the following:

CLIENT	QUANTITY		YEARLY AVERAGE
TANZANIA RAILWAY	27	2 years	14
NRZ	55	2 years	27
TOTAL	**82**		**41**

Using the same probability coefficient of 50 %, ZECO could therefore get orders for the construction of 20 coaches per year.

To this must be added a rehabilitation of 100 coaches in 2 years again in Tanzania, although in this particular case, TANZANIA RAILWAYS would themselves do the rehabilitation and ZECO would supply the components : windows, seats, water Tanks, etc.

- **Locomotives**

In 1970, ZECO ventured into the locomotive field. Since then, the following projects have been undertaken :

- 85 Alsthom diesel locomotives rebuilt structurally, with National Railway of Zimbabwe providing power units.
- 24 locomotives rebuilt and repowered with Brush U.K.
- Rebuilt complete 2 GE locomotives for Mozambique. This included engine and traction motor overhaul and rebuild.
- 3 GM Henschel Locomotives for Ziscosteel, complete rebuild and overhaul of engine.
- Manufacture and assembly of 30 all-electric locomotives with ABB.

- ZECO could therefore participate in the NRZ programme.

4. DESCRIPTION OF THE EXPANSION PROJECT

The sales forecast for ZECO shows that the company has to increase its wagon production capacity from 200 units (current production) to 375 units.

Moreover, the company has to improve its capacity for rehabilitation and construction of coaches.

An expansion project is therefore planned, with the following main features :

Location, site and environment

In order to implement the expansion of rolling stock capacity, ZECO has acquired approximately 6 500 m^2 of land, adjacent to the London Road plant works .

On this new property, the company plans to build new buildings to increase the length of the existing bays. The additional covered area would be 3 700 m^2, an increase of 31 % of the workshop's size.

Since it is therefore an expansion, the new project will benefit from the existing facilities in utilities, electricity, water, of the present works.

Technology

Additional equipment can be divided into two categories :

- complementary machines of existing types (but probably with some improved performance due to up-to-date technological progress) such as lathe, drill, press, fork lifts, plate rolls, shot blasting machine, saws, etc ...
- new facilities allowing more integrated production (providing more value added) such as fiber glass moulding shop for seat manufacturing (until now, seats have been purchased from suppliers for previous coach refurbishing).

Investments and additional sales

Financial statements for the new expansion projet are the following, in million US$ or Z$:

Fixed investment

Foreign currency	2,55 MUS$ or 16,32 M$
Local currency	17,28 M$
Interest during construction	0,83 M$
TOTAL	**34,43 M$**

Additional sales

Taking into account only the rolling stock increase in wagons with a price per unit of 55 000 US$, the additional sales are the following :

Foreign currency	80 %	7,7 MUS$ or 48,28 M$
Local currency		13,32 M$
TOTAL		**61,600 M$**

Sales correspond to approximately twice the value of the investment.

This is caracteristic of a "light industry" but we must keep in mind that this new investment benefits from existing facilities.

Production costs

The respective weights of the components are the following :

	M$	
- raw materials	18.64	39 %
- labour, direct	12.3	26 %
- overhead and administrative costs	10.11	22 %
- other production costs	2.6	6 %
- depreciation	2.37	5 %
- financial costs	0.83	2 %

Raw materials

Raw materials employed are composed mainly of steel or aluminium plates and sheets. The plates are used for building underframes or chassis of rolling stock and also special tanks (for high pressures). The sheets are used for building tanks and panels or doors of wagons and coaches. Aluminium is used as often as possible in order to reduce weight, thereby improving the load capacity. Sectional steels are either purchased or made in the company workshops according to their size, dimension or shape.

Other components such as bearings, axles, wheels, couplings, braking systems, welding rods, paint, electric wires, etc, are supplied by local or foreign factories. Bearings and couplings are imported from specialized foreign companies, as is the case for most braking systems components. Axles machining is carried out in ZECO plants with special imported steel.

Approximately, 30 % of the value of raw materials are imported and 70 % are supplied locally.

Human resources - Administration and overhead costs

The expansion will lead to the creation of roughly 150 additional jobs.

ZECO has some problems finding locally skilled manpower.

Administration and overhead costs are in fact the additional commercial costs resulting from development of sales in other African countries or overseas (Malaisia).

Plant implementation

The delivery time is less than one year.

Of course, ZECO's structural and erection divisions will participate in a large part of the civil engineering works and the estimated budget could be reduced.

Excavating work is being done. Workshop erection and equipment mounting will be achieved by the end of this year. Final machine layout will be optimized taking into account materials flows in connection with production lines.

Source of finance

A - FOREIGN

For the initial investment in foreign currency, a private bank loan of 2,6 MS$ could be arranged.
ZECO believes that the company would not have any problem obtaining such a loan.
The conditions would be approximately the following :

maturity	8 years
interest rate	10 %

B - LOCAL

The initial investment in local currency of 17.28 M$ would be entirely covered with funds from the shareholders, through an increase of capital, if necessary.

5. FINANCIAL ANALYSIS

Taking into account the investment cost, source of finance, production costs, depreciation rates, etc, the financial results obtained through the COMFAR are the following :

1. Internal rate of return

A. The Internal Rate of Return on total investment (IRR) is equal to 35 %.

This figure, when compared with an average level of 20 % for interest rates in Zimbabwe, shows a good profitability for the project.

B. The Return on Equity (IRRE 1) is equal to 61 %.

This criteria is in relation with the possibility of attributing dividends to shareholders, which is obvious in this project.

2. Pay back period

The pay back period is 3 years, which is quite satisfactory.

3. Debt service ratio

This ratio is always higher than 1. There is therefore no cash problem.

4. Break-even point

including financial costs, the break-even point is equal to 45 %.
This good ratio shows a good security in regard to sales variations.

To summary, the financial profitability of this project is excellent.

Variant with inflation

We proceeded to COMFAR calculations with an inflation rate of 10 %.

The IRR is then 41 %
The IRRE 1 is 72 %

The profitability is not altered by inflation.

To summary, the expansion project is excellent for ZECO.

This expansion has been made possible by the considerable efforts made by the company to increase its sales, particularly on the export market.

Conclusion and recommandations

From a technical point of view, ZECO's primary market is in wagon construction and the rehabilitation of coaches and steam locomotives.

With the technical expertise which ZECO intends to acquire this technology could easily be tranferred to the complete construction of coaches.

However, the fabrication series are small (300/400 wagons of various types per year). This does not justify the large degree of automatization that would be necessary to produce higher-technology items. Moreover, the market for locomotives is very limited.

In fact, ZECO is well adapted to its market and it would be hazardous for the company to proceed with a large investment for more sophisticated products.

From a commercial point of view, ZECO was clever enough to release itself from the economic stagnation of the subregion and of PTA countries in general. Thanks to, in particular, the dynamism of its Managing Director, ZECO was able to obtain contracts in other countries, thus allowing it to double its sales in wagons and to proceed with an expansion of the rolling stock facilities, through the project described in this study. The new equipment will be in operation before the end of the current year (1993). Moreover, the NRZ's restructuration programme will allow ZECO, in the coming years, to maintain its current workload even if all other projected ex) rt sales did not materialize.

From a financial point of view, as can also be seen in various production, financial structure and profitability ratios, ZECO is a sound and well-managed company.

ZECO gives its shareholders a good return. However, these shareholders are concerned with :

- permanently promoting the development of their company, at the same time retaining for the company an equal amount of funds as for dividends,

- keeping complete financial independence. The increase in capital in 1991 was done partly to eleminate all medium-term bank loans.

The new investment will increase ZECO's profitability. It must be emphasized, however, that this expansion results from the company's commercial efforts.

From a point of view of regulations, the Government's action largely contributes to the promotion of investments and development of export (OGIL, ERS, EIS, fiscal incentives). With its sales mainly oriented towards the export market, ZECO benefits fully from these regulations.

In conclusion :

- The extension project has reasonable objective and has adequately estimated the additional investment for equipments and civil engineering works required for the activity increase.

- Risk is practically nil and could only be caused by a wrong market forecast or a bad training for certain coach manufacturing operations (design, welding techniques, etc ...). This is however perfectly avoidable with technical supports from specialized coach manufacturers.

In recommandation :

The profitability of the project and its interest for the sub-region shows that the selection of ZECO by UNIDO was judicious.

We think that UNIDO could assist ZECO in the search of an industrial partner to allow the company to progress into higher valued added activities, for example, complete construction of coaches.

We think also that UNIDO could help ZECO for the sea rch of subcontractors and the conclusion of orders for its equipments.

CHAPTER II

THE ENTERPRISE: BACKGROUND AND HISTORY

2.1. BACKGROUND

Zeco Ltd is one of the largest mechanical manufacturing companies in Zimbabwe. It has been involved in the following fields for some of which it has acquired a good know-how :

a) Railway activities (Rolling stock)

Main activity of ZECO in this field is related to trailer stock, i.e. :

- Wagons
- Tankers
- Coaches

For tractive stock, ZECO has not designed nor built complete new locomotives or power cars. Its experience has been acquired through :

- Refurbishing of locomotives (especially steam locomotives and Diesel locomotives)
- Assembling of electric and Diesel (electric or hydraulic) locomotives.

b) Structural Engineering

Design, fabrication and assembly of Structural Steelwork, platework, steel framed buildings, material handling systems, conveyors,pressure vessels and Bulk Storage Tanks.

In fact, the company has to diversify its range of products and to gain parts of export markets in order to maintain a relative stability of the activity in the plants.

The present report deals only with rolling stock activities (trailer and tractive stock).

We have proceeded to a thorough analysis of the contracts carried out by ZECO for the period between 1964 and 1992. Three types of table classifying the contracts per Year, per Client, per type of Items are attached to this report. They are the basis of recapitulating documents leading to the following results :

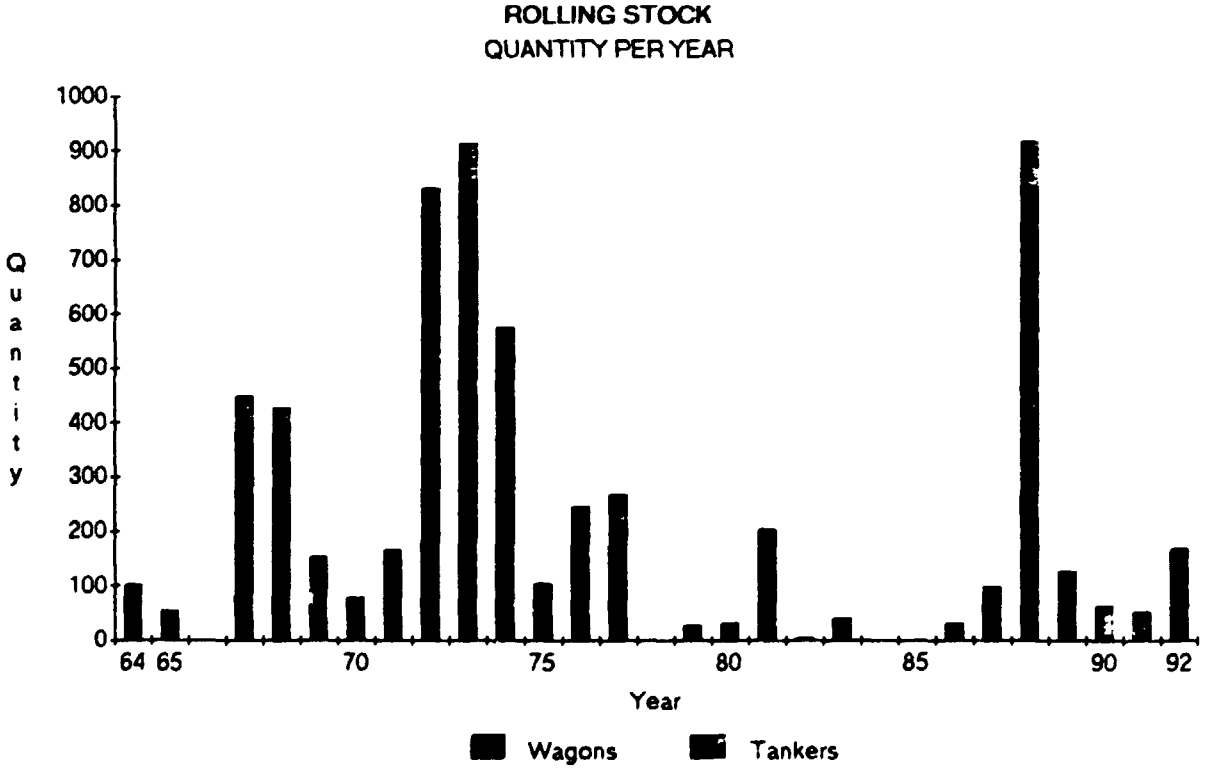
a) For the 1964 to 1992 period, rolling stock activities were subject to wide variations as it can be seen on the attached document named "Recapitulation of contract analysis: Classification per year" (see next page).

RECAPITULATION OF CONTRACT ANALYSIS

(ref:zerecap)

Classification per year

Year	Wagons	Tankers	Wag.+Tk.	Bogies	Wheelsets	Export%
1964	100		100			0.00%
1965	52		52			0.00%
1966			0			0.00%
1967	391	55	446			0.00%
1968	400	25	425			0.00%
1969	152		152			34.21%
1970	78		78			0.00%
1971	150	15	165			0.00%
1972	831		831			0.00%
1973	845	67	912			5.48%
1974	542	31	573			8.73%
1975	100	3	103			0.00%
1976	194	48	242			0.00%
1977	215	50	265			0.00%
1978			0			0.00%
1979	26		26			0.00%
1980	25	4	29			0.00%
1981	201	1	202			0.00%
1982	1	3	4			0.00%
1983	26	14	40			0.00%
1984	0	0	0			0.00%
1985	0	0	0			0.00%
1986	30		30			100.00%
1987	96		96			100.00%
1988	837	80	917			100.00%
1989	125		125			100.00%
1990		63	63			100.00%
1991	51		51	214	484	98.04%
1992	167		167			82.04%
Total	5635	450	6094	214	484	



b) As it can be seen on the document "Zeco rolling stock output" (see next page), Zeco has exported only 3.3% of its rolling stock output during the 1964-1985 period.

c) On the contrary, for the 1986-1992 period, Zeco has exported up to 97.9% of its rolling stock output to the following African countries :
Bostwana, Ethiopia, Tanzania, Tazara, Malawi, Mozambique, Madagascar, Uganda.

If National Railways of Zimbabwe (NRZ) has been ZECO's most important client, rolling stock activities for Export are increasing very rapidly.

In fact, ZECO forecasts a large increase for rolling stock activities in the forthcoming two years. However ZECO has purposedly limited its market quantitative evaluation to 1994 and 1995. The consequence of this evaluation on Zeco work load will be examined further. It is the basis of the project examined in this report.

However a large part of NRZ rolling stock is more than 30 years old.. Therefore the ZNR investment programme for the 1991-1995 period has planned to replace 1961 general purpose wagons and 155 passenger coaches. Untill the end of 1992, ZECO has received no order related to this programme. Only orders for 400 wagons and 55 coaches are projected for 1994 and 1995 probably due to a shortage of credit. This delay will consequently contribute to increase the output volume and national market share for the years following 1995.

2.2. THE ENTERPRISE

2.2.1. General information about the Enterprise

Name of the Enterprise	:	ZECO Limited.
Address	:	38 Josiah Chinamano Road, Bulawayo (Zimbabwe)
Date of incorporation	:	1948
Total staff and manpower	:	approximately 1000 people
Ownership	:	Meikles Group controls about 45% of the shares. Other private owners 25 % Nominee companies (pension Funds,Brokers, etc....): 10% Foreign owners (non-resident): 25 % (mainly Barclay's Bank and 4 other companies).

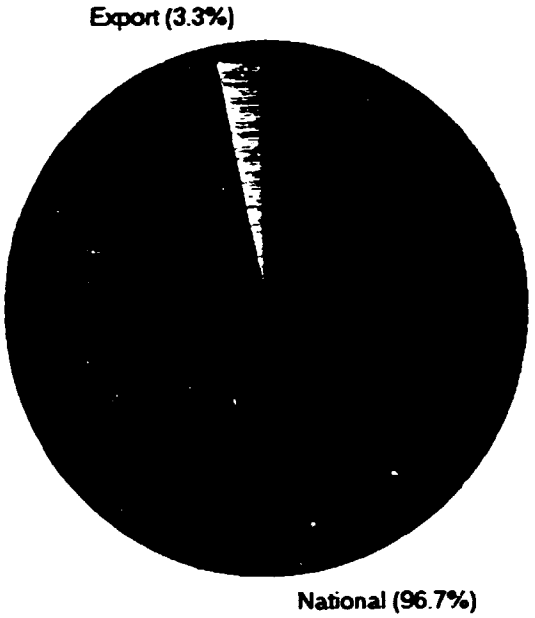
ZECO ROLLING STOCK OUTPUT

(ref: zecexpor)

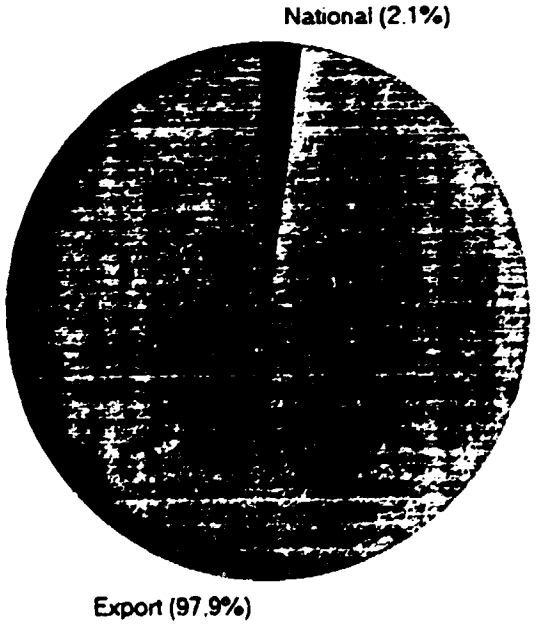
National/Export Shares

Period	Market	Quantity	0%
1964-1985	National	4493	96.73%
	Export	152	3.27%
1986-1992	National	31	2.14%
	Export	1418	97.86%

ZECO ROLLING STOCK OUTPUT (1964-1985)
NATIONAL/EXPORT SHARES



ZECO ROLLING STOCK OUTPUT (1986-1992)
NATIONAL/EXPORT SHARES



Corporate set-up

The company has important shares of local market and is gaining parts in rolling stock market of Southern Africa.

Company financial situation is solid. Estimated turnovers for 1993 and the following years show regular increase with good profit margins.

Affiliation to other companies, groups or individuals.

No affiliation has been mentioned by the Company at the moment.

Competitors

a) Local competitors

- MOREWEAR, located in Harare, is cited as Zeco main competitor.

- Other potential competitors:

The following companies are involved in rolling stock manufacturing, with production range different from ZECO but can potentially try a diversification towards similar products :

F.ISSELS and SON Limited in Bulawayo.
O'CONOLLY and Co Ltd in Bulawayo.
Professional Engineering Co

b) Foreign competitors

They are much more numerous and very active on international rolling stock market. They have offered prices much lower than ZECO a some circumstances.

Daewoo (South Korea).
PEC (Projects and Equipment Cy). (India).
SEMAF (Egypt)
Cobrasma (Brasil)
TAFESA (Spain)

2.3. HISTORY

ZECO Ltd was founded in 1948 in Bulawayo by Johnson and Fletcher Co which is still holding 20% of ZECO shares through several shareholders. The rolling stock activity has significantly increased since 1964. Presently ZECO is the most important rolling stock manufacturer in Zimbabwe and probably in Southern Africa (except South Africa).

According to ZECO forecast, its rolling stock activity will greatly increase in the 90s. For 1994 and 1995 for example, ZECO rolling stock turnover will be 50% greater than for 1993.

Additional facilities has to be provided in very short term in order to cope with this activity increase.

CHAPTER III

MARKET ANALYSIS

The main business of ZECO, which is an incorporated company in Zimbabwe, consists of the manufacture of railway rolling stock : steam, diesel electric and electric locomotives rehabilitation and assembly : structural engineering and erection contracting.

The rolling stock division is by far the largest.

The natural market for this division is of course the domestic market, particularly the National Railways of Zimbabwe (NRZ), as well as some large companies such as Zimbabwe Iron and Steel Corporation (ZISCO).

Both NRZ and ZISCO are parastatal companies.

In the regional market, the sales of ZECO are also made easier by the fact that NRZ track is laid to a 1 067 mm gauge, the standard gauge for Southern Africa, which is also used by the railway systems of Zambia, Zaire, Mozambique, Botswana, Angola, Swaziland, the Tanzania/Zambia Railway Authority (TAZARA) and RSA in an inter-connected regional system.

3.1. THE MARKET FOR ZECO IN ZIMBABWE

3.1.1. Background

As a landlocked country, Zimbabwe faces a serious problem with respect to the transport of its imports and exports through neighboring countries. The shortest rail routes to the sea are two lines through Mozambique, but full use of these lines has been severely handicapped by armed bandit attacks and deterioration of facilities. As a consequence, Zimbabwe's trade has become heavily dependent upon the relatively long and costly rail routes through RSA, the main route for this purpose being the lines through Botswana and Beitbridge to Port Elizabeth and Durban. Situated astride key international rail and road routes, Zimbabwe's transport network is of vital importance to the entire Southern Africa region, particularly to Zambia, Zaire, Malawi and Botswana.

The mainline network of NRZ was built between 1897 and 1904 to link Harare and Bulawayo to each other, to newly developed coal fields in Hwange in the northwestern part of the country and to the seaports of Beira and Cape Town. The mainline was extended into Northern Rhodesia (now Zambia) in 1907 following the discovery of lead, zinc and copper deposits in the central part of that country.

Subsequent additions to the system focussed on extending the branch line network to connect areas of agricultural and mining potential to the mainline network. In the early 1950s, the mainline network was extended to the southeastern border

town of Chicualacuala to connect to the southern railway network in Mozambique and provide access to the port of Maputo. the mainline was further extended from Rutenga to Beitbridge on the border with RSA to provide a shorter, alternative connection to the RSA railways network following increasing disruptions to operations on the Beira line by Zimbabwean freedom fighters and the total closure of the route on the independence of Mozambique.

The main rail routes in the region are shown on in the following map

3.1.2. National Railways of Zimbabwe

National Railways of Zimbabwe (NRZ) operates 3 414 Km of track and carries about 14,4 million tonnes of freight (1991) and 2,3 million passengers per year.

3.1.2.1. Assets and resources of the company

A) Locomotives

The NRZ motive power fleet consists of 30 electric, 80 steam and 285 diesel locomotives (as of late 1989). The 30 Co-Co electric locomotives, acquired in 1984, are of 2 400 KW rating operating at 25 KV, 50 Hz, single phase, and were built mainly by ZECO with equipment and parts supplied by European firms. The steam locomotives, acquired between 1949 to 1957, are of the articulated "Garratt" type, and are based at Bulawayo. Steam operations are confined to the Bulawayo-Victoria Falls section where they have been progressively supplemented by diesel locomotives as the density of traffic on this section has increased and the steam locomotives' haul capacity has been derated due to boiler efficiency problems. Diesel locomotives, accounting for over 70 % of engine-kilometers performed by NRZ, form the backbone of the motive power on the system. The diesel locomotive fleet is highly heterogeneous with as many as 13 different classes of different makes. Currently, out of a total of 285 locomotives in the diesel locomotive fleet, only 188 are serviceable.

The trend of locomotive availability (defined as the proportion of the serviceable fleet available for traffic operations) on the system has been as follows :

AVAILABILITY OF SERVICEABLE LOCOMOTIVES (%)

Type of locomotive	1983	1984	1985	1986	1987	1988	1989
Electric		64,0	55,6	55,4	67,2	73,0	74,2
Steam	46,6	41,6	38,6	42,0	42,1	40,0	37,5
Diesel	68,8	70,3	67,5	62,9	54,9	53,0	51,6

The trend of availability of the steam locomotives has been reasonable given the aging of the fleet. All spare parts for this fleet are manufactured or refurbished locally, mostly by ZECO. The availability of the electric locomotives has not been a serious concern.

The availability of the diesel locomotive fleet has deteriorated progressively in the last ten years, with the main underlying cause being the multiplicity of types and makes. Many of the classes of diesel locomotives have proved to be prone to problems and failures and need intensive maintenance. The diverse fleet requires good maintenance planning, an extended spectrum of technical skills and adequate spare parts inventory to ensure its adequate maintenance. The NRZ maintenance organization has been deficient in all three respects. Until recently, no systems of planning for the maintenance of the fleet and the manpower and spare parts requirements for such work has been in use.The rapid loss of skilled and experienced staff after independence and the rapid turnover of staff trained by NRZ have undermined NRZ's ability to deploy the wide array of skilled staff necessary to maintain the diverse fleet. This has been exacerbated by NRZ's inventory management system which became increasingly deficient through the 1980s as a vehicule for ensuring that the maintenance departments have the right volume of the right type of spare parts at the right time.

NRZ also suffered much from the domestic rationing of foreign exchange.

B) Wagons

In December 1989, NRZ undertook, for the first time, a physical census of its wagon fleet to ascertain the number and condition of the wagons in the fleet. The census results indicate that the total stock of NRZ's serviceable wagons is 12 147 units distributed across wagon types as follows :

Open Highsided	Open Dropsided	Tank Cars (P.O.L.)	Tank Cars (Others)	Others	Total
7,012	1,179	674	186	3096 *	12,147

* Including 600 wagons owned by ZISCO, the parastatal steel company, but operated by NRZ.

About 51 % (3 580) of the fleet of highsided will be life-expired on a chronological basis (i.e. over 40 years old) by the end of the decade. Of the other types of wagons, about 68 % of the fleet of livestock wagons, 36 % of the tank car fleet and all of the fleet of specialized explosives wagons will be life-expired by the end of the decade.

C) Passenger coaches

NRZ has a stock of 322 coaches for passenger services of which 170 will reach the end of their accounting lives (40 years) between 1991 and 1995 and a further 63 coaches between 1996 and 2000.

Given the absence of an incentive to be cost effective in the acquisition and use of assets, NRZ has historically taken the simple accounting lives rather than the condition of its assets as a basis for programming investment requirements and has been planning for a sizeable wagons and coaches replacement investment program over the last three years on this basis.

3.1.2.2. Restructuring programme

Consequently, NRZ has an important restructuring program which will be implemented with the help of the World Bank. For the locomotives and the rolling stock, the main features of this program are the following :

A) Locomotives

- **Main line locomotives**

Out of its current diesel locomotive fleet of 285 units (as at late 1989), NRZ plans to scrap or set aside 130 units by the end of 1995. Of the residual diesel locomotive fleet of 155 serviceable units at the end of the scrapping program, 83 units will be suitable for mainline service. The 83 units will consist of 3 classes of locomotives with different performance characteristics. However, based on their relative recent operation performance, theses locomotives are equivalent to 71 units of the most reliable and productive of NRZ's diesel locomotive fleet (the DE10A class).

Based on a review of the railways' traffic prospects, the requirement for mainline locomotive in 1997, when NRZ's effective capacity is projected to equal the maximum forecast traffic, will be for 95 DE10A class equivalent units, leaving a shortfall of 24 main line units (DE10A equivalents).

To fill the gap in NRZ's requirements over the next five years, threee broad choices have been examined : (i) acquisition of new locomotives ; (ii) repowering of some locomotives with suitable structural characteristics capable of being fitted with equipment similar or equivalent to DE10A class equipment ; and (iii) a mix of acquisition and repowering. There are a number of risks attached to the approach of repowering. In particular (i) there is no experience of repowering on the scale and complexity envisaged ; (ii) the prototype needs long-term trials and evaluation. There are also significant risks that (i) problems in production will lead to significant slippage in the delivery of locomotives as compared to the purchase of

new ones ; and (ii) the repowered locomotives may prove significantly less reliable and therefore less productive than new ones. Accordingly, GOZ and NRZ have decided that it would be best to acquire new locomotives and focus NRZ's engineering management efforts on the maintenance of its serviceable fleet.

The World Bank agreed with this position and for the procurement of 25 mainline locomotives equivalent to 29 DE10A class units. The new locomotives will operate predominantly in the eastern region where the track is better, the traffic denser and the hauls longer and that will have a relatively higher availability. The surplus of 5 locomotives on assessed requirements will grant NRZ additional flexibility in operations.

- **Repowering of Shunting Locomotives**

The core of NRZ's shunting locomotive fleet in the DE9 and DE9Alocomotives comprising 89 % of thes shunting locomotives. The DE9 locomotives are being repowered under a World Bank loan. The DE9A fleet is powered by the same make of engine as in the DE8 series mainline units. Similar problems have been encountered with these locomotives, with poor reliability and complex and intensive maintenance requirements.

Repowering is not a as technically complex as in the case of the DE8Bs since only the engine would be replaced. A prototype repowering using the engines to be fitted in the DE9 locomotives has already been successfully undertaken by NRZ with assistance and production guarantees from the engine manufacturers. NRZ intends to repower the 43 remaining units in the fleet of DE9As with the same type of engine as used in the successful prototype.

- **Locomotive Spare Parts**

NRZ has a significant accumulated backlog of schedules locomotive maintenance. The spare parts requirements for the estimated two years of backlog have already been assessed under a short-term Maintenance Action Plan. The foreign exchange requirements for routine ongoing maintenance of locomotives would be provided by the Government.

B) Procurement of wagons

A detailed assessment of NRZ's projected operating performance and a review of its planned wagon scrapping program indicates that, with the attainment of the wagon productivity targets, NRZ would need to invest in 520 dropsided wagons over the next five years to meet the prospective demand for rail transport of high density commodities.

These wagons, which will be funded under the project, would serve a dual role as carriers for both breakbulk and containerized traffic.

The assessment indicates that there will also be a shortfall of about 1,000 highsided wagons by 1995.

NRZ will buy 500 wagons ; the balance of the shortfall in highsided wagons being hired from contiguous railways.

C) Coaches

The requirement for coaches to operate the existing level of domestic passenger services has been estimated at 164 coaches, including provision for maintenance and spares. An additional 50 coaches are required for peak periods and for festive seasonal trains for a total requirement of 214 coaches under the current level of service provision. By 1995, the stock of non-life-expired coaches would be 152 units leaving a shortfall of 62 coaches to provide the existing level of service. The physical census of coaches indicates that a substantial number of coaches that will be life-expired have serious structural defects and it will not be cost-effective to rehabilitate them. Moreover, as NRZ completes the structural adjustment of its fares to cost recovery levels, it would need to upgrade the standard of its coaching fleet to stay competitive with road transport, particularly on the important Harare-Bulawayo segment.

To enable NRZ to continue to provide an acceptable level and quality of service, the procurement of 50 coaches was planned. For the balance of requirement of coaching stock, NRZ would select coaches that are life-expired on the basis of age but that are in reasonable condition and undertake minimal refurbishments on them for use on festive and seasonal trains. To protect the financial viability of the passenger services, agreement was reached with Government that passenger fares wil be increased each fiscal year by amounts sufficient to enable NRZ to generate adequate additional revenues to cover the amortization of coaches procured during such fiscal year. Agreement was also reached with Government that the passenger services' revenues and attributable costs will be accounted for and disclosed separately from NRZ's other activities in NRZ's annual accounts.

3.1.2.3. Summary

To summarize, the investment programme of NRZ consists of the following components :

- **procurement of 25 new main line locomotives,**
- **repowering of 43 shunting locomotives,**
- **provision of locomotive spare parts for clearing arrears of deferred maintenance,**
- **procurement of about 520 dropsided and about 500 highsided wagons,**
- **procurement of 50 passenger coaches,**
- **rehabilitation of coaches.**

The programme is to be implemented over a six-year period.

ZECO could of course participate in the repowering of the shunting locomotives, the complete fabrication of the wagons, and the rehabilitation of the coaches.

3.2. OTHER MARKETS FOR ZECO IN THE SUB-REGION

3.2.1. Zambia

Zambia Railways Ltd (ZR) operates 1988 Km of track and carries about 4 million tonnes of freight and 100 000 passengers per year. ZR's operational performance is poor and getting worse. Freight traffic of 4,9 million tonnes in 1988/89 fell to 3,4 million tonnes in 1990/91 and fell again in 1991/92 to 3,1 million tonnes. Actual locomotive availability has declined from 63 percent in 1986 to 43 percent in 1991.

As a result, ZR has had to hire locomotives from South African Transport Services (SATS) now knows as SPOORNET (25 in 1989, 22 in 1990 and 13 in 1991). Wagon turnaround times have also deteriorated. To address these problems, ZR prepared a ten-year development plan, involving expenditures of over US$ 200 million, and including the purchase of 26 Canadian locomotives and 52 new passenger coaches.

However, this plan was considered unrealistic by the World Bank, and was finally dropped and replaced by a more modest and commercially oriented program.

The study showed that, with efficient operation and reasonable utilisation levels, the corporation requires no additional locomotives and rolling stock.

According to the World Bank, ZR needs to improve its accounts, focus its core business on freight railways, improve overhaul and maintenance of locomotives and rolling stock, improve operational efficiency and rehabilitate high priority sections of track in a cost-effective manner.

In fact, with improved performance, no hires are necessary and there may even be a large surplus of locomotives and wagons.

Under these conditions, it is clear that ZECO will not get any significant order from ZR in the short and middle term.

3.2.2. Tanzania and Tazara

The main rail network of Tanzania consists of some 2 580 Km of track. The main system linking Dar-es-Salaam with the central and northern regions was constructed in 1914 and the gauge is inadequate to handle current traffic requirements.

The Tanzania/Zambia Railway Authority (Tazara) is a joint venture between the Governments of Zambia and Tanzania.

Tazara operates 1 860 Km of railway, of which 970 Km are in Tanzania, linking Dar-es-Salaam with Kapirir Mposhi in Zambia. The line, built with Chinese assistance, was opened in 1975 and mainly carries Zambian trade to Dar-es-Salaam port. This link was designed for a capacity of 2 million tons per annum. Severe shortages of rolling stock and financial difficulties have led to the periodic suspension of operations. Rehabilition is now under way with assistance from the World Bank.

3.2.3. Malawi

The activity of Malawi Railways Ltd (MRL) is commercial transportation of freight and passengers by rail and by water (Lake Malawi). The main track links Linlongwe to Blantyre. The international route of Nacala in Mozambique was officially reopened for limited commercial traffic in December 1989, but the other international rail route to Beira remains closed.

M.R.L carries about 420 000 tonnes of freight and 500 000 passengers per year (Lake: 160 000).

Like all other railway companies in the sub-region, M.R.L is not commercially viable.

Locomotives, wagons and coaches in service are :

- diesel electric 32
- diesel hydraulic 19
- wagons 814
- coaches 38

A continuous shortage of spare parts and materials and poor maintenance affects the viability of locomotives and wagons.

However, the new investments in rolling stock are very small, with efforts mainly oriented to the improvement of track.

3.2.4. Mozambique

Mozambique provides access to Indian Ocean for its landlocked neighbours in Southern Africa through its three international ports, Maputo, Beira and Nacala. The port of Maputo is linked to South Africa, Zimbabwe, Malawi and Swaziland by rail. The port of Beira is linked with Zimbabwe and Malawi and the port of Nacala with Malawi. There are also indirect links to Zambia, Zaire and Botswana. The rail and road distances between most Southern African countries and the Mozambican ports are shorter than those to alternative ports, leading to cheaper inland transport costs.

Before the 17 years civil war, almost 100 per cent of Malawi's foreign trade, 80 per cent of Zimbabwe's and Swaziland's trade, and 80 per cent of Zambia's copper moved through Mozambique's ports.

In theory, the signing in October 1992 of a general peace accord between Mozambique's Government and RENAMO makes it possible to maintain the roads and tracks safely once again.

However, due to the war, the reopening of the routes is slow and presently main efforts of the Mozambique Ports and Railways (CFM) are oriented to the rehabilitation of the tracks.

3.2.5. Botswana

The only rail route links Zimbabwe (Balawayo) to South Africa (Durban). The activity of the national railway company is small.

In conclusion, the situation of railway companies in the sub-region is difficult, and at present ZECO can hope for few orders for rolling stock from the region, except from Zimbabwe, Tanzania and perhaps Botswana.

3.3. RAILWAY PROJECTS UNDERTAKEN BY ZECO

3.3.1. Orders from 1968 to 1982

For almost 15 years, from 1968, date of the first orders of ZECO in the rolling stock field, to 1982, the company worked almost exclusively for NRZ, other Zimbabwean companies and Malawi.

During this period, the orders were the following :

DESCRIPTION	CLIENT	QUANTITY
Covered wagons	NRZ	500
Container and livestock wagons	NRZ	321
Ballast wagons	NRZ	97
High sided wagons	NRZ	2 059
High sided wagons	MALAWI RAILWAYS	88
Tankers	NRZ	249
Dropsided wagons	NRZ	523
Dropsided wagons	MALAWI RAILWAYS	12
Mechanical fridges	NRZ	86
Other wagons	NRZ	78
TOTAL NRZ	**3913**	
TOTAL MALAWI RAILWAY	**100**	

Others in Zimbabwe

DESCRIPTION	CLIENT	QUANTITY
Tankers	Zimbabwe fuel	50
Slag ladle	Ziscosteel	18
Scrap wagons	Zimbabwe mining	11
Explosive wagons	Zimbabwe explosives	50
Aluminium Coal wagons	Ziscosteel	133
Iron wagons	Ziscosteel	104
TOTAL	**366**	

Summary - Railway Projects from 1968 to 1982

CLIENT	Quantity of wagons	Average yearly quantity
NRZ	3 913	261
Other companies in Zimbabwe	366	24
MALAWI RAILWAY	100	7
TOTAL	**4 379**	**292**

In conclusion, from 1968 to 1982, ZECO produced an average of 300 wagons per year, of which 98 % were for the domestic market.

3.3.2. Orders from 1986 to date

Between 1983 and 1986, the number of orders of ZECO in rolling stock was very low. From 1987 to date the activity was reassigned to the export market, with the following main orders :

DESCRIPTION	CLIENT	QUANTITY
Highsided wagons	Botswana Railways	160
Dropsided wagons	Botswana Railways	250
Covered wagons	Botswana Railways	90
Tankers	Botswana Railways	80
Flat wagons	Botswana Railways	10
Vans	Botswana Railways	10
TOTAL Botswana Railways		**600**
Various wagons	Ethiopia Railways	78
Tray cars	Zambia Copper Mine	20
Highsided wagons	Tazara Railways	275
Covered wagons	Tazara Railways	50
Highsided wagons	Tazara Railways	50
TOTAL Tazara Railways		**336**
Phosphate wagons	Tanzania Railways Corp.	50
Low side bogie wagons	Tanzania Railways Corp.	75
Tankers	Tanzania Railways Corp.	25
TOTAL Tanzania Railways		**150**

(Table continued on next page)

(table continued from previous page)

DESCRIPTION	CLIENT	QUANTITY
Tank containers	Malawi Railways	33
Palm oil tank wagons	Zaïre Railways	5
Rehabilited wagons	Zaïre / Gecamines	50
TOTAL Zaïre		**55**
Lowsided wagons	Uganda Railways	50
Covered wagons	Uganda Railways	50
TOTAL UGANDA		**100**
One wagon	Madagascar Railways	26
Aluminium coal wagons	Zisco Steel	30

SUMMARY OF RAILWAY PROJECTS FROM 1986 TO 1992

CLIENT	Quantity of wagons	Average yearly quantity
Botswana	600	
Ethiopia	78	
Zambia	20	
Tazara	336	
Tanzania	150	
Malawi	33	
Zaire	55	
Uganda	100	
Madagascar	26	
Zimbabwe	30	
TOTAL	**1428**	**204**

In conclusion, from 1986 to 1992, ZECO produced an average of 200 wagons per year, mainly for the export market in the sub-region, plus Ethiopia and Madagascar.

This is the result of a strong commercial action on foreign markets with the use of agents in various countries together with good competitivity in cost prices.

This can be attributed, in large part, to the personal action of the present Managing Director of ZECO.

3.4. PRESENT SALES FORECAST OF ZECO

3.4.1. Quantities

The present sales forecast of ZECO, in the short term, is the following :

Total accessible market

- **Wagons**

CLIENT	QUANTITY		YEARLY AVERAGE
NRZ	400	4 years	100
MALAISIA	500	2 years	250
GHANA	100	1 year	100
OUGANDA	100	1 year	100
SUDAN	100	1 year	100
BURKINA FASO	50	1 year	50
ETHIOPIA	100	2 years	50
TOTAL	**1 350**		**750**

ZECO considers that the probability for getting the orders is 50 % on the total.

The annual amount of orders in the short term is therefore 375 wagons per year, for a present capacity of 200 wagons per year.

This shows the urgent need of an extension of the rolling stock production facilities.

Additional orders in production or rehabilitation of coaches could be the following:

CLIENT	QUANTITY	YEARLY AVERAGE
TANZANIA RAILWAY	27 2 years	14
NRZ	55 2 years	27
TOTAL	**82**	**41**

Using the same probability coefficient of 50 %, ZECO could therefore get an order for the construction of 20 coaches per year.

To this must be added a rehabilitation of 100 coaches in 2 years again in Tanzania, although in this particular case, TANZANIA RAILWAYS would themselves do the rehabilitation and ZECO would simply supply the components : windows, seats, water tanks, etc.

- **Locomotives**

In 1970, ZECO ventured into the locomotive field. Since then, the following has been undertaken :

- 85 Alsthom diesel locomotives rebuilt structurally, with National Railway of Zimbabwe providing power units.

- 24 rebuilds and repowered with Brush U.K.

- Rebuilt complete 2 GE U20C locomotives for Mozambique. This included engine and traction motor overhaul and rebuild.

- 3 GM Henschel Locomotives for Ziscosteel, complete rebuild and overhaul of engine.

- Manufacture and assembly of 30 all-electric locomotives with ABB.

ZECO could therefore participate in the NRZ programme.

3.4.2. Values corresponding to the sales forecast

The sales prices are currently :

Wagon	55 000 US$ per unit
Coach	370 000 US $ per unit

The total probable sales for wagons and coaches are therefore the following :

55 000 x 375	:	20.65 Million US$
370 000 x 20	:	7.40 Million US$
		28.00 Million US$

The turnover of ZECO for the year ending the 28th of February 1993 was 101 374 Million Zimbabwe dollars or approximatively 18 Million US$ of which approximately 10 million US$ for wagons. In 1993/94, the sales in wagons would approximately double and the total turnover of ZECO would increase by approximately 50 %.

This shows again the urgent need for an increase in capacity.

ZECO thinks that this strong increase in orders in many countries comes from new untied credits given by Japan.

3.5. ZECO SALES ORGANIZATION

3.5.1. Strengths of the company

In the previous diagnostic survey performed in 1991 by UNIDO experts, the ranking of the companies visited was made through criteria of various weights.

For all six criteria having the highest factor weight and representing 60% of the total, ZECO obtained the maximum figure. These criteria were the following :

- Technology level
- Product design
- Engineering capability
- General organisation
- Quality and quantity of manpower
- Location and proximity to market centre.

We generally agree with this evaluation.

3.5.2. Sales organization

For the sales in railways projects, the Sales Manager of ZECO is in fact the Managing Director himself.

This is understandable. The customers in this field are almost exclusively the National Railways of the countries, that is to say, large organisations. For these companies, ordering new locomotives or rolling stock is a strategic decision involving the high Management.

In the discussions, the customers wanted as negociator a person fully responsible, with the power to make decisions.

That could be a problem for ZECO as there is thus a large concentration of responsibility in one person. This is also probably emphasised by the strong personality of the Managing Director.

3.5.3. Marketing

Two features have to be mentioned : ZECO, very active on export markets, works with local agents.

ZECO not only answers tenders, but tries when necessary to propose financing for the project, which creates the necessity of also having contacts with banks and financial institutions.

3.5.4. Competitors of ZECO

The main competitors of ZECO are the following :

- In Zimbabwe, ZECO considers that there is only one competitor, MOREWEAR INDUSTRIES LTD in Harare.

- On the international market, the competitors are :

  - DAEWO — Korea
  - PEC (Project and Equipment CY) — India
  - SEMAF — Egypt
  - COBRASMA — Brasil
  - TAFESA — Spain

CHAPTER IV

RAW MATERIAL, FACTORY SUPPLIES AND PRODUCTS

4.1. CHARACTERISTICS OF RAW MATERIALS AND FACTORY SUPPLIES

Raw materials employed are composed mainly of steel or aluminium plates and sheets. The plates are used for building underframes or chassis of rolling stock and also special tank (for high pressures). The sheets are used for building tanks and pannels or doors of wagons and coaches. Aluminium is used as often as possible in order to reduce tare weight, improving therefore the load capacity. Sectional steels are either purchased or made in the company workshops according to their size, dimension or shape.

Other components such as bearings, axles, wheels, couplings, braking systems, welding rods, paint, electric wires etc...are supplied by local or foreign factories. Bearings and couplings are imported from foreign specialized companies. It is also the case for most components of braking systems. Axles machining is carried out in ZECO plants with imported special steel.

Electric energy is of course required for machining, welding or other manufacturing operations.

More detailed explanations on materails and supplies are given in chapter 6 (paragraph 6.3-Technology).

4.2 SUPPLY PROGRAMME

ZECO supply programme is not subject to seasonal variations. However its variation is rather unpredictable and can be very important due to irregularity of orders from customers as it is shown by the table and the graph representing the quantities of wagons and tankers ordered per year from 1964 to 1992. In 1988 for example a total of 917 wagons and tankers had been ordered by customers, but no order was placed on 1978,1984 and 1985. (refer to table attached to paragraph 2.1).

In order to minimize the cost of immobilized stock, ZECO production has been organized on a Just-On-Time basis: Suppliers have to deliver according to a precise schedule, the exact quantity of material or components needed by the wokshops for their manufacturing programme. This method can only be carried out with local suppliers. Generally foreign suppliers of specialized components (roller bearings, axle-boxes,etc...) demand long delivery times and do not accept small orders and deliveries spread out by small quantities.

Of course ZECO tries to reduce these imported supplies as much as possible because of their two main drawbacks: need of hard currencies and incompatibility with Just-On-Time delivery. Nevertheless the share of imported supplies cannot presently be lower than 30% for Wagons and 60% for Coaches.

Annual cost of supplies amounts in average to 72% of turnover for the last four years (1989 to 1992) including domestic and imported supplies. Actually the following figures are found in annual reports from 1989 to 1993.

YEAR OF TURNOVER	TURNOVER (Z$ 000)	SUPPLIES (Z$000)	%
1989	45 117	33 113	73
1990	62 367	46 911	75
1991	75 860	56 001	74
1992	62 546	42 231	68
1993	102 918	72 043	70

The range of ZECO products and activities in the field of rolling stock is largely diversified; Greatest parts of production are composed of Wagons and Tankers. ZECO started in 1961 this activity of manufacturing and repairing wagons.

In 1970 ZECO ventured into the locomotive field in collaboration with Western companies but its collaboration is limited to the manufacturing of certain mechanical parts and to general assembling of the locomotives.

The list of most typical products or services realized by ZECO is given hereafter :

Wagons and Tankers (figures in Annex 2)

TYPE	Total delivered
- Ballast Wagons	112
- Coal Wagons (Aluminium)	296
- Container Wagons	105
- Covered Wagons	690
- Dropsided Wagons	785
- Explosives Wagons	785
- Flat Wagons	12
- Goods/Guards Wagons	76
- Highsided Wagons	2 593
- Hopper Wagons	10
- Livestock Wagons	125
- Mechanical Fridges	190
- Ore Wagons	170
- Phophate Wagons	50

- Slag Ladles 18
- Tankers (fig.in Annex page xx) 441
- Tray Cars 20
- Wagons (General purpose) 61

Coaches

- 12 coaches rehabilitated for NRZ.
- 2 caboose coaches completely rebuilt.

It is clear that untill now ZECO has not yet manufactured complete new coaches but has only acquired some experience in coach complete rehabilitation. Very probably ZECO will need technical supports if it intends to get a part of the African coach market as it appears on the table related to turnover forecast (see next pages).

If ZECO is successful in its diversification towards Coach market, this output will probably represent 55 coaches per year corresponding to about 11 millions US$ of turnover per year i.e. roughly 36% of the rolling stock turnover predicted for the next two years.

Locomotives

- Rehabilitation of locomotives is ZECO main activities in this field.

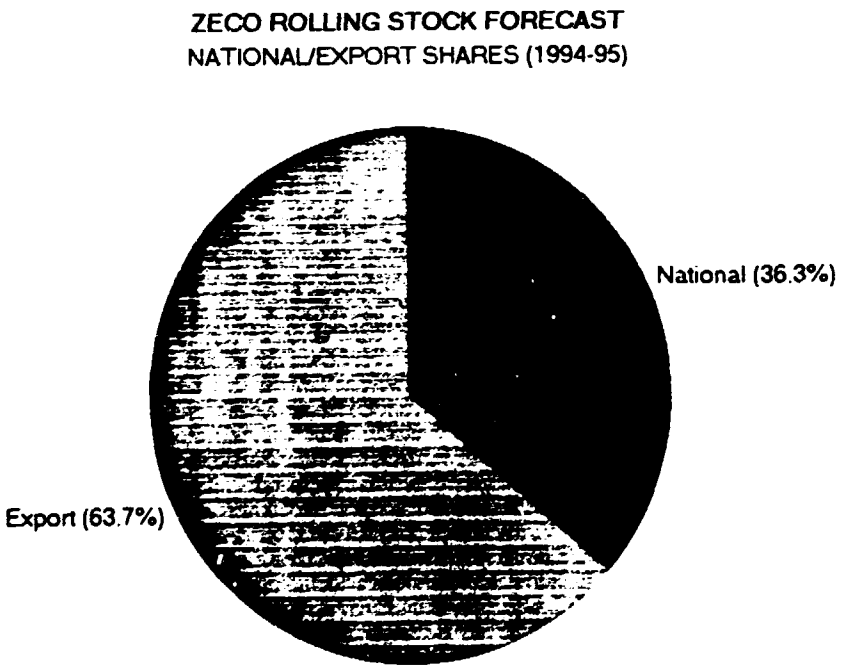
  Since 1970 the following rehabilitations have been carried out :

  - 85 Alsthom diesel locomotives for ZNR.
  - 24 Brush U.K. locomotives.
  - 2 GE locomotives for Mozambique Railways (fig. in Annex 2).
  - 3 GM Henschel locomotives of Ziscosteel.

- Assembly of 30 all electric locomotives with ABB. In this occasion ZECO had also to manufacture parts of the locomotive mechanical structures (fig. in Annex 2).

ZECO ROLLING STOCK
TURNOVER FORECAST 1994-1995
National/Export Shares
(ref: zefocas1)

Market	Turnover US$ 000	0%
National	42350	36.32%
Export	74240	63.68%



TURNOVER FORECAST FOR 1994 AND 1995

(ref:zefocast)

Country	Item	Offer placed or planned: Total Quantity	Unit Price	Total Price	Delivery period	Delivery projected for: 1994	1995
			US$	US$000			
	Wagons						
Zimbabwe Railways	Wagons (HSI)	400	55000	22000	4 years	100	100
Malaysia Railways	Wagons (Containers)	500	55000	27500	2 years	250	250
Uganda Railways	Fuel Tanks & Containers	100	55000	5500	1 year	100	
Ghana Railways	Wagons	100	55000	5500	1 year	100	
Sudan Railways	Fuel Tanks	100	55000	5500	1 year	100	
Burkina Fasso	Ore Wagons	50	55000	2750	1 year	50	
Ethiopa Railways	Wagons (Gl purpose)	100	55000	5500	2 years	50	50
	Total	1350		74250		750	400
Zeco shares (prob.50%)		675		**37125**		375	200
	Coaches						
Tanzania Railways	Coaches	27	370000	9990	2 years	34	33
Zimbabwe Railways	Coaches	55	370000	20350	2 years	28	27
Tanzania Railways	Coaches (rehabilitation)	100	120000	12000	2 years	50	50
	Total	182		42340		112	110
Zeco shares (prob.50%)		91		**21170**		56	55
Zeco cumulated shares (1994-1995)		**686**		**58295**		**431**	**255**

Zeco average turnover (1994-95) per year	**29 148 000**	**US$**
Zeco average delivery (1994-95) per year	**343**	**Items**

CHAPTER V

LOCATION, SITE AND ENVIRONMENT

5.1. LOCATION

ZECO has two plants in Bulawayo, located about 5 km from city centre. Access from city centre to the main plants requires approximately 15 minutes by car or taxi. Both plants are connected to NRZ network by rails. Goods delivery by road is also easy. Roads are generally in good condition in Zimbabwe, especially those leading to big cities like Harare or Bulawayo.

The plants are of course connected to electricity and water networks. There are frequent cuts in electricity and water supply due to recent years drought. Of course, the plants suffer from these inconveniences.

5.2. SITE

The main plant including office block for the management and its staff, is located at :

Stand 5091
Josiah Chinamano Road
P O Box 1874
Bulawayo
Zimbabwe

This site has a surface area of about 46000 sq.metres including the adjacent area of about 18000 sq.metres recently purchased by the company. Excavation is under way in this additional area before erecting the workshops that will be needed at the end of this year to cope with the forecast increase in rolling stock activities for the next two years.

The surface of the existing workshops is approximately 11900 sq.metres. Other premises are available on this site such as the main office, cloakrooms, stores, etc... All the existing buildings cover approximately 60% of the surface. The new workshops will occupy about 3700 sq.metres corresponding to 31% increase of the present workshops surface.

The second plant is located at Leamington road. The surface of this site is about 51000 sq.metres, 50% of which are covered by workshops and other premises for storage, machines, office, etc...

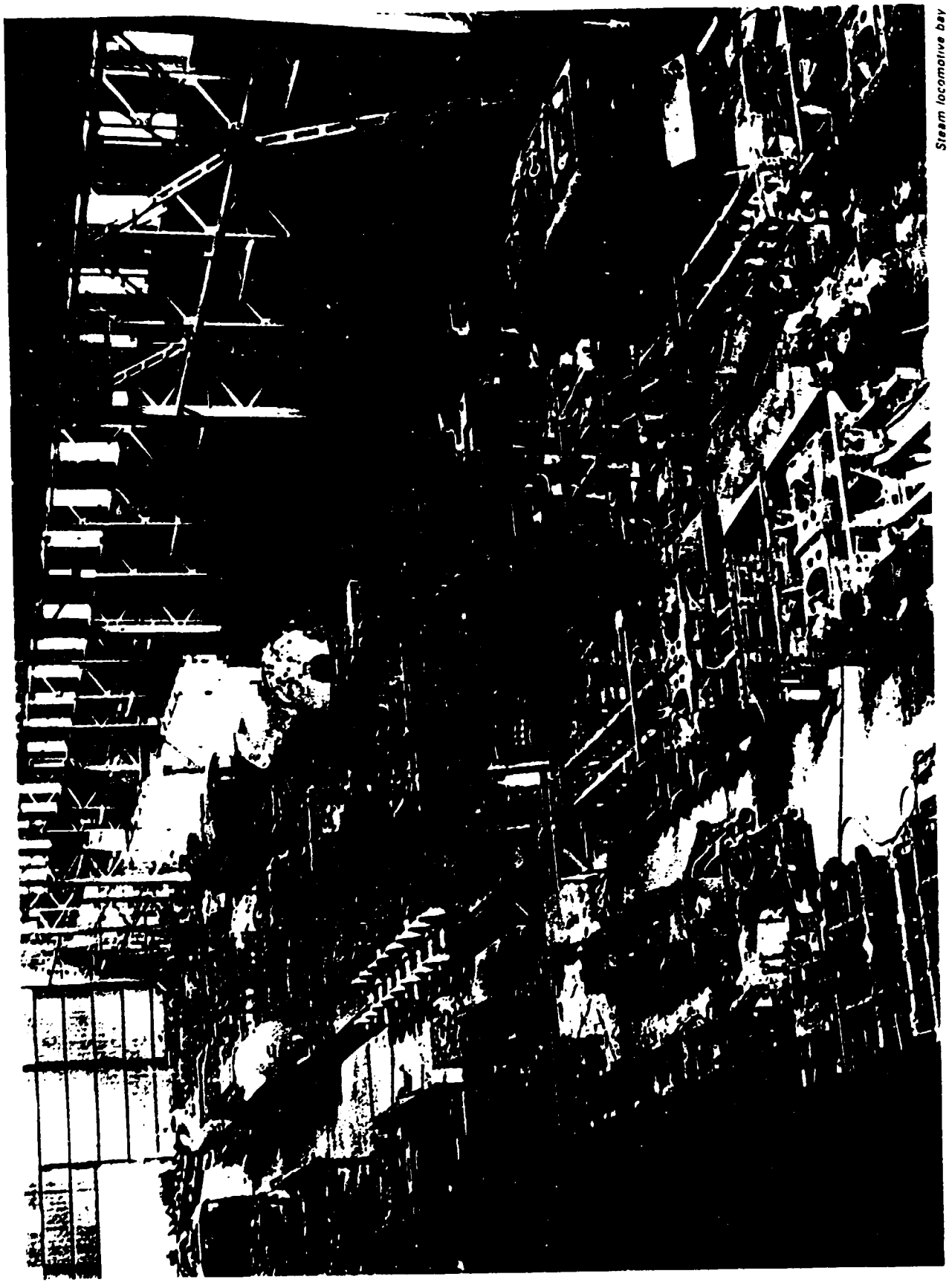
This plant has :

- two bays for railway activities (steam locomotives; fig. next page : steam locomotive bay).

- four bays for structural activities.

- one bay for material preparation (fig. on attached pages).

The plans of both sites are annexed to this report (see attached pages). Striped part on main plant correspond to expansion project persently under way.



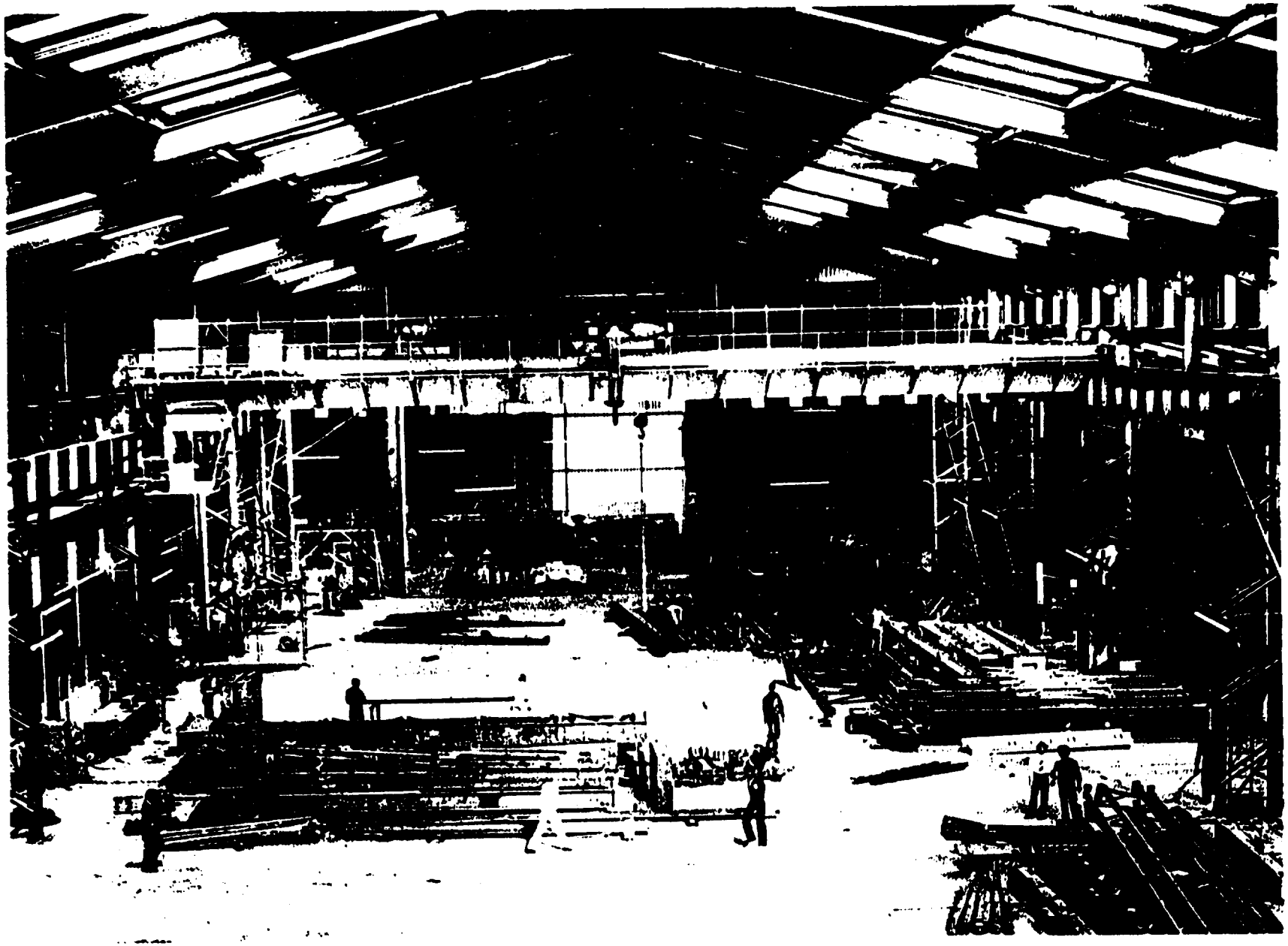
Steam locomotive bay

5.3. LOCAL CONDITIONS

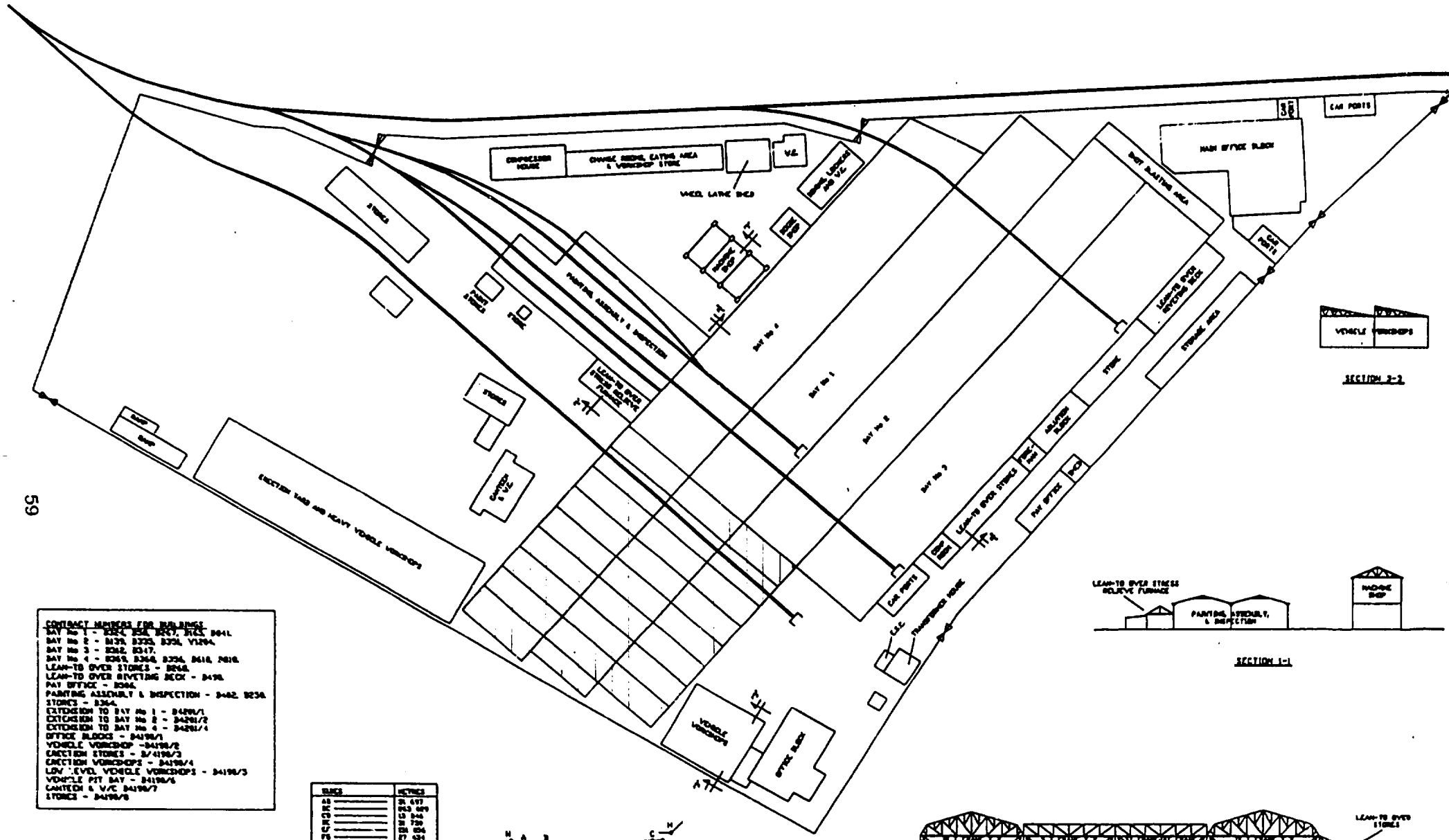
Presently the two plants provide works for about 1000 people in Bulawayo. With the extension of the main plant in relation with an activity increase of 50% in the field of rolling stock, requirement for complementary labour force will create about 150 additional jobs. This has a rather positive impact on local labour market without negative environmental impact :

Indeed the additional civil works consist mainly in the lengthening of existing workshops. Therefore they are well integrated to existing facilities

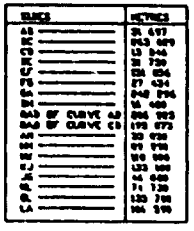
As described in chapter 6, the workshop activities for rolling stock consist mainly in manufacturing operations such as machining, cutting, beveling, bending and welding steel or aluminium plates. They have practically no polluting effect on environment. A simple 50% increase of these actiivities does not alter this matter of fact.

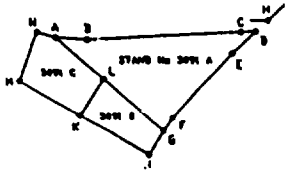


Structual fabrication bay, Leamington Road



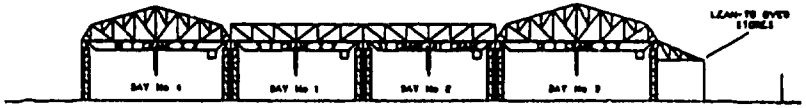
CONTRACT NUMBERS FOR BUILDINGS
BAY No 1 - 8364, 8366, 8367, 8368, 8641.
BAY No 2 - 8339, 8335, 8336, V1294.
BAY No 3 - 8362, 8347.
BAY No 4 - 8369, 8360, 8356, 8618, 7818.
LEAN-TO OVER STORES - 8368.
LEAN-TO OVER RIVETING DECK - 8438.
PAY OFFICE - 8364.
PAINTING ASSEMBLY & INSPECTION - 8482, 8238.
STORES - 8364.
EXTENSION TO BAY No 1 - 84298/1.
EXTENSION TO BAY No 2 - 84298/2
EXTENSION TO BAY No 4 - 84298/4
OFFICE BLOCKS - 84198/1
VEHICLE WORKSHOP -84198/2
ERECTION STORES - 8/4198/3
ERECTION WORKSHOPS - 84198/4
LOW LEVEL VEHICLE WORKSHOPS - 84198/5
VEHICLE PIT BAY - 84198/6
CANTEEN & V/C 84198/7
STORES - 84198/8



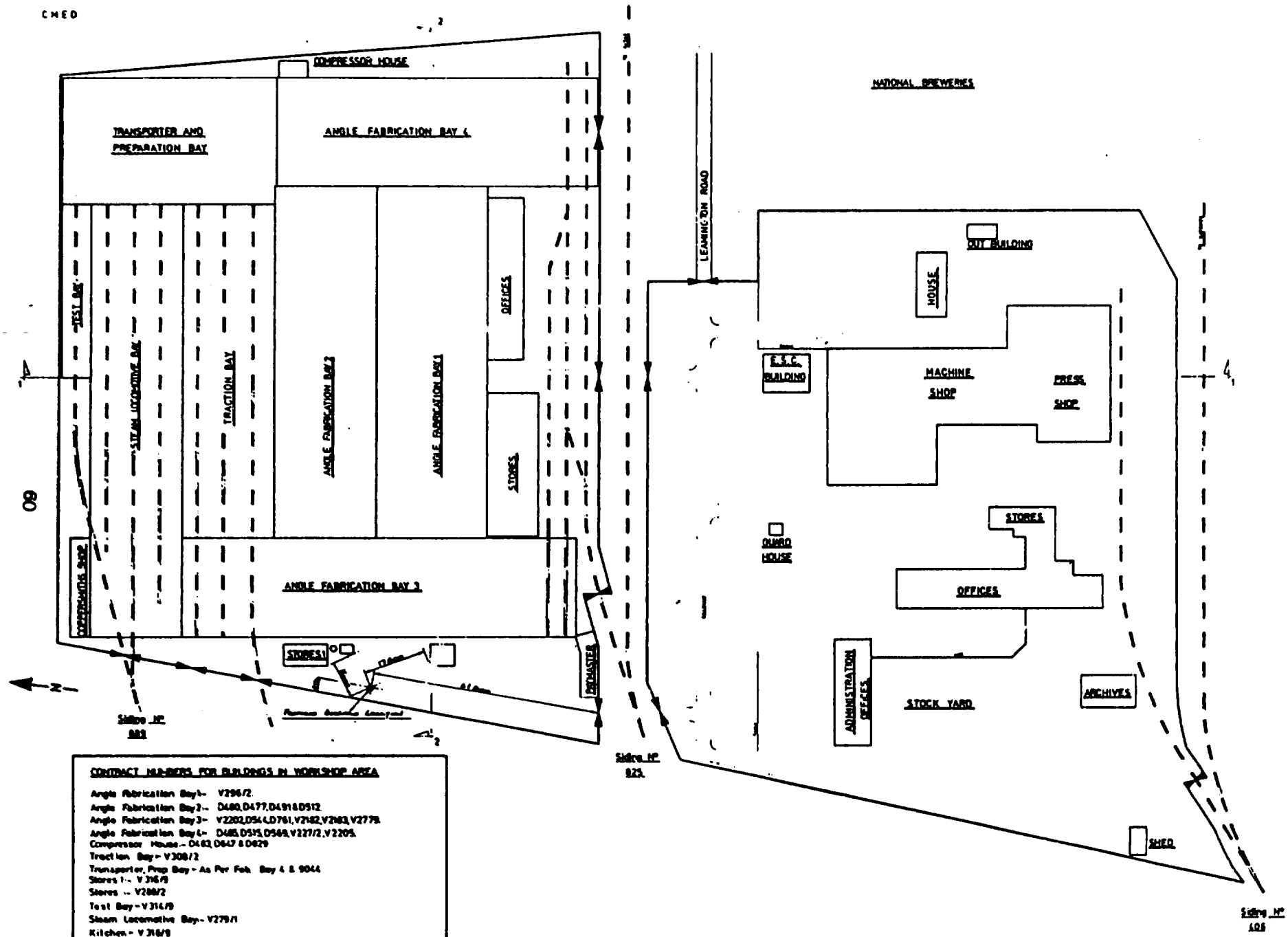


SECTION 2-2

SECTION 1-1



SECTION 3-3



CONTRACT NUMBERS FOR BUILDINGS IN WORKSHOP AREA

Angle Fabrication Bay 1 - V296/2.
Angle Fabrication Bay 2 - D480, D477, D491 & D512.
Angle Fabrication Bay 3 - V2202, D544, D761, V2182, V2183, V2779.
Angle Fabrication Bay 4 - D485, D515, D569, V227/2, V2205.
Compressor House - D463, D647 & D629.
Traction Bay - V308/2.
Transporter, Prep Bay - As Per Fab. Bay 4 & 9044.
Stores 1 - V316/9.
Stores - V288/2.
Test Bay - V314/9.
Steam Locomotive Bay - V279/1.
Kitchen - V316/9.
Coppersmiths Shop - V296/2.

CHAPTER VI

ENGINEERING SITUATION AND TECHNOLOGY

6.1. PRODUCTION PROGRAMME

As it appears from the preceding chapters the rolling stock production programme consists mainly in wagons and tankers at least for the last five years. It can be noticed that this activity is subject to very large fluctuations.

This production programme does not generate by-products.

The average output for the last 29 years is 200 units per year. According to the Management forecast, the output will have to be increased to 375 units per year in 1994 and 1995, i.e. roughly plus 50%.

This industrial activity which consists in machining and assembling of steel or aluminium parts has very little impact on environmental pollution. Wastes are composed mainly of scrap-iron which is resold for recuperation or recycling.

6.2. PLANT CAPACITY

Nominal maximum capacity of the two existing plants in the field of rolling stock manufacturing is about 200 to 220 wagons (and/or tankers) per year. The Leamington Rd plant has also the capacity for complete refurbishing of one steam locomotive per month. This activity can be considered as a diversification compensating partly the variations of wagon and tanker work load.

The company has other activities in the field of structural engineering and erection. These activities provide approximately 50% of total turnover in recent years. They suffer now from economic slump and lack of credit due to high interest rates. The increase in rolling stock is a beneficial occurrence for this slow-down.

6.3. TECHNOLOGY

ZECO has a good know-how in the field of body and bogie manufacturing for wagons and tankers. The manufacturing technology is in fact quite classical and equipment employed is well adapted to the fabrication.

In order to give a better [illegible] manufacturing activity of the company related to rolling stock, a more [illegible]ook into rolling stock technology is described hereafter.

A) Wagons

Wagons are used for goods traffic. They are often classified into three main categories :

1) general purpose wagons for various kind of goods: light or heavy devices, bulky goods, etc...

   Three typical types of design are used :

   a) flat wagons,
   b) covered wagons with one, two or three apertures on each side,
   c) high sided wagons (not covered) for loading from top.

2) specialized wagons used for carrying specific products between two (or more) sites specially equipped for loading and unloading these products. That is the case of ore or coal wagons, hopper wagons, slag ladles, refrigerated wagons (for frozen foods), tanker wagons (for oil, liquefied gaz, etc...).

3) container wagons are designed to allow easy handling and carrying of containers. Their sizes and shapes depend on the type of container they have to transport.

All wagons are composed of the following typical parts :

a) the chassis

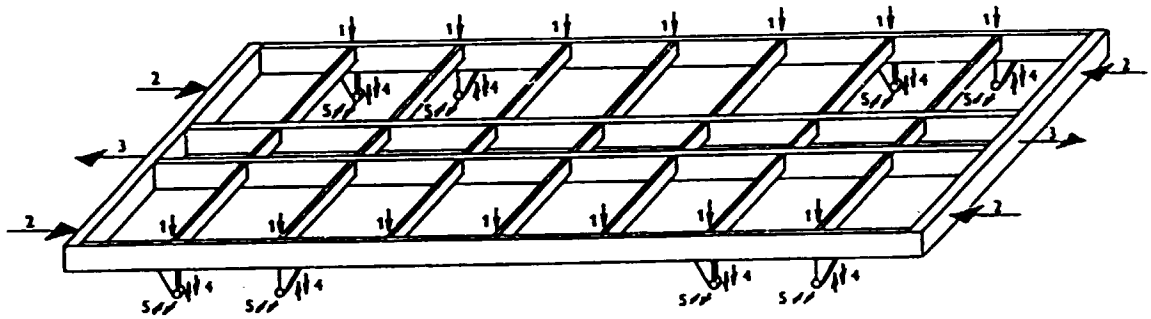
The chassis is the most important part of the wagon. It is a resistant structure, generally flat, supported often by two twin-axle bogies or sometimes directly by two axles. For very heavy loads more than four axles might be necessary.

The chassis is designed to resist to efforts applied in different directions :

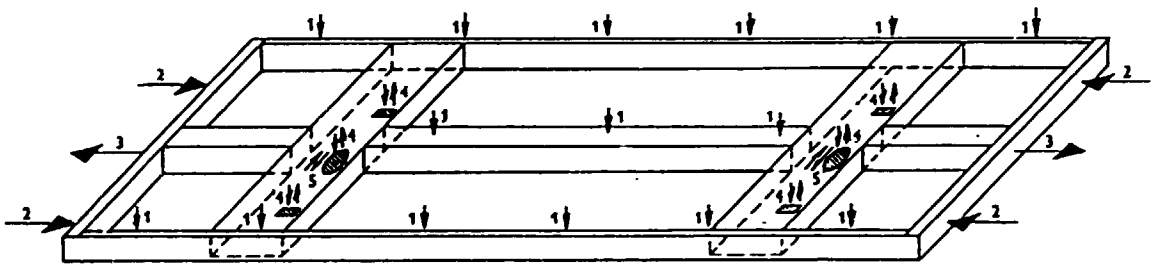
- longitudinal (tractive effort transmitted from the locomotive or compressive efforts during braking and in case of collision).
- vertical effort due to loads carried on the wagon.
- dynamic alternating efforts generated by the wheels running on rails.
- transverse (due to centrifugal efforts during running on curves)
- torsional (due to geometrical defects of the track).

Figures on next page show efforts applied to chassis equipping two types of wagons (wagons carried by two axles or by two bogies).

Efforts applied to a typical chassis for twin-axle-wagon.



Efforts applied to a typical chassis for wagon with two twin-axle bogies.



On next page, are represented :

- a chassis for flat wagon with re-inforced end bolsters for afterwards mounting of automatic couplings if required,
- an example of flat wagon with pivoting lateral stanchions and retractable joists.

The chassis is composed of sectional steels, the dimensions of which depend on maximum load weights. Sectional steels are assembled by welding. Sometimes apertures have to be cut in plates for various reasons, for example to give passage to air or cable pipes.

On following page, are represented a few details of welded joint assemblies showing the thickness of steel plates used for making sectional steels composing a chassis and the way of steel plate edges are prepared by beveling before welding operations.

To sum up, chassis manufacturing operations in ZECO workshops consist mainly in :

- cutting plates to right dimensions and shapes,
- beveling plate edges,
- bending plates (in particular for tank manufacturing),
- welding plates together to make frames or superstructures.

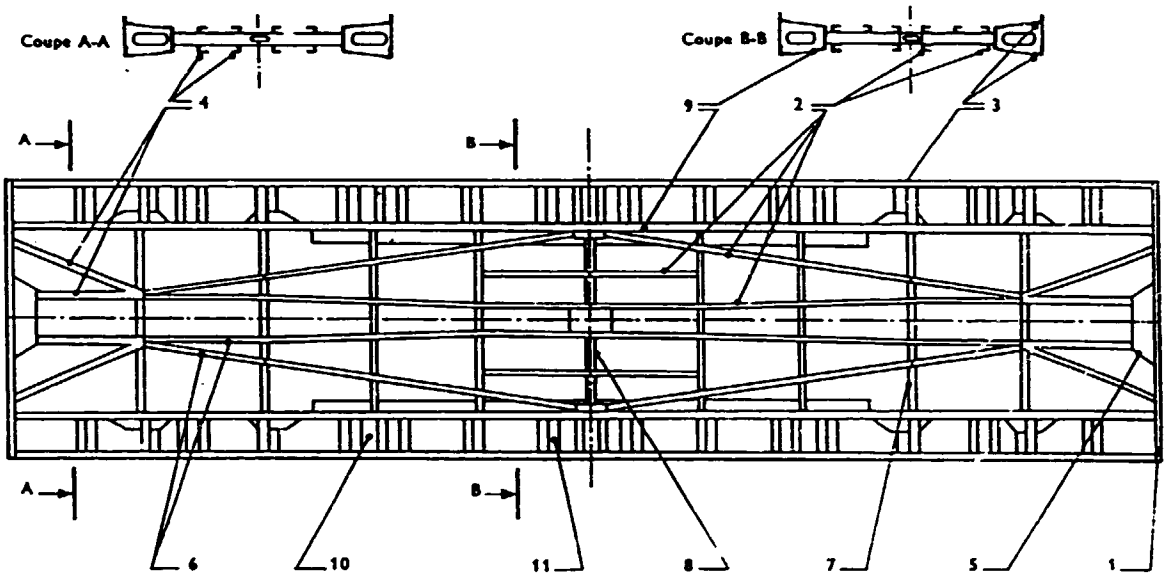
b) Superstructures

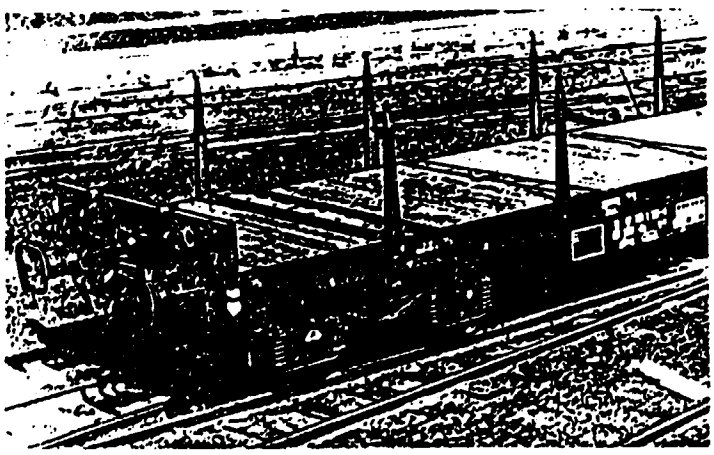
The chassis is completed by adding superstructures which are composed of sectional steels, steel panels (which can be flat, folded or dished). All these elements are assembled together by welding or rivetting (when welding is not possible, due to difference in the nature of metals for example).

Superstrutures are features characterizing the differences between various types of wagons. According to the nature of carried goods, they include some of the following constituents parts :

- a floor,
- lateral stanchions on each side of the wagon (i.e. a kind of rods attached to the chassis and preventing goods from sliding away,
- more or less high side boards depending on the nature of goods. Low side boards play the same role as stanchions and are necessary for goods of small dimensions. High side boards can be equipped with apertures for loading or unloading goods. Doors pivoting horizontaly can also be provided at each end of the wagons.

Chassis structure of flat wagon
(reinforced for afterwards mounting of automatic coupling)

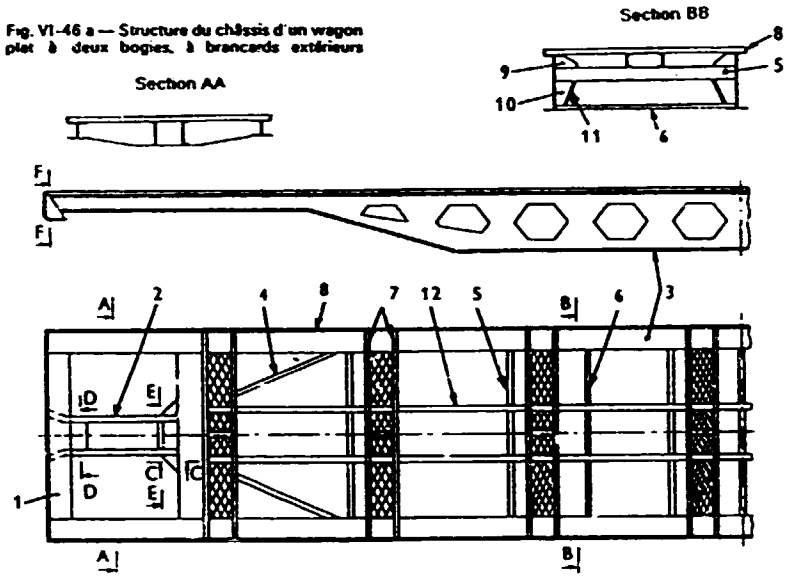




Wagon with pivoting lateral stanchions
and retractable joists

Chassis structure for twin bogie flat wagon
with longitudinal side-girders

Fig. VI-46 a — Structure du châssis d'un wagon plat à deux bogies, à brancards extérieurs



Preparation and importance of welding joints
for some strongly strained assemblings

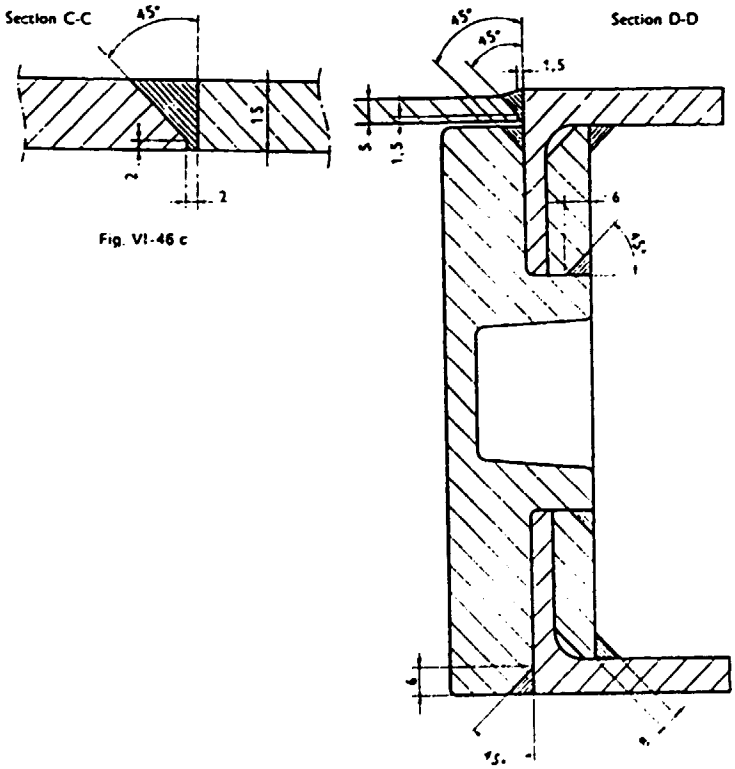


Fig. VI-46 c

- fixed or pivoting joists attached to the floor, providing easy handling of lengthy or heavy pieces of goods: securing chains or ropes can pass through the gap between the goods and the floor.

- a metallic frame supporting side and roof panels. The panels can be made of plywood, steel or aluminium sheets. The roofs can be mobile or retractable for loading goods from top. The structure composed of the frame with side and roof panels constitutes the wagon body ensuring protection of goods from bad weather. The body can also be thermally insulated for transportation of frozen foods, liquefied gaz, etc...

- an assembly under the form of loading hopper, sometimes equipped with a fixed or mobile roof. Lateral sides of hoppers can also be provided with apertures or ducts for unloading goods.

- special superstructures added when required by specific shapes of goods.

- a cylindric tank used for liquid goods (oil, chemicals, liquefied gaz, wines spirits, etc..). Liquefied gaz generates high pressures in the tanks. High tensile steel plates which can be thicker than 15mm must then be used. Test pressure up to 30 bars can be required.

As wagons are mainly assembled by welding, thermal tensile strain must be removed by using a stress removing oven with adequate sizes for housing a wagon entirely.

c) Suspension and running gear

Wagon chassis are supported by bogies or directly by axles. Twin-axle bogies are often used for better running through curves and better load distribution. Bogies also provide reduction of dynamic efforts tranmitted to wagon body thanks to double stage suspensions :

- primary suspension linking axles to bogie frames,
- secondary suspension placed between bogies and wagon chassis.

Helical springs (and sometimes laminated springs) are used in combination or not with resilient devices.

Each end of an axle is equipped with an axle-box containing roller bearings. Axle-boxes are specialized products supporting heavy efforts of diverse directions and types (axial, longitudinal, static and dynamic). Axle-box must be imported by ZECO from two well-known european manufacturers.

On next page are represented :

- an example of suspension between an axle and the chassis by means of laminated springs. This is an old and very simple suspension.

- a schematic diagramme of a chassis-to-bogie linking by means of a pivot bolster.

- an example of primary suspension by helical springs between axle and bogie chassis.

- drawings of an equipped axle and of an axle-box.

An example of wagon bogie is shown on next page.

d) Couplings (draw-gear and buffing-gear)

Automatic couplings are used for new rolling stock, but compatibility with former rolling stock can require the use of other types of coupling such as chain or screw-couplings associates to lateral buffers. Automatic couplings incorporate in one assembly both draw-gear and buffing-gear. They are centrally mounted on a head stock at each end of the wagon.

On following page, are represented :

- a buffer equipped with compound springs combining oil, rubber and steel rings,
- the Effort vs. Stroke characteristics of three types of springs (oil, rubber, and steel-rings).

A drawing of U.I.C automatic coupling is represented on attached page.

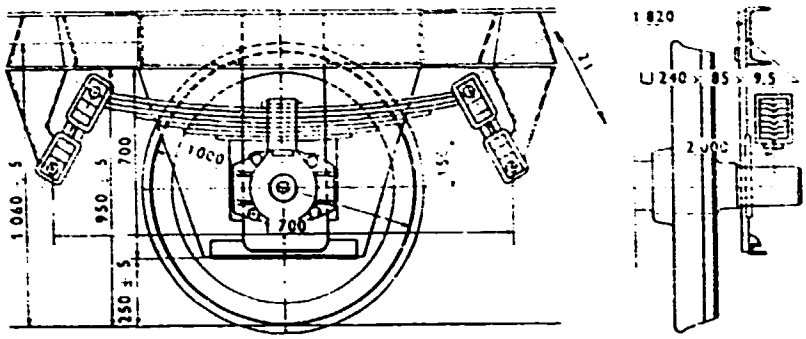
Couplings are composed of specialized components which are imported by ZECO.

e) Brake equipment

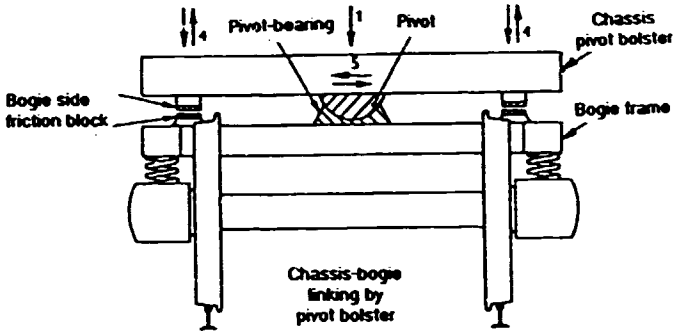
Compressed air brakes are generally used but compatibility with existing rolling stock requires often the use of vacuum brakes which are more cumbersome.

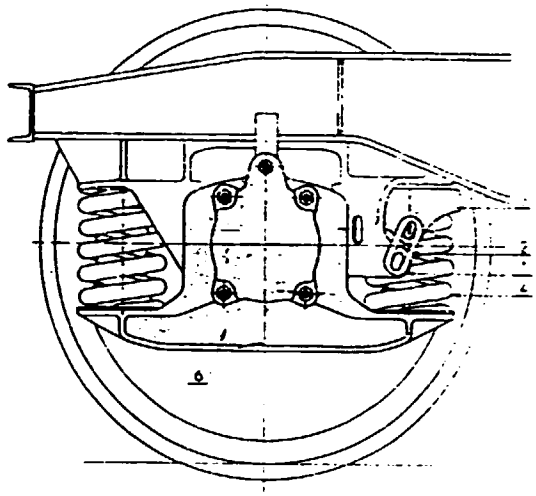
Brake equipments are safety devices requiring special know-how. Their main components have to be imported also by ZECO from two well-known Western suppliers (Westinghouse or Knorr).

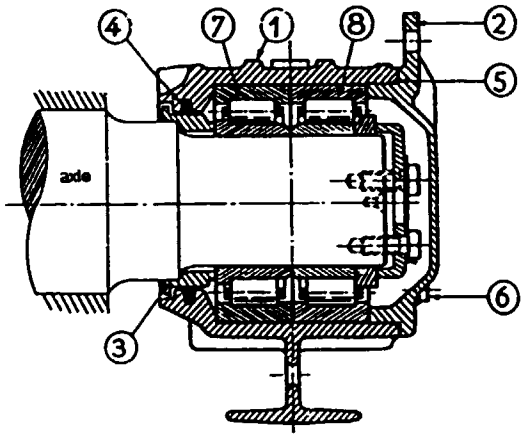
Suspension with laminated spring

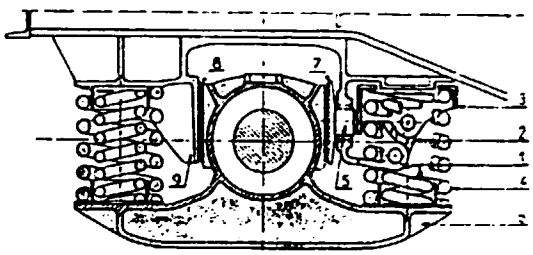


Primary suspension with helical spring

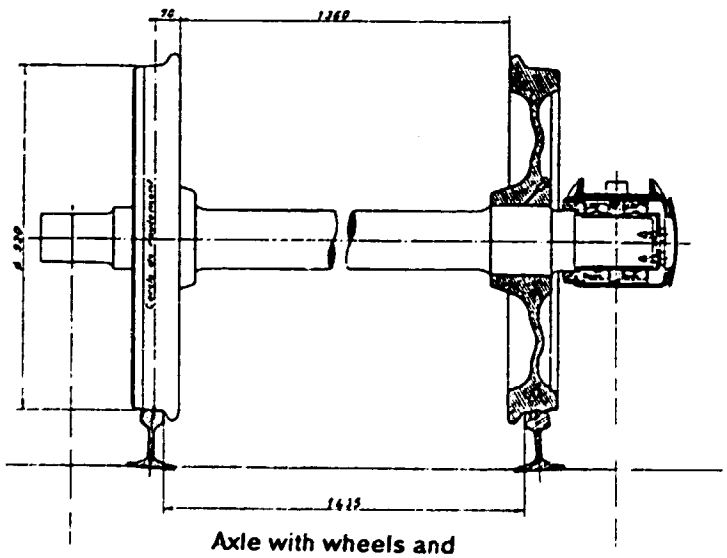






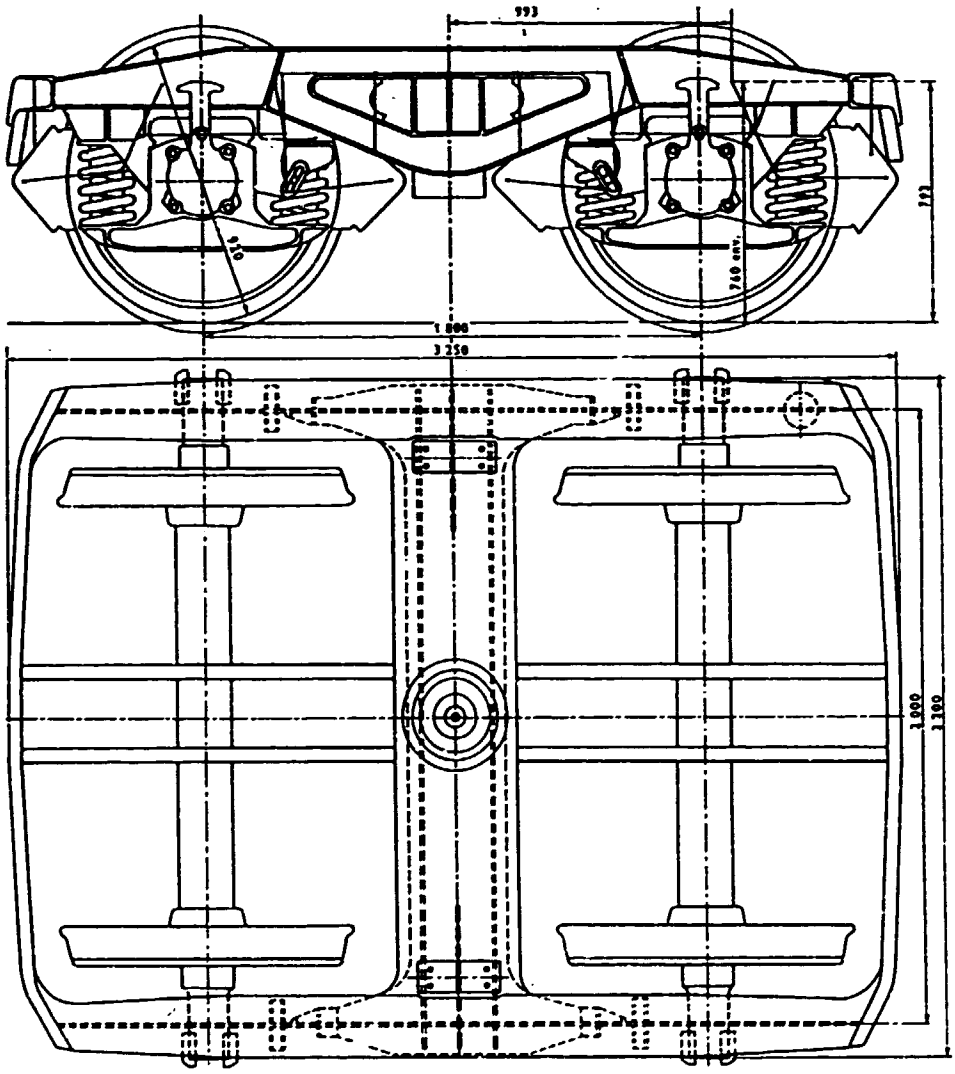


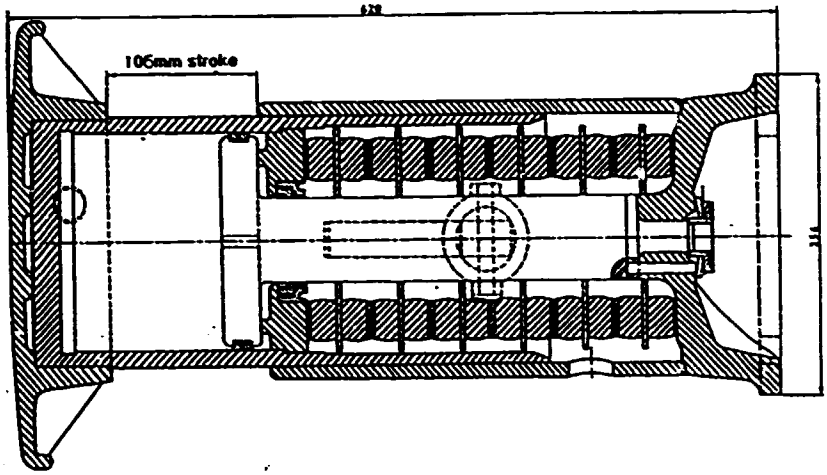
Roller bearing axle-box



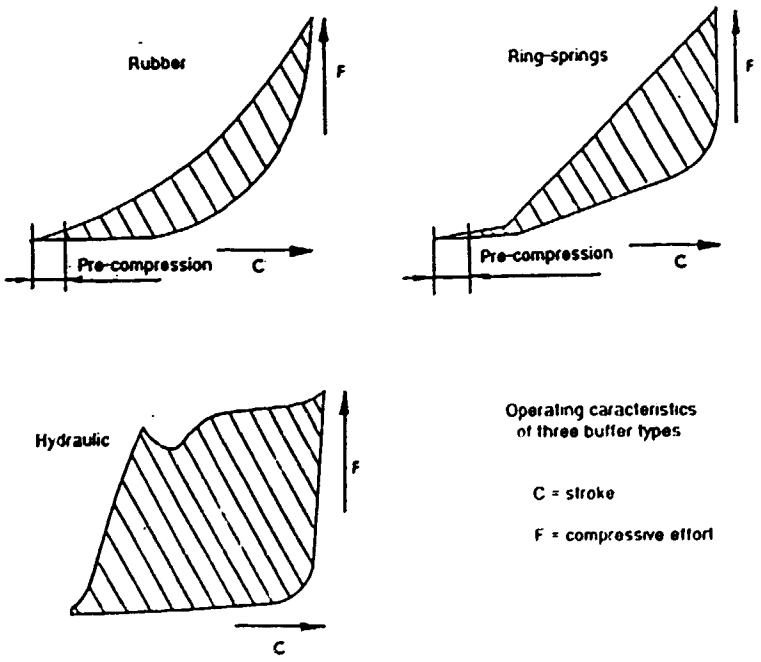
Axle with wheels and roller bearing axle-box

Example of wagon bogie





Example of 620mm buffer (105mm stroke) with compound (oil,rubber and steel) springs



Operating caracteristics of three buffer types

C = stroke

F = compressive effort

B) Coaches

Coaches are used for carrying passengers. Basically coaches are made up of the same sub-assemblies as wagons: body, chassis, suspension, running gear, couplings, brake equipment. Special features are however required for passenger comfort such as noise insulation, ventilation, air conditioning, heating, lighting, windows, seats, curtains, toilets, announcing equipment, safety devices, etc...

Technically speaking panels composing the sides and the roof of coaches are much thinner than plates used for wagons manufacturing. Welding process is therefore different and precautions must be taken to obtain good even surfaces on coach body.

Mechanical resistance calculations for coach body which is composed of hyperstatic structures with irregular shapes combined to a thin envelope are much more difficult than for simple straight structures like wagon chassis. Examples of stainless steel structure for coach body and of necessary acoustic and thermal insulations are given on next page.

Coach ventilation and heating require pipes and ducts structurally integrated to the body. An example of pulsed-air heating installation is given on following page, showing heating control apparatuses and air circuits.

Many components used on coaches are produced industrially in rather great series i.e. at low cost. They are therefore purchased by ZECO from specialized manufacturers. That is the reason why percentage of external supplies in coach price is much more important than for wagons.

Coach bogie is also more sophisticated than wagon bogie in order to provide better comfort to passengers. On attached page is represented a coach bogie with resilient primary suspension anh helical spring secondary suspension.

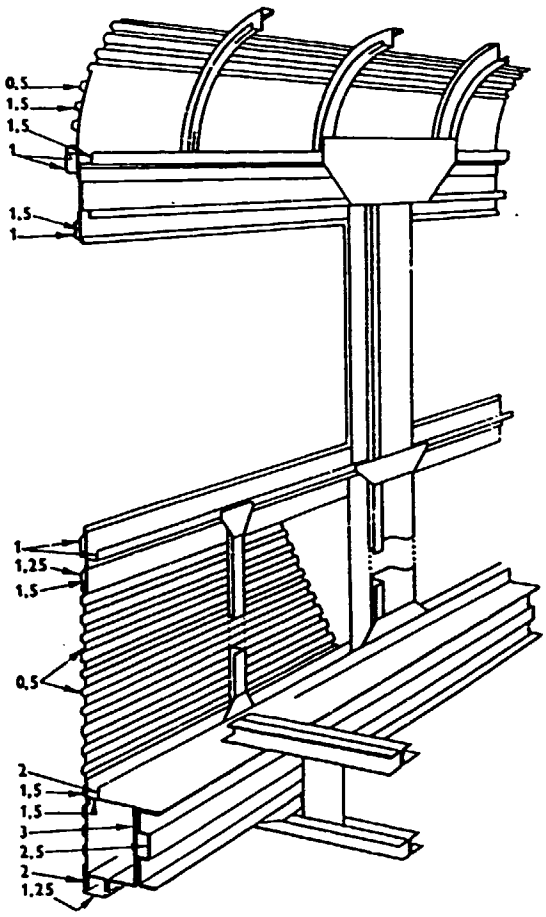
C) Locomotives

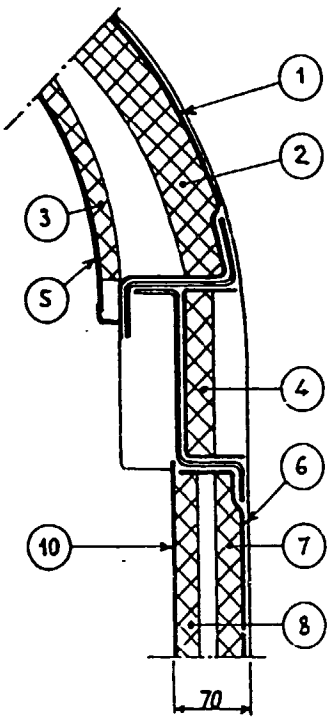
Locomotives have the same contituent parts as wagons and coaches. There are however significant dimensioning differences. Moreover they are equipped with heavy and powerful propulsion equipments.

Locomotive chassis are designed for higher strains than wagon chassis due to heavier loads and efforts.

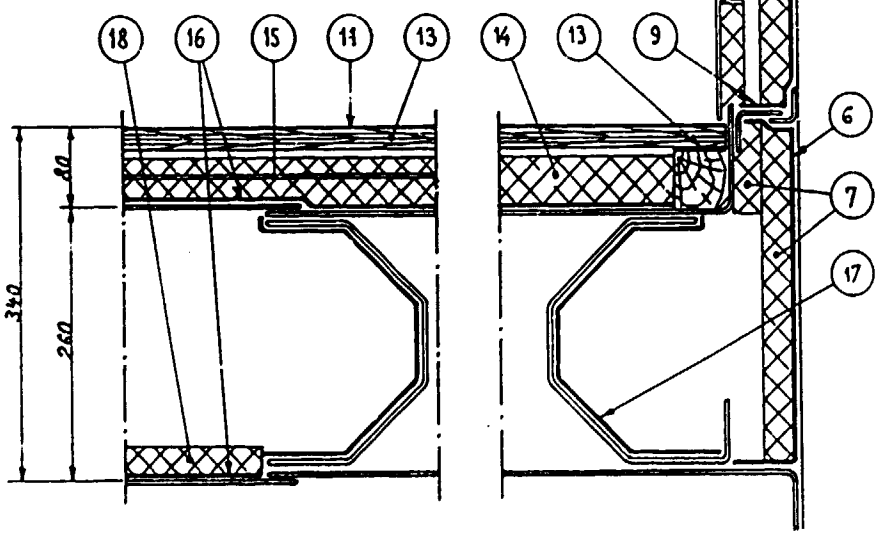
Stainless steel coach body frame

(thickness specified in mm)





Acoustic and thermal insulation of main line coach.



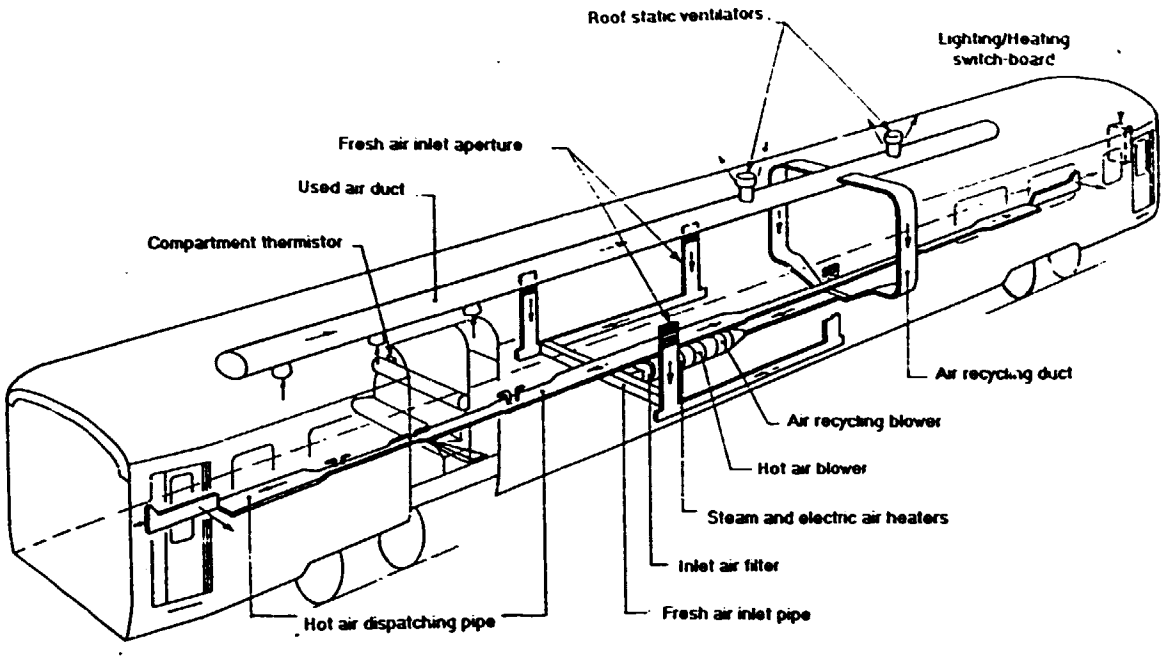
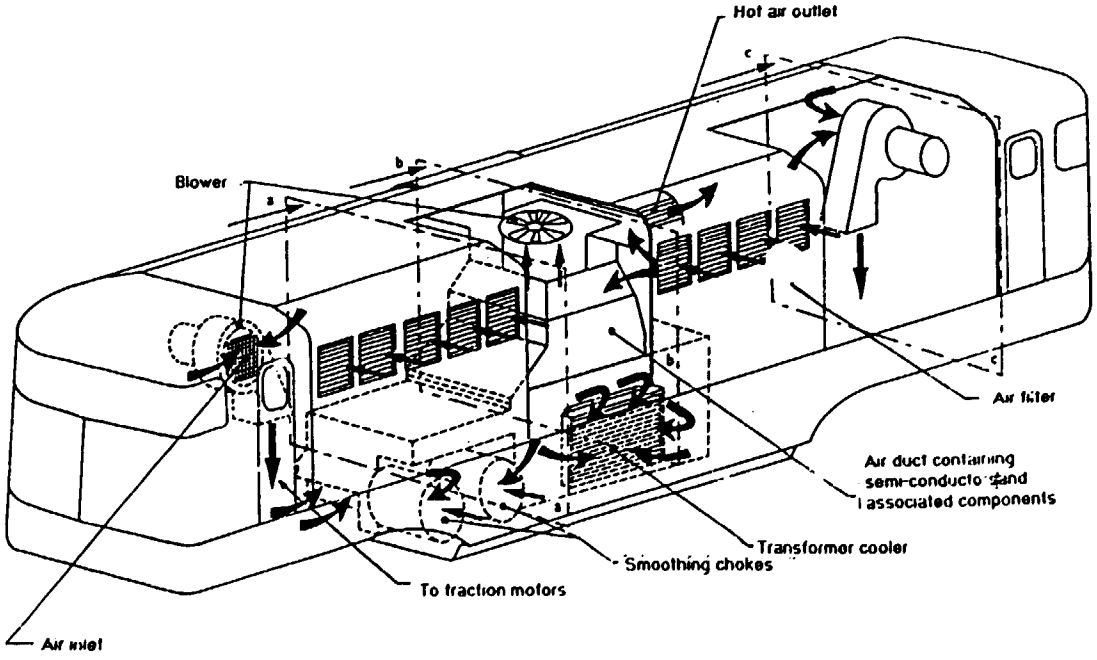
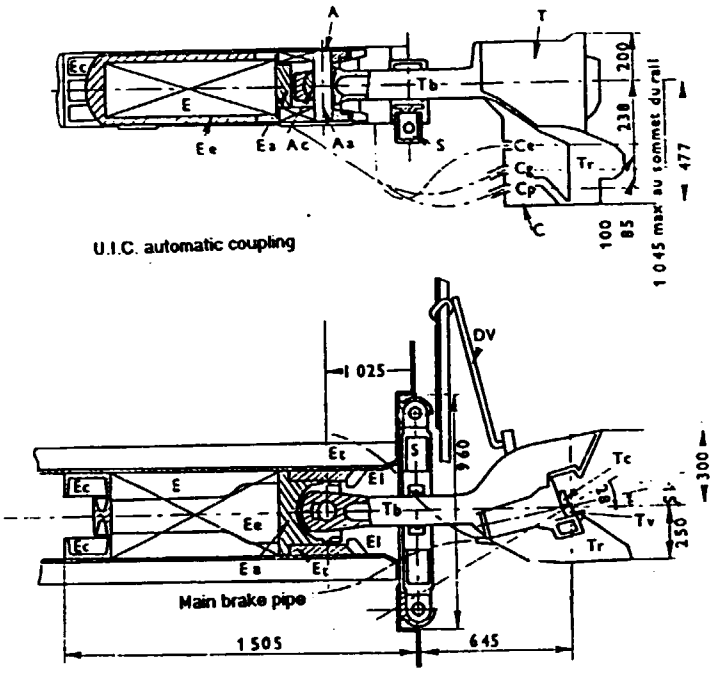


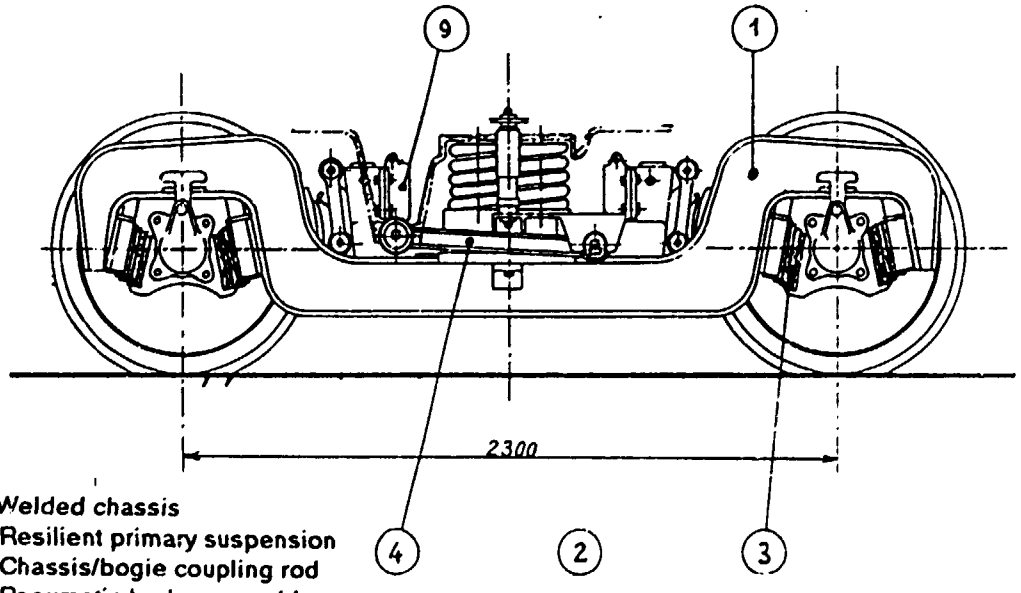
Diagramme of air circuit for coach pulsed-air heating with modulated and automatic control



Example of locomotive ventilation structure



Example of coach bogie



1.Welded chassis
3.Resilient primary suspension
4.Chassis/bogie coupling rod
9.Pneumatic brake assembly

Locomotive body must have electrical wiring and ventilation structure similar to coaches (refer to figure on following page). Electric locomotives require cables insulated for high voltage and rated for high current (large cross section).

Locomotive bogies are also more difficult to design due to high power transmitted to their chassis and running gear.

Propulsion systems are generally one of the three following types :

- Diesel engine associated to a mechanical or hydraulic transmission gear.
  The diagramme of a hydraulic automatic transmission gear is represented on next page with two characteristic curves giving tractive efforts in function of speed for three types of hydraulic transmission gear.

- Diesel electric system in which diesel engine power is converted into electric power feeding electric traction motors generally mounted on bogies.

- Electric locomotives generally fed by catenaries under AC or DC voltages. In some special locomotives (for example mine locomotives) electric power is supplied by built-in batteries. A transformer is required with AC voltage. Presently power electronic equipments are mainly used on new locomotives for the control of traction motor (variable torque and speed).

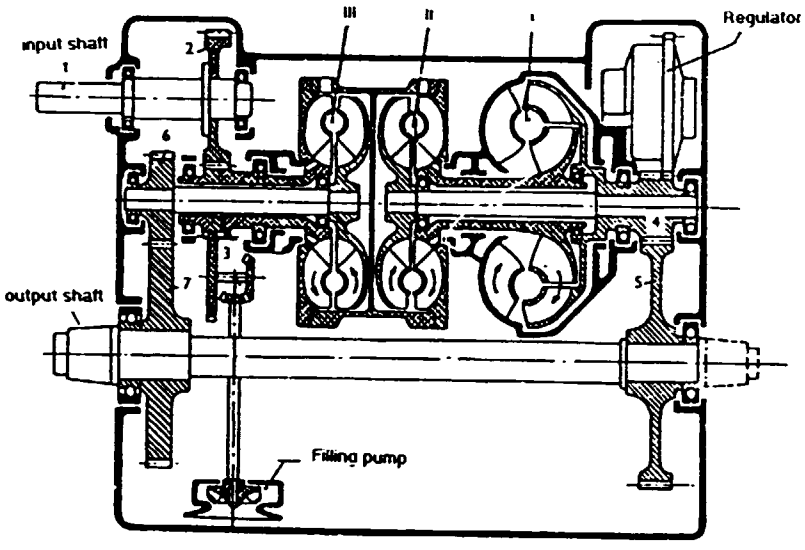
Conclusions

To sum up, rolling stock is produced in ZECO workshops in small series (about 200 units per year) unlike other industries (automobile or household electrical appliance, etc...). Therefore large scale automation is not needed nor justified.

Main activities carried out in ZECO workshops consist in labour consuming operations which can be classified as follows :

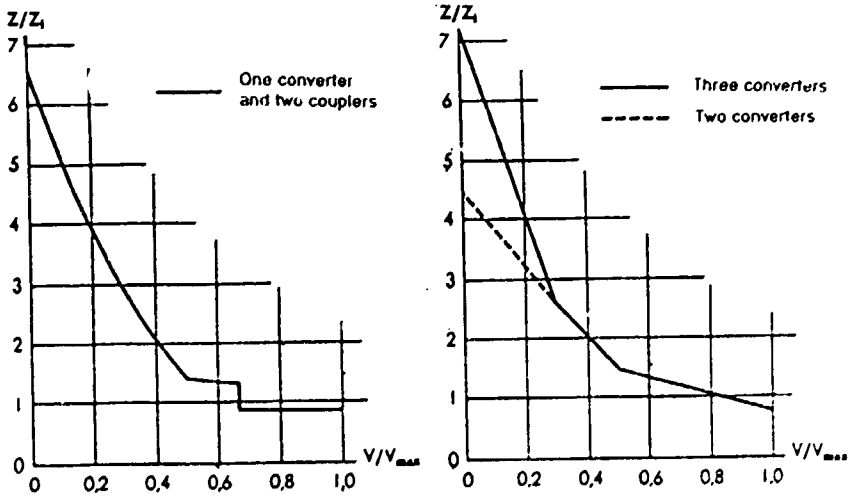
- Metal sheets or plates cutting in various shapes (precise cuttings are often required),
- Assembling by welding, riveting, screwing or press shrinking (for wheels mounting on axles for example),
- Dishing (flanging) of metal sheets,
- Machining of metal pieces: beveling, boring, drilling, surfacing, slotting, etc...
- Wiring (for electrical apparatuses),
- Equipments mounting,
- Painting,
- Lifting and handling of heavy pieces (wagon body, diesel engine, traction motor,etc...).

Principle of Voith
hydraulic automatic transmission equipped
with one torque converter (I) and two couplers (II, III)



Tractive effort vs. Speed curves
with hydraulic transmission

Z: Tractive effort at speed V
Zi: Tractive effort at maximum speed
and maximum engine power.



Products purchased by ZECO include equipments or components :

- requiring high technologies such as power and control electronics, hydraulic automatic gear-transmission gear for diesel hydraulic locomotives, roller bearing, etc....
- requiring special equipments for their elaboration such as glass for windows, forged steel components (axles, wheels, etc...);

- obtainable at lower prices due to industrial production in great series: electric wires, piping, hardware, brake equipments, automatic couplings, etc...

Finishing works, especially in coach manufacturing, are almost realized with portable machine-tools or hand-tools. Computerized machines are only needed when tight dimensional precisions are required (cutting or machining of special components).

Lifting and handling means for heavy load such as overhead cranes and fork-lift trucks are of course necessary.

Special forms and gauges necessary for precise assembling of frames and superstructures are manufacture to measure by ZECO workshops.

Existing equipment as it is described hereafter is adequate for ZECO production in the field of rolling stock with a nominal average capacity of 210-220 wagons and tankers per year. Increase in production capacity requires of course additional investments in equipment and space which are the matter of this project.

The know-how has been acquired through fabrication and assembling in cooperation with specialized european or american companies (ABB, Henschel, Sambre et Meuse, General Motors, General Electric, etc...). It concerns mainly wagons manufacturing. For coaches, ZECO has acquired an experience on refurbishing but has never built complete new coaches. In the field of locomotives, that is the same case. ZECO has a good knowledge in locomotive refurbishing, in particular steam locomotives. ZECO is of course able to manufacture mechanical parts of locomotives designed by european or american companies and to assemble complete locomotives with imported specialized components such as diesel engines, power electronic equipments and control units.

In fact the locomotive market is different from wagon market and seems to present less interest for ZECO. Indeed locomotive unit prices are much higher than wagons and series ordered by customers are rather small. ZECO is more interested in the supply of series of over ten units.

No significant figures have been mentioned by ZECO management concerning fixed payments or royalties in connection with the acquired technology. In fact after having acquired manufacturing know-how, ZECO is able to design wagons and tankers which usually do not need very sophisticated technologies. That is not the case for modern locomotives where electronic equipments are largely used.

ZECO has acquires CAD equipments allowing a standardization of components used in wagons manufacturing. In case of important failures such as fissures in mechanical structures due to overstrain and needing sophisticated calculations, the intervention of specialized british firms are sometimes required.

6.4. EQUIPMENT

Equipment involved in ZECO rolling stock production can be classified into two categories :

a) Equipment specifically affected to Railway Divisions.
b) Equipment common to Railway and Structural divisions.

1) For Wagons and Tankers activities, the equipment consists in :

4 - covered bays (116m long and 22m wide)
4 - 10 ton cranes
3 - 5 ton cranes
12 - radial arm drills (1 800mm swing)
1 - (2.4m x10mm) plate rolls
1 - beam bending machine
1 - (3m x 20mm) "Hamerele-Zofingen" hydraulic guillotine
1 - shot-blasting machine (2 400 x 700)
1 - "Pels" 250 ton press brake
1 - 14 metre long stress-relieving oven
1 - Peddlinghaus punch and cropper
1 - cold saw
1 - wheel press
1 - 13.5m double head Aluminium/Steel welder
1 - wheel lathe
1 - profile cutting machine
1 - Ingersol-Rand SSR M90/150 compressor

2) For Steam locomotive activities :

1 - covered bay (121m long and 25m wide)
2 - 30 ton overhead cranes
6 - radial arm drills (2m swing)

3) Machine and press shop (shared by all manufacturing divisions) :

1 - covered bay (28m long and 30m wide)
2 - 2 ton overhead cranes
1 - 10 - ton overhead cranes
15 - centre lathes: from 1m to 4m bed
8 - turret lathes
1 - C.N.C lathe (1 200mm bed)
1 - C.N.C lathe (1 000m bed)
3 - sharper machines
6 - milling machines
3 - vertical boring machines
2 - horizontal boring machines
1 - surface grinder
1 - pin grinder
5 - band saw
4 - pedestal drills
2 - radial arm drills
1 - slotting machine
1 - machine tool and surface grinder
2 - pipe cutting and threading machines
1 - pipe bender (hydraulic) up to 60mm N.B.
1 - iron/steel worker cropping and punching machine
1 - forging hammer
1 - furnace (with automatic under feed stroker)
3 - portable furnaces
1 - stress relieving oven
1 - 600 ton hydraulic press
1 - 150 ton press

The above list does not include hand tools, measuring instruments or other small tools such as painting devices (spray guns for example).

General layout of main equipment can be seen on attached plans.

This equipment is sufficient for the maximum average capacity mentioned hereabove. It must be completed to cope with the 50% increase in capacity programmed for 1994 and later. Required investment programme is developed in chapter ...

Test facilities are very limited due to the type of production, only composed of wagons. Further investments will be necessary for coach production and, even in a larger extent, for locomotive production.

6.5. CIVIL ENGINEERING WORKS

As already mentioned in paragraph 6.2, the existing buildings include :

- office buildings for staff and design activities.
- four covered bays 116m long and 22m wide for wagons and tankers manufacturing.
- one covered bay 121m long and 25m wide for steam locomotive refurbishing.
- one covered bay for material preparation (for all manufacturing divisions).
- one covered bay 28m long and 30m wide housing machines, press and other facilities such as furnaces and a stress relieving oven.

Production line bays are equipped with overhead cranes for heavy component handling
(putting wagon body on bogies or chassis shifting for example).

6.6. EXTENSION PROJECT

According to ZECO Management forecast for 1994 and 1995 (refer to table attaches to paragraph 4.2), annual production output will correspond approximately to:

- 375 wagons per year,
- 46 coaches per year.

This represents 50% increase in wagon activity and new additional coach activity compared to recent years.

The extension project has been set up to cope with this largely increased activity. It requires additional investments for equipment as well as for civil engineering.

A) Additional equipment can be classified into two categories :

- complementary machines of existing types (but probably with some improved performances due to up-to-date technological progress) such as lathe, drill, press, fork lifts, plate rolls, shot blasting machine, saws, etc...

- new facilities allowing more integrated production (providing more value added) such as fiber glass moulding shop for seat manufacturing (untill now seats have been purchased to suppliers for previous coach refurbishing).

Total cost of additional equipment amounts to about 14.1 millions Z$ (approximately 2.5 millions US$ with average exchange rate of May 1993)

The list of equipments with estimated costs is given on page xx.

This list is considered as sufficient for the objectives of the project :

a) coach manufacturing, although technical differences exist between coaches and wagons (refer to chapter 6)
b) 50% increase of production capacity.

In fact, the differences between coach and wagon manufacturing are related to their design and the know-how, not to the equipments.

B) Additional civil engineering works

Of course, the project requires also an increase in workshop surface at London Rd plant where wagons are assembled.

The company had the opportunity of buying in right time an adjacent surface area allowing the lengthening of three existing bays used for wagon assembling. The additional covered area corresponds to striped parts on plant plan of page xx and represents approximately 3,700 m2 which correspond to a 31% increase in workshop size. This rather limited additional workshop surface is enough for a much larger increase in production output for many reasons :

- probable reduction in erection and structural activities due to low economic situation,
- space is still available for additional material preparation and machine installation.

Of course, ZECO structural and erection divisions will participate in a large part of the civil engineering works and the estimated budget could be reduced.

Excavating works are being done. Workshop erection and equipment mounting will be achieved at the end of this year. Final machine layout will be optimized taking into account materials flows in connection with production lines.

Total cost of additional civil engineering budget amounts to 6.7 millions Z$ corresponding to about 1.19 millions US$ in which imported supplies represent approximately 520 000 US$.

More details related to civil engineering works are given on page 86.

Estimated budget for additional equipment

Equipment	Price (Z$ millions)
1. Fiber glass moulding shop	10
2. Saws	5
3. Plate rolls	5
4. Paint shop bay equipment	10
5. Side lifters	6.6
6. Fork lifts (2)	10
7. Welding machines :	
a) sub arc) b) CO2) c) spot welder) d) argon arc) e) general)	20
8. Plasma arc	5
9. shot blasting	10.4
10. C.N.C lathe (primary for axles)	2
11. radial arm drills (4)	20
12. 500 ton press	20
TOTAL	**14.1**

Estimated budget for additional civil engineering works

	Price (Z$)
- Cladding (6 500 m2)	1 000 000
- Steel work :	
BAY 4 (1327 m2) = 84,4 TE)	
BAY 2 (1284 m2) = 57,0 TE)	
BAY 1(1180 m2) = 79,7 TE)	
Total	**2 000 000**
- Concrete :	
Found floor 750 m x 500m	500 000
Pits 3 x 21 m x 750$	200 000
- Track work (280 m)	1 000 000
- Craneage :	
Mechanicals (25 000 £))	
Bridge and end (in Z$))	2 000 000
TOTAL	**6 700 000**

CHAPTER VII

ADMINISTRATION
PLANT ORGANIZATION AND PLANT OVERHEADS

The breakdown of operations can be given by statement of value added, as following for 1991 and 1992 :

	1991 $000		1992 $000	
Sales	74 623		61 447	
Sales Tax	1 237		1 099	
	75 860	100 %	62 546	100 %
Less : Cost of materials and services purchased	56 001	74 %	42 231	68 %
Difference	**19 859**	26 %	**20 315**	32 %
Value added per employee	18,9		26,2	
Distributed to :				
Employees				
Salaries, wages and benefits	13 356	67 %	9 457	47 %
Government taxes	1 237	6 %	1 099	5 %
Re-invested in the company	2 739	14 %	4 846	24 %
Depreciation	**767**		**1 499**	
Retained profits	**1 972**		**3 347**	
Providers of capital	2 527	13 %	4 913	24 %
Dividend to shareholders	**1 915**		**3 351**	
Interest paid	**612**		**1 562**	
	19 859	**100 %**	**20 315**	**100 %**

Roughly

Materials and services purchased represent two thirds of the sales.

Value added represents one third of the sales.

The breakdown of this value added is the following for 1992 :

Labour	9 457	47 %	(salaries)
Assets	1 499	7 %	(depreciation)
Funds	3 347	16 %	(retained profits)
Shareholders	4 913	24 %	(dividends)
Government	1 099	6 %	(taxes)

- The part for employees is relatively small.
- The part for the Government is small due to the fact that sales are mainly export-oriented.
- The part distributed is relatively high. ZECO is a good company for the shareholders.
- A substantial part is reserved for the company itself, showing Management's concern with increasing the wealth of the company.

CHAPTER VIII

HUMAN RESOURCES AND ORGANIZATION

8.1. ORGANIZATION

ZECO activities are distributed to six divisions :

- Administration and Accounting (about 20 people)
- Rolling stock (in fact, trailer stock, about 440 people)
- Steam locomotives (about 60 people)
- Structural (about 120 people)
- Erection (about 320 people)
- Press/Machine Shop (housing press and machines shared by all ZECO manufacturing divisions) (about 40 people).

ZECO organisation chart is given on next page. Manpower for each division mentioned on the chart is purely indicative. It is quite flexible and varies according to the work-load of the company.

ZECO total personnel corresponds in average to 1 000 people including the staff which account for 10 % of this number.

8.2. LABOUR

ZECO total labour force represents in average 900 people. About 500 of them are assigned to Railway activities (wagon manufacturing and steam locomotive refurnishing).

The extension project will require an additional labour force of 150 people, i.e. 30 % increase in Railway activity labour force.

ZECO ORGANIZATION CHART

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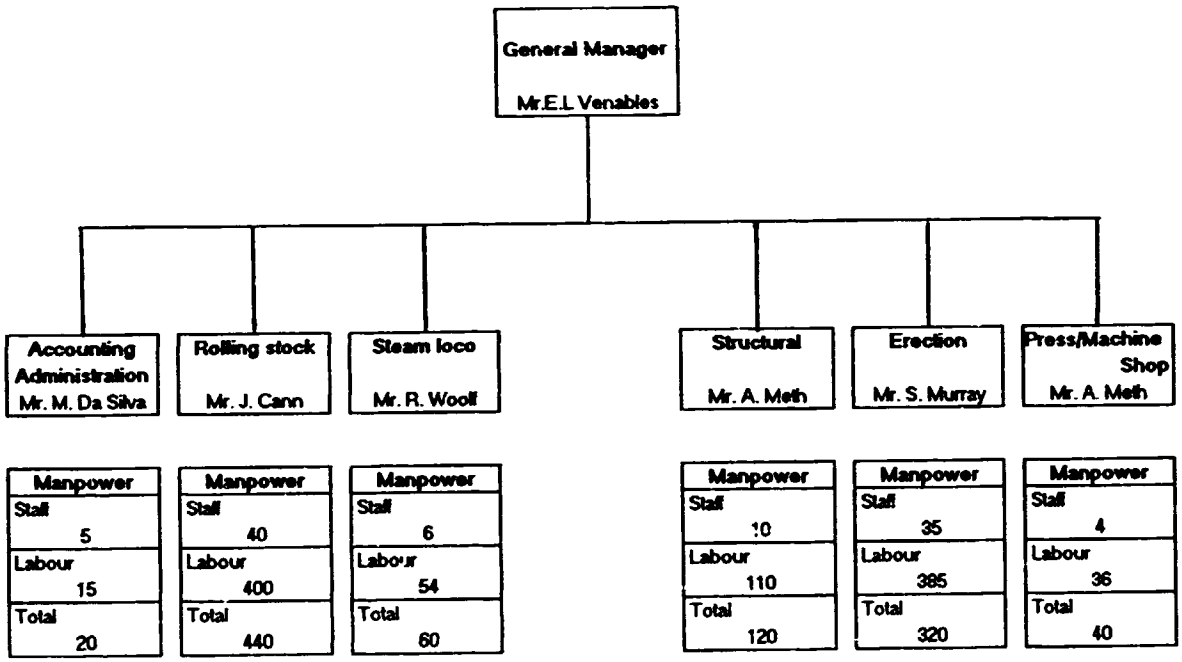


Operational functions of manufacturing division:

1) Project identification

2) Client liaison

3) Estimating

4) Project control

5) Quality control

6) Invoicing

Assuming a stability of ZECO's other activities, the following table shows the estimated change in manpower due to the extension project :

Division	Classification	Present manpower	Extended manpower
Accounting and Administration	Staff	5	5
	Labour	15	15
Rolling stock	Staff	40	40
	Labour	400	550
Steam locomotive refurnishing	Staff	6	6
	Labour	54	54
Structural	Staff	10	10
	Labour	110	110
Erection	Staff	25	25
	Labour	235	235
Press/Machine Shop	Staff	6	6
	Labour	36	36

After realization of the extension project, the total labour force for rolling stock activities will reach 600 people (instead of 450 presently), with the following classification :

1) unskilled workers	300
2) semi-skilled workers	150
3) skilled workers	150

The company will have no difficulty for hiring unskilled workers as they are easy to find on local labour market.

Semi-skilled workers can be obtained by means of specific training programme inside the company.

Skilled workers is more difficult to find. In fact, the lack of high level techinicians and skilled workers will be a problem for the development of new activities requiring higher technical knowledge and expertise. Technical supports from industrialized countries will be a must.

According to ZECO's estimated balance sheet for 1993, the total amount of manpower cost (staff included) represents about 1 677 millions Z$. The share of labour cost correspond to approximately 11 millions Z$.

8.3. STAFF

Staff represents abour 10 % of total manpower, i.e. 100 people. The distribution of staff in the company structure is given in the organization chart cited hereabove. The numbers mentioned on the chart include division managers, department manager, engineers and other qualified technicians (for CAD, quality control, tests, etc ...).

According to figures mentioned in paragraph 8.2, annual staff cost for 1993 amounts to 5,77 millions Z$.

CHAPTER IX

ZECO's FINANCIAL STRUCTURE

9.1. CAPITAL STRUCTURE

9.1.1. Capital stock and main shareholders

ZECO is a public company incorporated in Zimbabwe.

In 1992, the share capital was as follows :

Authorised
70 000 000 ordinary shares of 50c each 35 000
Issued and fully paid
59 847 408 ordinary shares of 50c each 29 924

Subject to the limitations imposed by the Companies Act (Chapter 190) the directors may allot the unissued share capital of $ 5 076 296 at their discretion

The ZECO Executive Share Scheme has an option to subscribe for 1 897 130 shares (1991-1 897 130 shares) at ruling market prices

The number of shareholders is 512, with the following distribution :

	Number of shareholders	%	Number of shares	%
ORDINARY SHARES				
Parent company	1	1	27 024 941	45
Nominee companies	11	2	4 820 676	8
Pension funds	13	3	3 483810	6
Other residents	462	89	15 375 974	26
Non-residents	25	5	9 142 007	15
TOTAL	**512**	**100**	**59 847 408**	**100**

1) The parent company, owning 45 % of ZECO's capital, is MEIKLE Consolidated Holding. MEIKLE is a private company, a well-known Zimbabwean group family-owned and acting on stores, tea plantations, cattle farms and big hotels in Harare and Bulawayo. The name of the holding is THOMAS MEIKLE TRUST.

Included in the 45 %, 20 % is held by the company JOHNSON and FLETCHER, incorporated in Zimbabwe.

JOHNSON and FLETCHER is an industrial company with a size comparable to ZECO (860 staff employed : turnover 100 Million $).

50 % of the ordinary shares are held by the same Holding company as ZECO.

2) Nominee companies hold 8 % of ZECO.
There are stockbrokers and other companies, such as investment companies.

3) Pension funds hold 6 % of ZECO.

The main funds are :
- OLD MUTUAL
- ZESA
- POLICE

4) Other residents hold 26 % of ZECO.
Their number is 462. Each of them has therefore a small participation.

5) Non residents hold 15 % of ZECO.
This include English citizens related to Barclays Bank, namely Mr C. BUXTON, and Mr H. YOUNG.

Of the nominee companies, 5 of them are also controlled by members of the MOXON family.

Consequently, MEIKLE Holding holds directly or indirectly more than 52 % of the capital. They therefore have completed control of ZECO.

9.1.2. Movements and values of shareholders funds

All monetary figures in $ 000

	1987	1988	1989	1990	1991	1992
Shareholders' funds prior year	8 409	8 885	9 076	10 611	24 873	54 908
Retained income	477	191	1 235	1 571	1 972	3 347
Share premium					12 202	12 202
Revaluation of fixed assets			300	12 691	3 334	
Shareholder's funds	8 885	9 076	10 611	24 873	54 908	64 096
Consumer price index	236,1	256,2	266,2	274,7		
Growth of shareholders' funds in real terms	8 885	8 364	9 411	21 378		

An important increase in capital of approximatively 25 Million Zimbabwean $ took place in January 1991. The shareholders' funds rose from 24 873 Million Zimbabwean $ to 54 908 Million Zimbabwean $.

The parent company undersigned the offer, commulting itself to buying all shares not sold to the public.

9.2. ANALYSIS OF FINANCIAL STATEMENTS

9.2.1. Note on inflation

To evaluate the variations of the activity and of the financial statements, it is preferable to use the values in real terms, taking inflation into account.

For this purpose, we can use the consumer price index tables.

The consumer price index used is for the financial year ended as quoted by the central statistical office in respect of the "all items consumer price index for higher income urban families".

These indexes are the following :

1987	236,1	Corresponding rate of increase
1988	256,2	8,5
1989	266,2	4,0
1990	274,7	3,4
1991	304,1	11,0

The variations indicated by these indexes are much lower than the rates of inflation, particularly in recent years. These rates are the following :

(Source : Country Report N° 1 1993 and Budget Statement 1992)

1988	7,5 %	
1989	12,8 %	
1990	17,7 %	
1991	25,3 %	
1992	44,8 %	
1993	25,0 %	(forecast)

The inflation can also be indicated by exchange rates.

The value of the Z$ to the US $ has been the following :

	Z$ per US$	Increase %
1988	1,802	
1989	2,113	17,2
1990	2,448	15,8
1991	3,428	40,0
1992	5,040	45,8
1993 *	6,41	27,0

* May 19, 1993

We can see that there is a good correspondance between the inflation rates and the exchange rates, except in 1991.

In conclusion, to evaluate the figures in constant values, we will take the inflation rates.

A combination of factors have contributed to the high rate of inflation. These include the high cost of importing, the removal of price controls on a substantial number of commodities and the budget deficit.

In addition, initial food shortages experienced at the beginning of the drought also tended to push up prices.

Due to efforts made by the Government, it seems that the inflation rate has peaked and could fall at to range of 25 % or less.

9.2.2. Turnover

Turnover comprises :

i) The total sales value of closed contracts or seperately identifiable portions of contracts, invoiced to third parties and excludes sales tax.

ii) The value of work executed on contracts where the stage of completion and revenues can be estimated but which have not been invoiced.

iii) Revenues attribuate to Government export incentive allocations which are brought to account in the year in which the respective export proceeds are received.

iv) Sales to affiliated companies which are conducted in the normal course of business and are transacted on an arms length basis.

The values are the following :

	1988	1989	1990	1991	1992	1993
Turnover	21121	45117	62367	74623	61447	101374

Turnover increased by 38 % in 1990 (financial year ending the 28th February 1990), 20 % in 1991, decreased by 17,7 % in 1992 and increased again by 65 % in 1993.

The decrease of 1992 was due to a delay in the awarding of two contracts by the clients.

The capital expenditure was 2.6 Million Zimbabwe $ in 1990, 8 M$ in 1991, 3,2 Million Zimbabwean $ in 1992 and approximatly 10 M$ in 1993. In addition to the equipment, the company concluded the purchase of a large piece of property adjoining the works on Josiak Chinamano Road. This acquisition was due to expand the existing factory, for the rolling stock expansion under study here.

The increase in turnover and capital expenditure would not have been contemplated without the additional shareholders' funds injected with the rights issue in February 1991.

9.2.3. Fixed assets

The values are the following :

	1988	1989	1990	1991	1992
Fixed assets	7221	8116	22811	33407	40951

Revaluation of free hold land and buildings is carried out annually by professional valuers on the basis of depreciated replacement value. Cranes and major items of plant and machinery are revalued every three years by management on the same basis.

Surpluses on revaluation are transferred to non-distributable reserve. On disposal of the asset the appropriate portion of non-distributable reserve is transferred to retained income.

9.2.4. Depreciation of fixed assets

Depreciation is not provided on freehold land and certain buildings, capital work in progress and assets whilst not in use. Other fixed assets are depreciated on the straight line basis over their anticipated future lives as follows :

Site buildings, sidings and roads	5 ,0%
Plant and machinery	12,5 %
Vehicles	25,0 %
Cranes, furniture and fittings and office equipment	10,0 %

Certain cranes, plant and machinery on contract sites suffer a loss in excess of normal depreciation. Additional amounts may be written off when the expected useful lives are reviewed.

9.2.5. Foreign currencies

Assets and liabilities in foreign currencies are translated at the approximate rates ruling at balance sheet date, or at rates applicable in forward exchange contracts. Translations during the year are translated at the rates ruling at the relevant dates. Exchange gains or losses arising on the translation or the settlement of foreign currency transactions are dealt with in the income statement.

9.3. ANALYSIS OF ZECO's FINANCIAL EVOLUTION SINCE 1988 WITH THE METHOD OF RATIOS

NOTA

1) When the mission was in Zimbabwe in May 1993, only some figures (turnover-profit) of the fiscal year 1992/93 were known, because the fiscal year ends on February the 28th.

   Therefore, the comparaisons will be made from 1988 to 1992.

2) The important inflation in the recent period makes it difficult to compare the figures in normal values. However, it is possible to calculate ratios which allow to study the evolution out of the inflation factor.

9.3.1. Production ratios

1. **Ratio :** $\frac{\text{Value added}}{\text{Turnover}}$

This ratio gives the contribution of the company to the national production.

The values are the following :

	1988	1989	1990	1991	1992
Value added	8876	12004	15456	19859	20315
Turnover	21121	45117	62367	74623	61447
Ratio	42 %	27 %	25 %	27 %	33 %

It can be seen that the this ratio is in the range of 30 %.

This shows that manpower is an important factor in the production of ZECO.

2. **Ratio :** Net income

Turnover

This very important ratio allows to evaluate the performances of the enterprise in its competition environment.

The values are the following :

	1988	1989	1990	1991	1992	1993
Profit	597	1641	3137	3887	6698	7983
Turnover	21121	45117	62367	74623	61447	101374
Ratio	3 %	4 %	5 %	5 %	11 %	8 %

It can be seen that the ratio, which was about 5 % up to 1991, increased strongly to 11 % in 1992 and maintained a good level of 8 % in 1993.

The commercial performances of ZECO are therefore quite satisfactory.

3. **Ratio :** Value added

Fixed assets

This ratio gives the contribution of assets to the creation of value added.

The values are the following :

	1988	1989	1990	1991	1992
Value added	8 876	12 004	15 456	19 859	20 315
Fixed assets	7 221	8 116	22 811	33 407	40 951
Ratio	123 %	148 %	68 %	59 %	50 %

The decrease in 1990 corresponds to the new investments financed with the increase in capital.

4. **Ratio :** Self Financing Margin

Turnover

Self financing margin is the sum of net income plus depreciation.

The ratio gives the ability of the company to create cash.

The values are the following :

	1988	1989	1990	1991	1992
Value added	8 876	12 004	15 456	19 859	20 315
Salaries wages	6 470	7 781	9 776	13 356	9 457
Government Taxes	1 336	1 816	2 021	1 237	1 099
EBE	1 070	2 407	3 659	5 266	9 759
Fixed assets	7 221	8 116	22 811	33 407	40 951
Ratio	15 %	30 %	16 %	16 %	24 %

In general, the above ratios show that the producion performances of ZECO are good and that they improved in the last years.

9.3.2. Financial structure ratio

Ratio : Permanent funds

Fixed assets

This ratio allows to compare the economic capital with the financial capital. It is very important, because it shows the available working capital.

It most be always higher than 1.

The values for ZECO are the following :

	1988	1989	1990	1991	1992
Permanent Funds	9 076	10 611	55 638	54 908	64 096
Fixed assets	7 221	8 116	22 811	33 407	40 951
Ratio	126 %	131 %	244 %	164 %	157 %

The above ratios, chiefly those of recent years which are higher than 1,5, show that the enterprise beneficiates of a comfortable working capital.

2. **Ratio :** Shareholders' funds

Total liabilities

This ratio gives an indication on the financial independance of the company.

The values are the following :

	1988	1989	1990	1991	1992
Shareholder's funds	9 076	10 611	55 638	54 908	64 096
Total liabilities	19 195	51 244	48 688	87 071	126 110
Ratio	47 %	21 %	51 %	63 %	51 %

This ratio of roughly 50 % confirms the financial autonomy of the company.

9.3.3. Ratio of profitability

Ratio : Net income

Shareholders' funds

The values for ZECO are the following :

	1988	1989	1990	1991	1992
Profit	597	1 641	3 137	3 887	6 698
Shareholder's funds	9 076	10 611	55 638	54 908	64 096
Ratio	7 %	15 %	13 %	7 %	10 %

From the shareholders point of view the profitability of the enterprise is good. The decrease in 1991 corresponds to the increase of capital.

To summarize, ZECO is a very sound company, both on the industrial and financial point of view.

9.4. TAX POSITION

9.4.1. Corporate income tax

Tax is payable on taxable income which is determined by assessing all income derived from a business source within Zimbabwe and allowing the deduction of expenditure and losses (other than those of a capital nature) incurred in the production of income or for the purpose of trade.

Since April 1992, the nominal income tax rate for corporate bodies is 42 and a half per cent. It was previously 45 %.

There is a provision limiting to 6 years the carry forward of losses.

Under this provision, ZECO has not paid any income tax for several years. In 1992, provision was not made for normal taxation as the tax loss brought forwards exceeded the taxable income for the year.

9.4.2. Sales tax

This is levied on the purchase of most goods and services within Zimbabwe. The basic rate is 10 per cent. For semi-durable goods, the rate is 15 %, but a higher rate of 20 per cent applies in the case of durable goods (and many other items which may be considered luxuries). As an incentive for investment in high priority projects and/or investment in designated "growth point areas", Government has provided for the refund of Sales Tax on goods of a capital nature purchased within Zimbabwe.

With respect to sales tax, as to the Import tax, a recent concession announced by Government provides for the refund on the importation of new goods of a capital nature (i.e. plant and equipment) earmarked for approved new projects which are : Priority projects, i.e. they involve exports or create an appreciable number of job opportunities or introduce new technology ; and/or of any type, but located in a designated "growth point area".

9.4.3. Duties and taxes on imported items

Customs Duty, Surtax and Import Tax are levied on various items imported into Zimbabwe. However, the rates on items of primary interest to potential investors are very modest and are in line with corresponding rates levied by developed countries. Futhermore, Government offers a number of specific incentives to new investment through the rebate or drawback of various import duties and taxes, and these result in an effective rate of zero. The following paragraphs give an outline of the main provisions.

Customs Duties range from 0 per cent up to 50 per cent (for cars), with most items of interest to investors being in the range 5-20 per cent. Surtax is normally 20 per cent but some industrial, agricultural and mining equipment qualifies for a 15 per cent rate. Rates of Import Tax range from 10, 15 and 20 per cent.

With respect to Customs Duty as an incentive to the manufacturing industry, many raw materials and components are either imported duty free or at rebate rates of duty. Similarly, as an incentive to the export sector, a system of industrial drawbacks allows full remission of duty on those imported raw materials and components contained in exported goods. Duty free import (or duty rebate) of some plant and equipment is also possible.

9.4.4. The Preferential Trade Area

The Treaty for the establishment of the Preferential Trade Area for Eastern and Southern Africa States was concluded at LUSAKA on the 21st December, 1981 and entered into force on the 30th September, 1982.

Currently, PTA includes the following countries :

COUNTRIES	CURRENCY
ANGOLA	Kwanza
BURUNDI	Franc
COMOROS	Franc
DJIBOUTI	Franc
ETHIOPIA	Birr
KENYA	Shilling
LESOTHO	Maloti
MALAWI	Kwancha
MAURITIUS	Rupee
MOZAMBIQUE	Metical
RWANDA	Franc
SOMALIA	Shilling
SUDAN	Dinar
SWAZILAND	Lilangeni
TANZANIA	Shilling
UGANDA	Shilling
ZAMBIA	Kwancha
ZIMBABWE	Dollar

The main objective of the Agreement between the members of PTA is to encourage trade between the states.

The Agreement also aimed at strengthening regional economic co-operation and the integration of development efforts by member states.
The main thrust of PTA is the promotion of trade in goods and services as a means toward achieving the broader goals of accelerated development, transformation and industrialisation in the sub-region.

The Unit of Account of the PTA (UAPTA) is equal to the Special Drawing Right (SDR) of the International Monetary Fund and all intra-regional settlements are expressed and recorded in this unit of account.

In Zimbabwe, the Government published at the beginning of 1993 (Statutory Instrument 3 of 1993) a schedule giving the new values of customs duties and surtax applying to a considerable number of products.

The new tariffs are applicable only if the goods concerned are produced or manufactured within the territory of any one of the Member States and comply with the rules of origin set in the P.T.A. Treaty.

The products are classified according to the Harmonized System (H.S. Code). The Harmonized System Code sections corresponding to railway materials (locomotives, wagons, coaches, parts) are numbers 8 602 to 8 609 (four first digits), inclusive.

It can be seen in the schedule (page 95) that, for these goods :

- Effective customs duty is free.
- Effective surtax is either 3,24 % or 4,32 %.

These figures are therefore very low.

CHAPTER X

FINANCIAL AND ECONOMIC EVALUATION

This chapter makes a synthesis of the data contained in the preceeding chapters in order to arrive at a financial evaluation of the project.

Other data are also introduced for financing, net working capital requirements, depreciation rates and corporate income tax level.

In this study, we used the computer programme developed by UNIDO for feasibility studies. This programme is entitled COMFAR (Computer Model For Feasibility Analysis And Reporting).

The programme produces 9 schedules as indicated below :

1 Summary sheet
2 Total initial investment
3 Investment during production
4 Production costs
5 Working capital requirements
6 Source of finance
7 Cash flow tables
8 Net income statement
9 Balance sheets

COMFAR also produces standardized graphical presentations (26 charts) showing particularly the :

- annual and accumulated cashflows
- present value of cashflows
- sensivity of the Internal Rate of Return
- break-even analysis
- debt service ratios
- profitability ratios
- structures of production costs and sales

  etc..

In the main hypothesis, as defined in the study, we join the nine schedules and the detailed charts.
For the alternative hypothesises, we only give the summary sheets and the main charts.
The definition of the hypothesis appears on the schedules.

10.1. BASIC HYPOTHESIS FOR THE EVALUATION

We remind that the subject of the present study is the expansion of the ZECO plant, in order to increase its production capacity in rolling stock and particularly in wagons.

NOTES

1 In the present study and in the following text, the accounting currency units are 1 million Zimbabwe dollars (M$) or 1 million US dollars (MUS$); the conversion rate being 6.4 $ for 1 US$.

2 The study is made on a production duration of 15 years.

3 The calculations are made before taxes.

10.1.1. Production hypothesis

The current production of ZECO is 200 wagons per year.

After the expansion of the facilities, the production is expected to reach 375 wagons per year.

We will then consider that the new investment corresponds to a production of 175 wagons per year.

10.1.2. Fixed investment

A - FOREIGN CURRENCY

The investment costs in foreign currency are mainly the imported equipment.
The corresponding amounts are :

	MUS$
- structures	0.45
- machinery and equipment	1.6
- vehicules	0.1
- transport	0.15
- contingencies	0.25
Total	**2.55 or 16.32 M$**

Some equipment will be renewed at the 5th year of production for 0.25 MUS$ and again at the 10th year, also for 0.25 MUS$.

B - LOCAL CURRENCY

The local section includes the cost of the land, the site preparation and development, the structures and civil engineering and some machinery and equipment.
The amounts are the following, in million $.

- land	6.4
- structures and civil engineering	4.16
- machinery	5.12
- construction and other	1.6
Total	**17.28**

C - INTEREST DURING CONSTRUCTION

To the pre-production expenditures, must be added the costs corresponding to the interest of the loans during the construction period. The amount here is 0.83 M$.

This amount appears in the COMFAR schedule "cash flows during construction" under the heading "cost of finance".

As a summary, the initial fixed investments are :

	M$
Foreign currency, 2.55 MUS$ or	16.32
Cost of finance during construction	0.83
Local currency	17.28
Total	**34.43**

These sums appear in the COMFAR schedule "total initial investment" and also in the summary sheet under the heading "fixed assets".

NOTE : According to the investment code in Zimbabwe, imported equipment is not subject to import tax and surtax.

10.1.3. Depreciation

According to the fiscal law and the procedures of ZECO, depreciation is calculated with the straight line option.
The values are the following :

- land	2 %
- site buildings, sidings and roads	5 %
- plant and machinery	12.5%
- cranes, fittings and office equipment	10 %
- vehicules	25 %

We also choose 25 % for the pre-production expenditures.

10.1.4. Working capital requirements

For the needs of the production, the coverage is the following, in days :

- raw materials foreign	90 days
- raw materials local	30 days
- spare parts foreign	90 days
- spare parts local	60 days
- work in progress	30 days
- finished products	30 days
- accounts receivable	30 days
- accounts payable	30 days

The figures above have been introduced in the input table and the corresponding values appear in the schedule " Net working capital".

10.1.5. Source of finance

A - FOREIGN

For the initial investment in foreign currency, a private bank loan could be arranged. ZECO believes that the company would not have any difficulty obtaining such a loan. The conditions would be approximately the following :

maturity	8 years
interest rate	10 %

In the input table, we considered that the repayment would be made with the method of constant principal.

We presumed that investments made during production would be paid through self-financing.

B - LOCAL

The initial investment in local currency of 17.28 M$ would be entirely covered with funds from the shareholders, through an increase of capital, if necessary.

10.1.6. Corporate income tax

The current rate in ZIMBABWE is 42.5 %.

However, for several years ZECO has not paid any income tax because they carry forward losses of previous years.
In the input table, we assume that this situation, equivalent to a tax holiday, would not last more than two years.

10.2. FINANCIAL ANALYSIS

10.2.1. Sales

The new investment will allow the sale of 175 additional wagons per year.

In this figure, about 80 %, that is 140 wagons, will be sold on the export market and 20 %, that is 35 wagons, will be sold on the local market.

The price of one wagon is currently 55000 US$.

Consequently, the increase in turnover for ZECO, corresponding to the quantities above, would be :

- export	140 X 0.055 = 7.7 MUS$	or 48.28 M$
- local	35 X 0.055 X 6.4 =	13.32 M$
Total		**61.60 M$**

It can be noticed that these additional sales are approximatively the double of the additional investment, which is characteristic of "light" industry.
Anyhow it is here an expansion which can benefit from many existing facilities.
Therefore, the ratio 2 over 1 is not the one of the totality of ZECO.

10.2.2. Production costs

The COMFAR schedule shows that factory costs for the standard year are 38.69 M$. In order to obtain the total production costs, it is necessary to add administrative overhead, indirect costs, for instance for sales, plus depreciation and financial costs.

If we consider for instance the year 1988 (6th year of production), the total production costs amount to 46.88 M$.

The respective weights of the components are the following :

	M$	
- raw materials	18.64	39 %
- labour, direct	12.3	26 %
- overhead and administrative cost	10.11	22 %
- other production costs	2.6	6 %
- depreciation	2.37	5 %
- financial costs	0.83	2 %

10.2.3. Break-even point

The break-even point indicates the risk associated with a possible reduction in production and sales through the impact on the profitability of the project. It is calculated as the ratio between fixed costs and difference between sales and variable costs.

In this project, the figures for the year 1988 (5th year of production) are the followings, in millions of dollars :

- sales	61.60
- variable costs	33.70
. raw materials	17.92
. labour, direct	12.32
. others	3.46
- fixed costs	12.27
. overhead and services	9.90
. depreciation	2.37
- financial costs	0.83

The break-even point is therefore equal to :

12.27 / (61.6 - 33.7) = 0.44, without financial costs

When including financial costs, the figure becomes 0.45.

This shows that the project could remain profitable under the condition that the production does not go below 45 % of normal capacity.

It is a good ratio, showing an important security as regards the variations of sales.

The production costs, and the break-even points, can be seen on COMFAR charts which give a perfect illustration of the values above.

10.2.4. Working capital

On the basis of the covering periods indicated above, the working capital reaches a value of 9.42 M$, from the first production year.

This working capital is relatively important and has to be taken into account in the financing plan.

The figures above appear in the COMFAR schedule "working capital requirements".

10.2.5. Cash flows

In the COMFAR software, the cash flow is defined as the sum of net profit plus depreciation plus interest of the loans, less increase in working capital.

COMFAR produces schedules and charts of the cash flows.

For the present project, the results are the following :

- The NET ANNUAL CASH FLOW, which is the basis for the determination of the Internal Rate of Return (IRR), is of course negative in the year of construction and shows that the values of the investments in foreign currency are very close to those in local currency.

  During the 15-year production period, the annual net cash flow is always positive at an average level of 11 M$ from the third year.

  The CUMULATED NET CASH FLOW becomes positive from the third year of production. This gives the value of the pay-back period, time at the end of which the net resources are equal to the investments.

This 3-year result is very satisfactory. The return is very quick.

- The graph of the net cash flow and the summary sheet show that the discounting rate of 20 %, a little higher than the loan rates, which we choose, leads to a positive net present value of 21.11 M$.
  Consequently, on this basis, the project is acceptable.

  The graph also shows the value of the IRR, of 34 %, which corresponds to a net present value equal to zero.

10.2.6. Internal rate of return

- The Internal Rate of Return on total investment (IRR) gives the correspondance between investment and discounted net cash flows.
  It is the most important criterion for appraising the financial profitability of a project.
  Here, the IRR is equal to 34.68 %.

  This figured, compared to an average level of 20 % for interest of loans in Zimbabwe, shows that the the project is satisfactory.

- The OIRR sensibility graph shows that, for this project, the factors which have the most influence on the IRR are sales prices and production costs.
  An increase of % in sales prices, for instance, leads to a value of the IRR of %, that is, an increase of %.

- The return on equity (IRRE1) gives the correspondance between equity and discounted net pofits.
  For this project, the value of the rate is 61 %.

This criterion is in relation with the possibility of attributing dividends to shareholders, which is clear in this project.
To summarize, the financial profitability of the project is excellent.

Moreover, the cash generated by the project is mostly in foreign currency.

This will allow ZECO to fully beneficit from the recent increase of Export Retention Scheme (ERS), which we mentioned in a previous chapter.

10.2.7. Debt service ratio

Part of the investment being financed by a loan, it must be verified that repayments and interest financial costs can be covered by net cash flows.
This is called debt service ratio.

COMFAR produces a graph of the values of this ratio, per year, which must be higher than 1.
This is the case in the present project.

This question can also be studied with cash flow schedules, where the values appear on the 11 th line, under the heading "surplus or deficit".

10.2.8. Net income statement

The COMFAR schedule shows that the project generates a net profit from the first year of production.

The net profit of 7.33 M$ in 1996 (3rd year) increases to about 9 M$ from the 5th year.
The percentage is roughly 27 % of sales, which is high.

We considered, by analogy of the present practice of ZECO, that half of the net profit was distributed to the shareholders as dividends. The distributed amount, then corresponding to the expansion, is here about 4.5 M$ per year.

COMFAR :

- INPUT DATA ENTER FORM
- SCHEDULES
- CHARTS

are placed at the end of the present volume, after the chapters 11 et 12.

CHAPTER XI

INSTITUTIONAL ENVIRONMENT, NATIONAL AND REGIONAL AUTHORITIES SUPPORT REGULATIONS

11.1. THE ECONOMIC REFORM PROGRAMME

In Zimbabwe, the general outline of the Government's action is the Second Five-year National Development Plan 1991-1995.

In this plan, in the field of economy, the Government began at the end of 1990 the implementation of the Economic Reform Programme, with three main objectives :

- trade liberalisation
- removal of price controls
- relaxation of labour regulations.

The reforms aim to create an environment which will stimulate investment and growth. The implementation of the Economic Reform Programme was pursued in 1991 and 1992, despite the difficulties resulting from the drought.

Regarding the manufacturing sector in general and ZECO in particular, the main points are the following :

11.2. TRADE LIBERALISATION, OGIL and ERS

Trade liberalisation is made through a two pronged strategy, that is placing items on to the Open General Import Licence (OGIL) and enhancing the Export Retention Scheme.

The Export Retention Scheme is a mechanism through which an exporter may keep a percentage of the foreign currency resulting from its foreign sales. The E.R.S. funds may be used to freely import goods. The goods imported are freely transferable.

If the exporter does not use the totality of the E.R.S. for his own imports, he can sell the difference.

The unrestricted OGIL was increased to 20 percent of imports while the restricted, or end user specific OGIL is in 1993 at 13 percent.

Since its inception in 1989, the Export Retention Scheme (ERS) has increased over time from the original 5 and 7,5 percent, and stands in 1993 at 35 percent of export earnings.

The Government took the decision to pursue trade liberalisation primarily through the ERS route.

It is important to pursue this strategy, which is linked to increased exports, in order to generate the foreign exchange earnings required for the economic reform programme to be successful.

To support more rapid export growth, the ERS was enhance to 15 percent during the second half of 1991. From January to June 1992 the ERS was raised from 15 percent to 25 percent. The level was raised from 30 percent in the last half of 1992 to the current level of 35 percent.

11.3. EXPORT INCENTIVE SCHEME (E.I.S)

The Export Incentive Scheme is a mechanism through which a tax free cash payment may be made to registered Zimbabwean exporters on the basis of actual performance and of a list of qualifying export commodities.

The current rate is 9 % of the FOB value of the exports.

11.4. FISCAL INCENTIVES

There are a number of provisions within the fiscal system, which are aimed at promoting exports and investment. These include the duty drawback system, the inward processing arrangement, and the duty exemptions on capital goods, in addition to the current 9 percent incentive scheme.

11.5. DUTY EXEMPTIONS FOR CAPITAL GOODS

At the beginning of 1992, exemptions were introduced for capital goods from import tax and surtax for imports under ZIC-approved projects. Investments made outside ZIC can benefit from this facility if they apply for exemption through ZIC. The approval process which caused delays in obtaining Exemption Certificates was simplified by delegating the authority to the Department of Taxes who determine whether the goods in question are of a capital nature.

A list of qualifying capital goods will be produced thereby obviating the need for application to get an exemption. The exemption of capital goods from import tax and surtax means that the only import duty paid in respect of capital goods is the customs duty.

11.6. INVESTMENT INCENTIVES

In spite of the balance of payments constraints which still necessitated some exchange controls, the Government recognised that the remittability of dividends and profits was an important consideration for foreign investors. In order to provide a clear signal to foreign investors and to promote rapid investment in Zimbabwe, the following new reforms on dividends and capital remittances will apply :

Effective May 1 1993, any new company established with foreign shareholding and without recourse to direct foreign exchange allocation is automatically eligible for unrestricted remittance of after-tax dividends accruing to the foreign shareholders, provided those dividends are paid in foreign exchange through the ERS market.

CHAPTER XII

CONCLUSIONS AND PRACTICAL RECOMMENDATIONS INCLUDING RISK FORESEEN

The extension project is realistic with practically no risk as it aims only to increase the existing production capacity without venturing into new technologies incompatible with acquired know-how.

Its objective is only to fulfil the following targets :

1) to cope with the forecasted increase in rolling stock activity,
2) to prepare for coach manufacturing activity which is very similar to wagon manufacturing with however some different features.

However equipments cannot replace expertise and know-how. In chapter 6 (paragraph 6.3. Technology) have been described the differences between the design, the technical features and the manufacturing of three types of rolling stock (wagons, coaches, locomotives) which can present an interest for ZECO.

It appears that ZECO has acquired a good know-how in wagon and tanker manufacturing and in steam locomotive refurbishing.

For coaches, this know-how is useful and easily transferable to coach manufacturing. It could be necessary for ZECO to have some complementary expertise as explained in chapter 6.

For the moment ZECO shows limited interest in locomotive manufacturing as this activity provides less value added than wagons for equal turnover. Moreover the quantity of locomotives ordered by customers are generally limited to a few units at each time. Profit margins are therefore smaller than for wagons.

One of the economic benefits of the increase in local production is to reduce the share of imported parts which must be paid in hard currencies. This share is much greater for locomotives and coaches as it amounts to 60% for coaches , 70% for locomotives instead of 30% for wagons. The immediate idea is to produce more locomotives and coaches. In fact considerations concerning turnovers as well as economic and technical feasibilities lead to different conclusions :

1) Turnover considerations :

According to ZECO's market forecast for the next two years, annual orders would concern aproximately 675 wagons, 90 coaches and possibly 10 locomotives. (It seems however that the potential locomotive market is much more important in the future as many railway administrations are using very old locomotives and are even hiring locomotives due to lack of capital for purchasing !)

With these hypotheses, turnover figures result from the following table :

Material	Unit price (US$)	Quantity/year	Turnover (MUS$)	Import (MUS$)
Wagons	55000	375	20.62	6.19
Coaches	370000	45	16.65	9.99
Locomotives	800000	5	4.00	2.80

Considering only turnovers, it seems evident that it is more efficient to increase local production of wagons and coaches which corresponds to a better use of ZECO know-how.

2) Local production of imported parts

Is it possible to have a further reduction in hard currency spending by increasing local production of other components of rolling stock?

As it has been explained in chapter 6, imported parts for rolling stock correspond to specialized components which requires either high technology or costly investments for mass production.

Local production of these components is therefore difficult to realize due to :

- lack of skill labour and high qualification staff,
- high cost of required investment which is not profitable considering the limited local market.

These components are for example :
Electric traction motors, Diesel motors, Specialized electrical appatuses, automatic tranmission gear, power and control electronics, brake equipments, etc...)

In conclusion :

- The extension project has reasonable objective and has adequately estimated the additional investment for equipments and civil engineering works required for the activity increase.
- Risk is practically nil and could only be caused by a wrong market forecast or a bad training for certain coach manufacturing operations (design, welding techniques, etc...). This is however perfectly avoidable with technical supports from specialized coach manufacturers.

COMFAR

COMFAR 2.1 - INPUT DATA ENTRY FORM

1. TEXT VARIABLES

---------- COMFAR - DATEN ----

1	Project name:	ZECO - Expansion of the rolling stock
2	Date and time:	8/06/93 ZECO A1
3	Remarks:	Fabrication of wagons
4	Accounting units and currency:	Million $ Zimbabwe

5 Product name(s) ---------- sub-menu

Product A:	Wagons exported
Product B:	Wagons sold locally
Product C:	
Product D:	
Product E:	
Product F:	

2. GENERAL VARIABLES

---------- COMFAR - DATEN ----

1	Foreign currency conversion rate: US $	6.4.
2	Local currency conversion rate:	1
3	Duration of construction (in years): (maximum four years if half-yearly, otherwise maximum eight years)	1/2/3/4/5/6/7/8 *)
4	Planning during construction:	yearly/half-yearly *)

5 Cashflow discounting rate (in per cent) ---------- sub-menu

1	Discounting rate for net present value:	20

*) cross-out item(s) not applicable

continued ...

6 Equity and subsidy conditions

---------- sub-menu

year disbursement starts

1 Foreign equity - o(rdinary):	
2 Foreign equity - p(referred):	
3 Foreign subsidy:	
4 Local equity - o(rdinary):	
5 Local equity - p(referred):	
6 Local subsidy:	

7 Loan and overdraft conditions

---------- sub-menu

foreign loan A

1 Year disbursement starts: 1

2 Amortization type: constant principal/annuity/profile *)

3 Amortization period (in years): 8

4 Amortization paid: yearly/half-yearly/quarterly *)

5 Grace period (in years): 1

6 Interest rate (in per cent per year):

10	from year	1	through	9
	from year		through	
	from year		through	

---------- sub-menu

foreign overdraft

1 Year disbursement starts:

6 Interest rate (in per cent per year):

	from year		through	
	from year		through	
	from year		through	

*) mark item(s) applicable

Confer 3.1 - Input data entry form

3.2 I N I T I A L F I X E D I N V E S T M E N T - (f)oreign/(l)ocal ?) *) mark item(s) applicable

Lines (3.2.*)	Columns / Description of investment	1 Depreciation \ p. a.	2 Depreciation type	3 Sal. v. \	4 Depr.p. years	5 Construction phase → per. 1	6 per. 2	7 per. 3	8 Planning period = year/half-year per. 1	9 per. 2	10 per. 3	11 per. 4	12 per. 5
3/13	Land												
3/14	Site preparation and development												
3/15	Structures and civil engineering (a)	5	1			0,5							
3/16	Structures and civil engineering (b)												
3/17	Inc. fix. assets (a) constr., transport												
3/18	Inc. fix. assets (b) technology, start-up												
3/19	Inc. fix. assets (c) others												
3/30	Plant, machinery and equipment (a)	12.5				1,7							
3/31	Plant, machinery and eqipment (b)	25				0,1							
3/32	Auxiliary & service facilities	25				0,25							
3/33	Pre-production expenditures												
3/34	Inventory												

Comfar 3.1 - Input data entry form

3.1 INITIAL FIXED INVESTMENT - (f)oreign/(l)ocal *)

*) mark item(s) applicable

Column	1	2	3	4	5	6	7	8	9	10	11	12
Lines (...) Description of investment	Depreciation % p. a.	Depreciation type	Sal. v. %	Depr.p. years	Construction phase → per. 1	per. 2	per. 3	Planning period = year/half-year per. 4	per. 5	per. 6	per. 7	per. 8
1/12 Land	2				6,4							
2/14 Site preparation and development												
3/15 Structures and civil engineering (a)												
4/16 Structures and civil engineering (b)	5				4,16							
5/17 Inc. fix. assets (a) constr., transport												
6/18 Inc. fix. assets (b) technology, start-up												
7/19 Inc. fix. assets (c) others												
8/20 Plant, machinery and equipment (a)	10				5,12							
9/21 Plant, machinery and eqipment (b)												
10/22 Auxiliary & service facilities												
11/23 Pre-production expenditures	25				1,6							
12/24 Inventory												

3.2 C U R R E N T F I X E D I N V E S T M E N T - (f)óreign/(l)ocal *)

Lines (f l *)	Description of investment	Columns 1 / Depreciation % p. a.	2 Depreciation type	3 Res. v. %	4 Depr.p. years	5 Production phase year 1	6 year 2	7 year 3	8 year 4	9 year 5	10 year 6
36 37	Land										
36 38	Site preparation and development										
37 39	Structures and civil engineering (a)										
38 40	Structures and civil engineering (b)										
39 41	Inc. fix. assets (a) constr., transport										
39 42	Inc. fix. assets (b) technology, start-up										
41 43	Inc. fix. assets (c) others										
42 44	Plant, machinery and equipment (a)	12,5								0,25	0,25
43 45	Plant, machinery and equipment (b)										
44 46	Auxiliary & service facilities										
45 47	Pre-production expenditures										
46 48	Inventory										

*) mark item(s) applicable

3.3.3 STANDARD PRODUCTION COSTS - (f)oreign/(l)ocal *)

TOTAL EXPORT A LOCAL B

Columns		1	2	3	4	5	6	7	8	9	10	11	12
Lines (f/l *)	Description of production costs item	Product A value/a	Product A vari. %	Product B value/a	Product B vari. %	Product C value/a	Product C vari. %	Product D value/a	Product D vari. %	Product E value/a	Product E vari. %	Product F value/a	Product F vari. %
81/94	Raw material (a) 1)	0,6	100	0,4	100	0,2	100						
85/95	unit cost 2)	1		1		1							
86/96	Raw material (b) 1)	14,8	100	12	100	2,08	100						
87/97	unit cost 2)	1		1		1							
88/98	Utilities p.a.	0,5	100	0,4	100	0,1	100						
89/99	Energy p.a.	2	100	1,5	100	0,5	100						
90/100	Labour, direct p.a.	12,32	100	10	100	2,32	100						
91/101	Maint. & repairs p.a.												
92/102	Spare parts p.a.	0,5	100										
93/103	Factory overhead p.a.	5											
94/104	Admin. labour p.a.	2											
95/105	non-lab. p.a.												
96/106	Marketing labour p.a.	2,5											
97/107	non-lab. p.a.	0,5											
98/---	total deprec. borne %												

1) enter either quantity (units consumed p. a.) or annual costs
2) enter "1" if annual costs are entered instead of quantity

*) mark item(s) applicable

3.4. PRODUCTION AND SALES - (f)oreign/(l)ocal *)

Lines (f/l *)	Columns / Description	1 Inflat. % p. a.	2 Production phase year 1	3 year 2	4 year 3	5 year 4	6 year 5	7 year 6	8 year 7
	PRODUCT A								
112/--- 146	Quantity produced/sold		140 →						
111/147	Sales price per unit		0,055 →						
113/148	Total sales tax								
113/149	Total other direct sales costs								
114/150	Total other dir. non-var. costs								
115/151	Labour costs includ. in 114/150								
	PRODUCT B								
116/--- 152	Quantity produced/sold								
117/153	Sales price per unit								
118/154	Total sales tax								
119/155	Total other direct sales costs								
120/156	Total other dir. non-var. costs								
121/157	Labour costs includ. in 120/156								

*) mark item(s) applicable

3.4. P R O D U C T I O N A N D S A L E S - (f)oreign/(l)ocal *) (continued)

Lines (f / l *)	Columns / Description	9	10	11	12	13	14	15	16
						Production phase			
		year 8	year 9	year 10	year 11	year 12	year 13	year 14	year 15
	P R O D U C T A								
110/---	Quantity produced/sold								
---/146									
111/147	Sales price per unit								
112/148	Total sales tax								
113/149	Total other direct sales costs								
114/150	Total other dir. non-var. costs								
115/151	Labour costs includ. in 114/150								
	P R O D U C T B								
116/---	Quantity produced/sold								
---/152		35	35 →						
117/153	Sales price per unit		0,352						
118/154	Total sales tax								
119/155	Total other direct sales costs								
120/156	Total other dir. non-var. costs								
121/157	Labour costs includ. in 120/156								

*) mark item(s) applicable

3.3 WORKING CAPITAL REQUIREMENTS

Lines	Columns / Description of assets / liabilities	1	2	3	4
		Minimum coverage (in days)			
		Products/costs		Cash in hand	
		foreign	local	foreign	local
	ASSETS				
182	Accounts receivable/ /cash in hand:	30	30		
	INVENTORIES				
183	Raw material (a):	90			
184	Raw material (b):		30		
185	Utilities:				
186	Energy:				
187	Spare parts:	90	60		
188	Work in progress:	30	30		
189	Finished products:	30	30		
	LIABILITIES				
190	Accounts payable:	30	30		

3.6 SOURCES OF FINANCE - (f)oreign/(l)ocal *)

Lines (f l *)	Columns / Description	1	2	3	4	5	6	7	8	9	10
		Financial flow of funds (disbursements) by period									
		per. 1	per. 2	per. 3	per. 4	per. 5	per. 6	per. 7	per. 8	per. 9	per. 10
EQUITY, SUBSIDIES AND GRANTS											
191/198	ordinary shares	18									
192/199	preference shares										
193/200	subsidies & grants										
LOANS AND OVERDRAFTS											
194/201	loan A	2,6									
195/202	loan B										
196/203	loan C										
197/204	flow of funds drg. const., overdrafts										

*) mark item(s) applicable

[illegible] 2.1 - Input data entry form

[illegible] INCOME, TAX AND CASHFLOW

Columns		1	2	3	4	5	6	7
Lines	Description	Income tax 0=constant 1=variable	Constant tax rate in % p. a.	Tax holidays in years	Period to c/f loss, in years	Period of tax cred. in years	Additional tax on profit distributed foreign	(in %) local
205	Income tax descriptors		42,5	2				

Columns		1	2	3	4	5	6	7	8
Lines	Description	Annual payments — Production phase year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8
206	Investment allowance								
207	Depreciation allowance								
208	Income tax adjustment								
209	Variable tax rate (%)								
	PROFIT DISTRIBUTED ON:								
210	preferred equity, foreign								
211	preferred equity, local								
212	ordinary equity, foreign								
213	ordinary equity, local	4,5	→						

ZIMBABWE ZECO EXTENSION DE L'USINE
09/06/1993 ZECOAI
PRODUCTION DE WAGONS

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 6.4000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: MILLIONS DE $ ZIMBABWE 1US$=6.4$

Total initial investment during construction phase

fixed assets:	34.43	49.814 % foreign
current assets:	0.00	0.000 % foreign
total assets:	34.43	49.814 % foreign

Source of funds during construction phase

equity & grants:	18.00	0.000 % foreign
foreign loans :	16.64	
local loans :	0.00	
total funds :	34.64	48.037 % foreign

Cashflow from operations

Year:	1	5	10
operating costs:	43.69	43.69	43.69
depreciation :	3.32	2.36	1.21
interest :	1.66	0.83	0.00
production costs	48.67	46.88	44.89
thereof foreign	16.49 %	14.16 %	10.35 %
total sales :	61.60	61.60	61.60
gross income :	12.93	14.72	16.71
net income :	12.93	8.09	9.19
cash balance :	4.74	6.78	8.79
net cashflow :	8.49	9.69	8.79

Net Present Value at: 20.00 % = 21.11
Internal Rate of Return: 34.68 %
Return on equity1: 60.91 %
Return on equity2: 47.53 %

Index of Schedules produced by COMPAR

Total Initial Investment in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1993
Fixed investment costs	
Land, site preparation, development	6.400
Buildings and civil works	7.360
Auxiliary and service facilities	1.600
Incorporated fixed assets	0.000
Plant machinery and equipment	16.640
Total fixed investment costs	32.000
Pre-production capital expenditures.	2.432
Net working capital	0.000
Total initial investment costs	34.432
Of it foreign, in %	49.814

Total Current Investment in MILLIONS DE $ ZIMBABWE 1US$=6.45

Year	1994	1995-97	1998	1999-2002	2003
Fixed investment costs					
Land, site preparation, development	0.000	0.000	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000	0.000	0.000
Auxiliary and service facilities	0.000	0.000	0.000	0.000	0.000
Incorporated fixed assets	0.000	0.000	0.000	0.000	0.000
Plant, machinery and equipment	0.000	0.000	1.600	0.000	1.600
Total fixed investment costs	0.000	0.000	1.600	0.000	1.600
Preproduction capitals expenditures.	0.000	0.000	0.000	0.000	0.000
Working capital	9.423	0.000	0.000	0.000	0.000
Total current investment costs	9.423	0.000	1.600	0.000	1.600
Of it foreign, %	18.973	0.000	100.000	0.000	100.000

Total Production Costs in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1994	1995	1996	1997	1998
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000
Raw material 1	3.840	3.840	3.840	3.840	3.840
Other raw materials	14.080	14.080	14.080	14.080	14.080
Utilities	0.500	0.500	0.500	0.500	0.500
Energy	2.000	2.000	2.000	2.000	2.000
Labour, direct	12.320	12.320	12.320	12.320	12.320
Repair, maintenance	0.000	0.000	0.000	0.000	0.000
Spares	0.948	0.948	0.948	0.948	0.948
Factory overheads	5.000	5.000	5.000	5.000	5.000
Factory costs	38.688	38.688	38.688	38.688	38.688
Administrative overheads	2.000	2.000	2.000	2.000	2.000
Indir. costs, sales and distribution	3.000	3.000	3.000	3.000	3.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	3.322	3.322	3.322	3.334	2.365
Financial costs	1.664	1.456	1.248	1.040	0.832
Total production costs	48.674	48.466	48.258	48.062	46.885
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	16.489	16.130	15.769	15.427	14.156
Of it variable,%	69.212	69.509	69.809	70.092	71.853
Total labour	16.820	16.820	16.820	16.820	16.820

Total Production Costs in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1999	2000	2001	2002- 3	2004- 5
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000
Raw material 1	3.840	3.840	3.840	3.840	3.840
Other raw materials	14.080	14.080	14.080	14.080	14.080
Utilities	0.500	0.500	0.500	0.500	0.500
Energy	2.000	2.000	2.000	2.000	2.000
Labour, direct	12.320	12.320	12.320	12.320	12.320
Repair, maintenance	0.000	0.000	0.000	0.000	0.000
Spares	0.948	0.948	0.948	0.948	0.948
Factory overheads	5.000	5.000	5.000	5.000	5.000
Factory costs	38.688	38.688	38.688	38.688	38.688
Administrative overheads	2.000	2.000	2.000	2.000	2.000
Indir. costs, sales and distribution	3.000	3.000	3.000	3.000	3.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	2.563	2.563	2.589	1.206	0.893
Financial costs	0.624	0.416	0.208	0.000	0.000
Total production costs	46.875	46.667	46.485	44.894	44.581
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	14.138	13.755	13.417	10.350	10.867
Of it variable,%	71.867	72.188	72.471	75.038	75.566
Total labour	16.820	16.820	16.820	16.820	16.820

Total Production Costs in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	2006	2007	2008
% of nom. capacity (single product).	0.000	0.000	0.000
Raw material 1	3.840	3.840	3.840
Other raw materials	14.080	14.080	14.080
Utilities	0.500	0.500	0.500
Energy	2.000	2.000	2.000
Labour, direct	12.320	12.320	12.320
Repair, maintenance	0.000	0.000	0.000
Spares	0.948	0.948	0.948
Factory overheads	5.000	5.000	5.000
Factory costs	38.688	38.688	38.688
Administrative overheads	2.000	2.000	2.000
Indir. costs, sales and distribution	3.000	3.000	3.000
Direct costs, sales and distribution	0.000	0.000	0.000
Depreciation	0.906	0.694	0.701
Financial costs	0.000	0.000	0.000
Total production costs	44.594	44.382	44.389
Costs per unit (single product)	0.000	0.000	0.000
Of it foreign, %	10.893	10.469	10.482
Of it variable,%	75.544	75.904	75.893
Total labour	16.820	16.820	16.820

Net Working Capital in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year			1994	1995-2008
Coverage	mdc	coto		
Current assets &				
Accounts receivable	30	12.0	3.641	3.641
Inventory and materials	42	8.6	2.135	2.135
Energy	1	360.0	0.006	0.006
Spares	74	4.9	0.195	0.195
Work in progress	30	12.0	3.224	3.224
Finished products	30	12.0	3.391	3.391
Cash in hand	1	360.0	0.056	0.056
Total current assets			12.647	12.647
Current liabilities and				
Accounts payable	30	12.0	3.224	3.224
Net working capital			9.423	9.423
Increase in working capital			9.423	0.000
Net working capital, local			7.635	7.635
Net working capital, foreign			1.788	1.788

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Source of Finance, construction in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1993
Equity, ordinary ..	18.000
Equity, preference.	0.000
Subsidies, grants .	0.000
Loan A, foreign .	16.640
Loan B, foreign..	0.000
Loan C, foreign .	0.000
Loan A, local....	0.000
Loan B, local....	0.000
Loan C, local....	0.000
Total loan	16.640
Current liabilities	0.000
Bank overdraft	0.000
Total funds	34.640

Source of Finance, production in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1994	1995-2001
Equity, ordinary ..	0.000	0.000
Equity, preference.	0.000	0.000
Subsidies, grants .	0.000	0.000
Loan A, foreign .	-2.080	-2.080
Loan B, foreign..	0.000	0.000
Loan C, foreign .	0.000	0.000
Loan A, local....	0.000	0.000
Loan B, local....	0.000	0.000
Loan C, local....	0.000	0.000
Total loan	-2.080	-2.080
Current liabilities	3.224	0.000
Bank overdraft	0.000	0.000
Total funds	1.144	-2.080

Cashflow Tables, construction in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1993
Total cash inflow . .	34.640
Financial resources .	34.640
Sales, net of tax . .	0.000
Total cash outflow . .	34.432
Total assets	33.600
Operating costs . . .	0.000
Cost of finance . . .	0.832
Repayment	0.000
Corporate tax . . .	0.000
Dividends paid . . .	0.000
Surplus (deficit) .	0.208
Cumulated cash balance	0.208
Inflow, local	18.000
Outflow, local	17.280
Surplus (deficit) .	0.720
Inflow, foreign . . .	16.640
Outflow, foreign . . .	17.152
Surplus (deficit) .	-0.512
Net cashflow	-33.600
Cumulated net cashflow	-33.600

Cashflow tables, production in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1994	1995	1996	1997	1998	1999
Total cash inflow	64.824	61.600	61.600	61.600	61.600	61.600
Financial resources	3.224	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	61.600	61.600	61.600	61.600	61.600	61.600
Total cash outflow	64.579	51.724	57.520	57.400	59.322	57.518
Total assets	12.647	0.000	0.000	0.000	1.600	0.000
Operating costs	43.688	43.688	43.688	43.688	43.688	43.688
Cost of finance	1.664	1.456	1.248	1.040	0.832	0.624
Repayment	2.080	2.080	2.080	2.080	2.080	2.080
Corporate tax	0.000	0.000	6.004	6.092	6.622	6.626
Dividends paid	4.500	4.500	4.500	4.500	4.500	4.500
Surplus (deficit)	0.245	9.876	4.080	4.200	2.278	4.082
Cumulated cash balance	0.453	10.329	14.409	18.609	20.887	24.969
Inflow, local	15.187	12.320	12.320	12.320	12.320	12.320
Outflow, local	54.402	43.900	49.904	49.992	50.522	50.526
Surplus (deficit)	-39.215	-31.580	-37.584	-37.672	-38.202	-38.206
Inflow, foreign	49.637	49.280	49.280	49.280	49.280	49.280
Outflow, foreign	10.177	7.824	7.616	7.408	8.800	6.992
Surplus (deficit)	39.460	41.456	41.664	41.872	40.480	42.288
Net cashflow	8.489	17.912	11.908	11.820	9.690	11.286
Cumulated net cashflow	-25.111	-7.199	4.709	16.529	26.219	37.505

Cashflow tables, production in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	2000	2001	2002	2003	2004	2005
Total cash inflow	61.600	61.600	61.600	61.600	61.600	61.600
Financial resources	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	61.600	61.600	61.600	61.600	61.600	61.600
Total cash outflow	57.404	57.278	55.706	57.306	55.847	55.847
Total assets	0.000	0.000	0.000	1.600	0.000	0.000
Operating costs	43.688	43.688	43.688	43.688	43.688	43.688
Cost of finance	0.416	0.208	0.000	0.000	0.000	0.000
Repayment	2.080	2.080	0.000	0.000	0.000	0.000
Corporate tax	6.720	6.802	7.518	7.518	7.659	7.659
Dividends paid	4.500	4.500	4.500	4.500	4.500	4.500
Surplus (deficit)	4.196	4.322	5.894	4.294	5.753	5.753
Cumulated cash balance	29.165	33.487	39.382	43.676	49.429	55.183
Inflow, local	12.320	12.320	12.320	12.320	12.320	12.320
Outflow, local	50.620	50.702	51.418	51.418	51.559	51.559
Surplus (deficit)	-38.300	-38.382	-39.098	-39.098	-39.239	-39.239
Inflow, foreign	49.280	49.280	49.280	49.280	49.280	49.280
Outflow, foreign	6.784	6.576	4.288	5.888	4.288	4.288
Surplus (deficit)	42.496	42.704	44.992	43.392	44.992	44.992
Net cashflow	11.192	11.110	10.394	8.794	10.253	10.253
Cumulated net cashflow	48.697	59.807	70.202	78.996	89.249	99.503

Cashflow tables, production in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	2006	2007	2008
Total cash inflow . .	61.600	61.600	61.600
Financial resources .	0.000	0.000	0.000
Sales, net of tax . .	61.600	61.600	61.600
Total cash outflow . .	55.841	55.936	55.933
Total assets	0.000	0.000	0.000
Operating costs . . .	43.688	43.688	43.688
Cost of finance . . .	0.000	0.000	0.000
Repayment	0.000	0.000	0.000
Corporate tax . . .	7.653	7.748	7.745
Dividends paid . . .	4.500	4.500	4.500
Surplus (deficit) .	5.759	5.664	5.667
Cumulated cash balance	60.942	66.606	72.273
Inflow, local	12.320	12.320	12.320
Outflow, local	51.553	51.648	51.645
Surplus (deficit) .	-39.233	-39.328	-39.325
Inflow, foreign . . .	49.280	49.280	49.280
Outflow, foreign . . .	4.288	4.288	4.288
Surplus (deficit) .	44.992	44.992	44.992
Net cashflow	10.259	10.164	10.167
Cumulated net cashflow	109.762	119.926	130.093

Cashflow Discounting:

a) Equity paid versus Net income flow:

Net present value	27.72 at	20.00 %
Internal Rate of Return (IRRE1) ..	60.91 %	

b) Net Worth versus Net cash return:

Net present value	24.40 at	20.00 %
Internal Rate of Return (IRRE2) ..	47.53 %	

c) Internal Rate of Return on total investment:

Net present value	21.11 at	20.00 %
Internal Rate of Return (IRR) ..	34.68 %	

Net Worth = Equity paid plus reserves

Net Income Statement in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1994	1995	1996	1997	1998
Total sales, incl. sales tax	61.600	61.600	61.600	61.600	61.600
Less: variable costs, incl. sales tax.	33.688	33.688	33.688	33.688	33.688
Variable margin	27.912	27.912	27.912	27.912	27.912
As % of total sales	45.312	45.312	45.312	45.312	45.312
Non-variable costs, incl. depreciation	13.322	13.322	13.322	13.334	12.365
Operational margin	14.590	14.590	14.590	14.578	15.547
As % of total sales	23.686	23.686	23.686	23.665	25.239
Cost of finance	1.664	1.456	1.248	1.040	0.832
Gross profit	12.926	13.134	13.342	13.538	14.715
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	12.926	13.134	13.342	13.538	14.715
Tax	0.000	0.000	6.004	6.092	6.622
Net profit	12.926	13.134	7.338	7.446	8.093
Dividends paid	4.500	4.500	4.500	4.500	4.500
Undistributed profit	8.426	8.634	2.838	2.946	3.593
Accumulated undistributed profit	8.426	17.061	19.899	22.845	26.438
Gross profit, % of total sales	20.984	21.322	21.660	21.977	23.888
Net profit, % of total sales	20.984	21.322	11.913	12.087	13.139
ROE, Net profit, % of equity	71.813	72.969	40.768	41.365	44.963
ROI, Net profit+interest, % of invest.	33.913	33.913	19.957	19.723	20.002

Net Income Statement in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1999	2000	2001	2002	2003
Total sales, incl. sales tax	61.600	61.600	61.600	61.600	61.600
Less: variable costs, incl. sales tax.	33.688	33.688	33.688	33.688	33.688
Variable margin	27.912	27.912	27.912	27.912	27.912
As % of total sales	45.312	45.312	45.312	45.312	45.312
Non-variable costs, incl. depreciation	12.563	12.563	12.589	11.206	11.206
Operational margin	15.349	15.349	15.323	16.706	16.706
As % of total sales	24.917	24.917	24.875	27.119	27.119
Cost of finance	0.624	0.416	0.208	0.000	0.000
Gross profit	14.725	14.933	15.115	16.706	16.706
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	14.725	14.933	15.115	16.706	16.706
Tax	6.626	6.720	6.802	7.518	7.518
Net profit	8.099	8.213	8.313	9.188	9.188
Dividends paid	4.500	4.500	4.500	4.500	4.500
Undistributed profit	3.599	3.713	3.813	4.688	4.688
Accumulated undistributed profit	30.037	33.750	37.563	42.251	46.939
Gross profit, % of total sales	23.904	24.242	24.538	27.119	27.119
Net profit, % of total sales	13.147	13.333	13.496	14.916	14.916
ROE, Net profit, % of equity	44.992	45.628	46.185	51.045	51.045
ROI, Net profit+interest, % of invest.	19.547	19.338	19.096	20.590	19.878

Net Income Statement in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	2004	2005	2006	2007	2008
Total sales, incl. sales tax	61.600	61.600	61.600	61.600	61.600
Less: variable costs, incl. sales tax.	33.688	33.688	33.688	33.688	33.688
Variable margin	27.912	27.912	27.912	27.912	27.912
As % of total sales	45.312	45.312	45.312	45.312	45.312
Non-variable costs, incl. depreciation	10.893	10.893	10.906	10.694	10.701
Operational margin	17.019	17.019	17.006	17.218	17.211
As % of total sales	27.629	27.629	27.608	27.951	27.940
Cost of finance	0.000	0.000	0.000	0.000	0.000
Gross profit	17.019	17.019	17.006	17.218	17.211
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	17.019	17.019	17.006	17.218	17.211
Tax	7.659	7.659	7.653	7.748	7.745
Net profit	9.361	9.361	9.354	9.470	9.466
Dividends paid	4.500	4.500	4.500	4.500	4.500
Undistributed profit	4.861	4.861	4.854	4.970	4.966
Accumulated undistributed profit	51.800	56.660	61.514	66.484	71.450
Gross profit, % of total sales	27.629	27.629	27.608	27.951	27.940
Net profit, % of total sales	15.196	15.196	15.184	15.373	15.367
ROE, Net profit, % of equity	52.003	52.003	51.964	52.609	52.590
ROI, Net profit+interest, % of invest.	20.251	20.251	20.236	20.487	20.479

Projected Balance Sheets, construction in MILLIONS DE $ ZIMBABWE 1US$=6.4$

Year	1993
Total assets	34.640
Fixed assets, net of depreciation	0.000
Construction in progress	34.432
Current assets	0.000
Cash, bank	0.000
Cash surplus, finance available	0.208
Loss carried forward	0.000
Loss	0.000
Total liabilities	34.640
Equity capital	18.000
Reserves, retained profit	0.000
Profit	0.000
Long and medium term debt	16.640
Current liabilities	0.000
Bank overdraft, finance required.	0.000
Total debt	16.640
Equity, % of liabilities	51.963

Projected Balance Sheets, Production in MILLIONS DE $ ZIMBABWE 1US$=6.4$

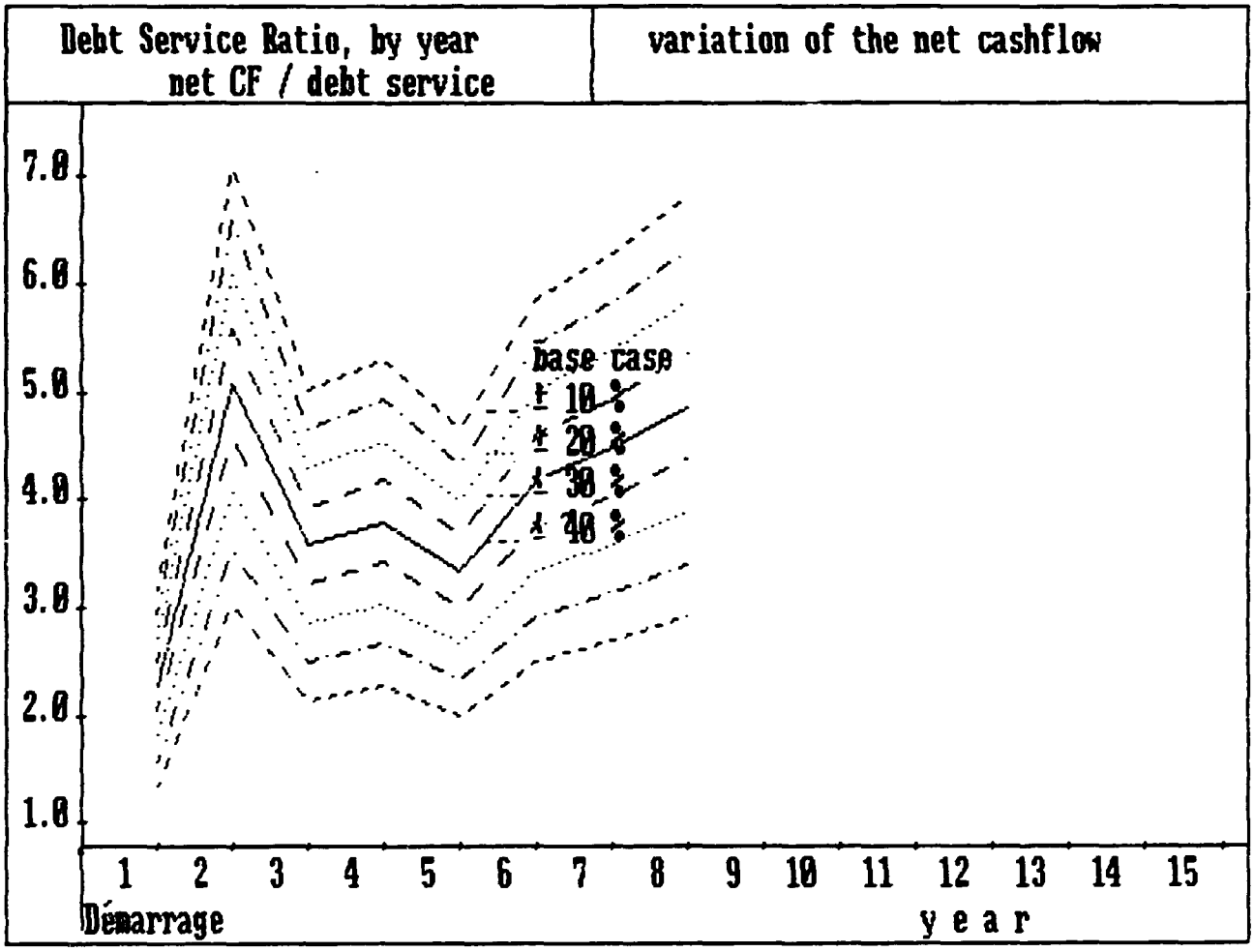
Year	1994	1995	1996	1997	1998
Total assets	48.710	55.265	56.023	56.889	58.402
Fixed assets, net of depreciation	31.110	27.789	24.467	21.133	18.768
Construction in progress	0.000	0.000	0.000	0.000	1.600
Current assets	12.591	12.591	12.591	12.591	12.591
Cash, bank	0.056	0.056	0.056	0.056	0.056
Cash surplus, finance available	4.953	14.829	18.909	23.109	25.387
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	48.710	55.265	56.023	56.889	58.402
Equity capital	18.000	18.000	18.000	18.000	18.000
Reserves, retained profit	0.000	8.426	17.061	19.899	22.845
Profit	12.926	13.134	7.338	7.446	8.093
Long and medium term debt	14.560	12.480	10.400	8.320	6.240
Current liabilities	3.224	3.224	3.224	3.224	3.224
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	17.784	15.704	13.624	11.544	9.464
Equity, % of liabilities	36.953	32.570	32.130	31.641	30.821

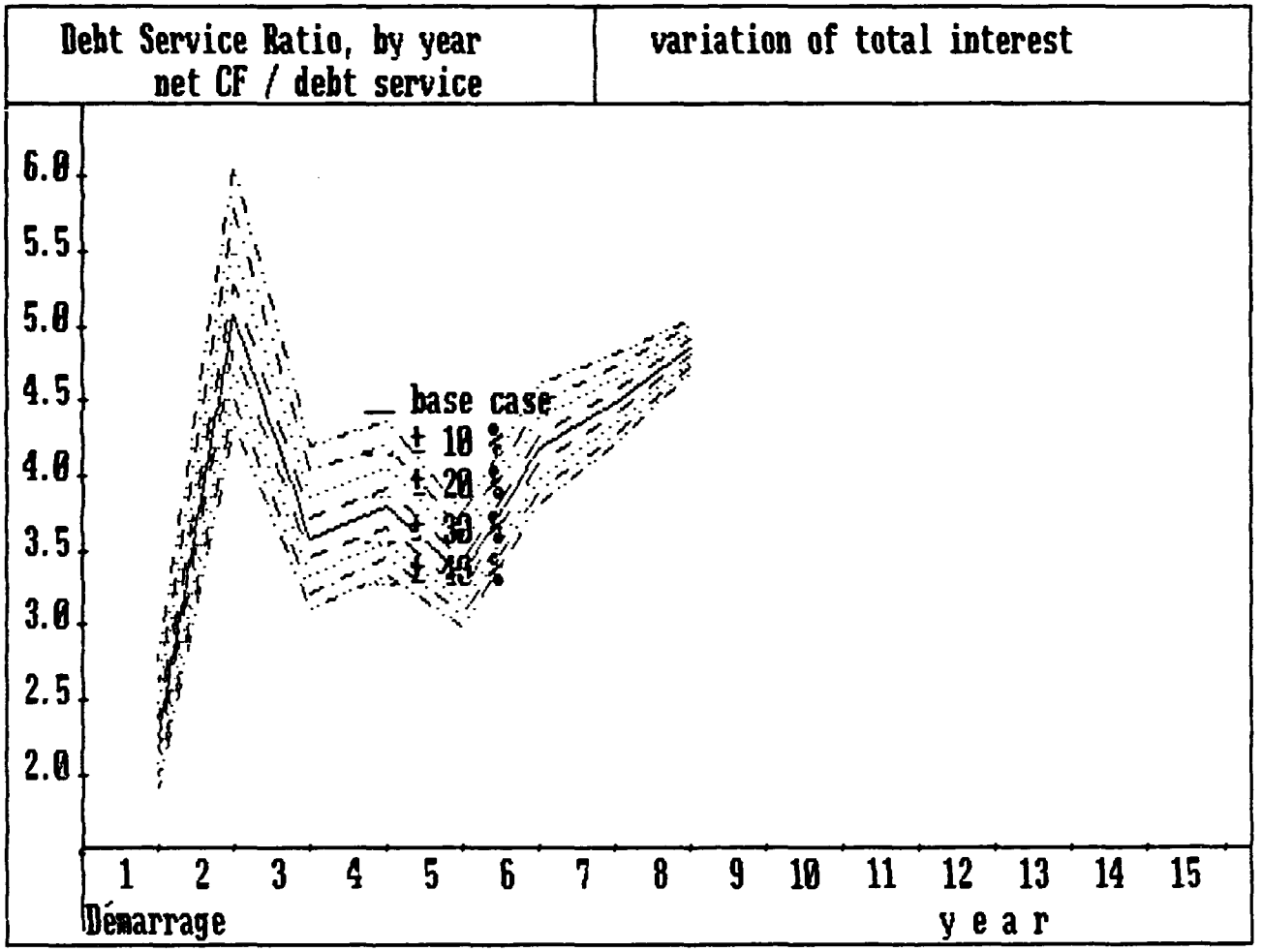
Projected Balance Sheets, Production in MILLIONS DE $ ZIMBABWE 1US$=6.4$

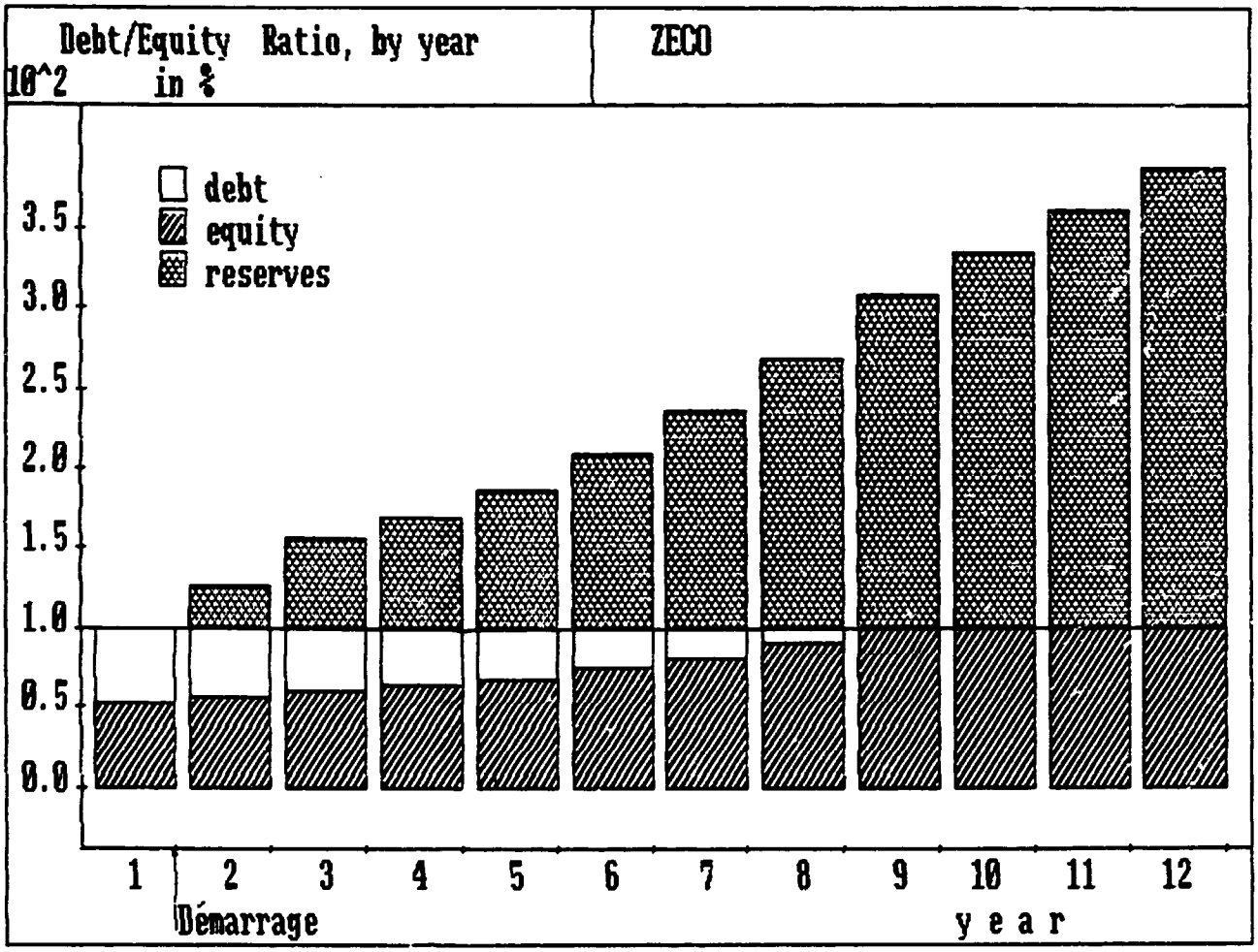
Year	1999	2000	2001	2002	2003
Total assets	59.921	61.554	63.287	67.975	72.663
Fixed assets, net of depreciation	17.805	15.242	12.653	11.446	10.240
Construction in progress	0.000	0.000	0.000	0.000	1.600
Current assets	12.591	12.591	12.591	12.591	12.591
Cash, bank	0.056	0.056	0.056	0.056	0.056
Cash surplus, finance available	29.469	33.665	37.987	43.882	48.176
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	59.921	61.554	63.287	67.975	72.663
Equity capital	18.000	18.000	18.000	18.000	18.000
Reserves, retained profit	29.438	30.037	33.750	37.563	42.251
Profit	8.099	8.213	8.313	9.188	9.188
Long and medium term debt	4.160	2.080	0.000	0.000	0.000
Current liabilities	3.224	3.224	3.224	3.224	3.224
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	7.384	5.304	3.224	3.224	3.224
Equity, % of liabilities	30.040	29.243	28.442	26.480	24.772

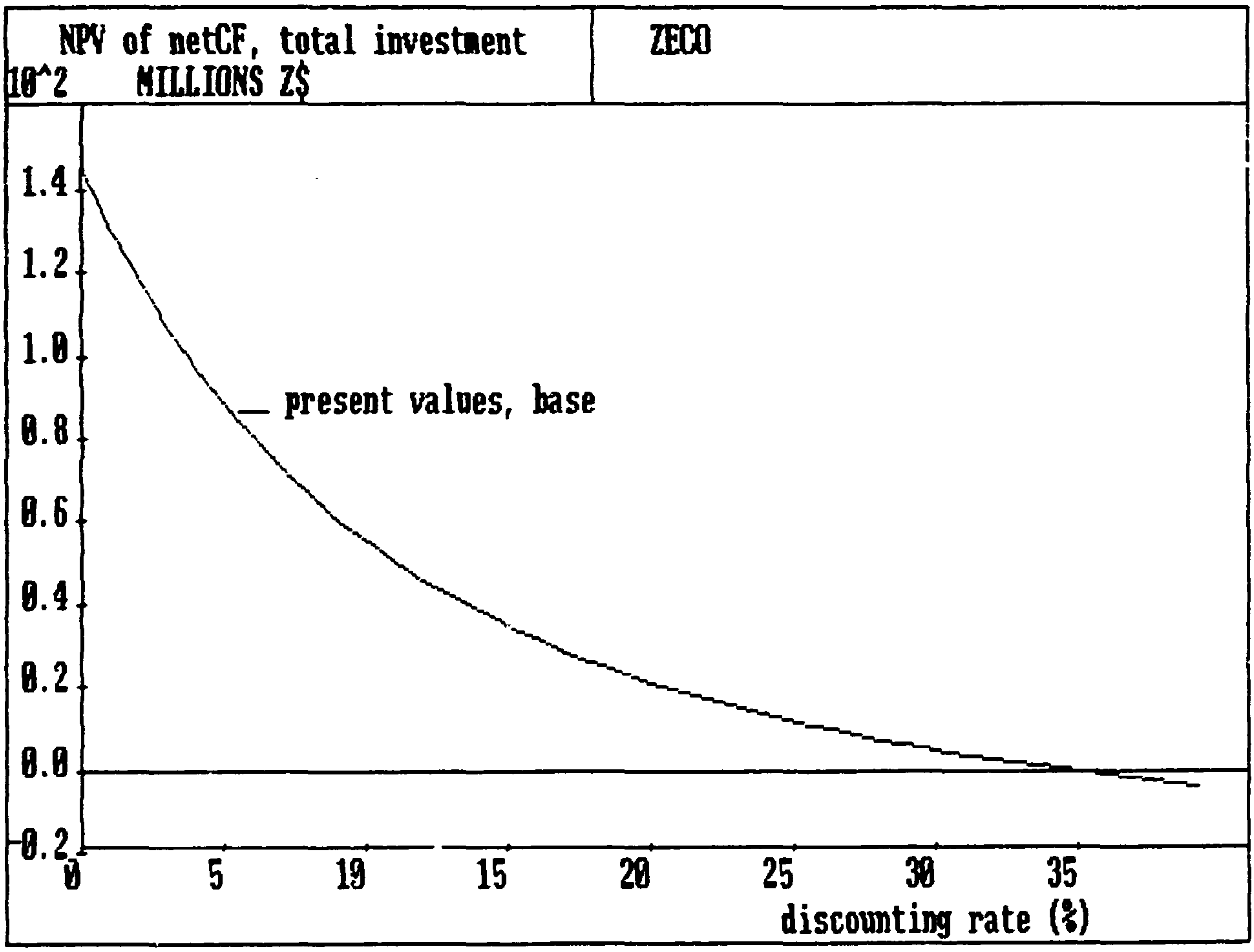
Projected Balance Sheets, Production in MILLIONS DE $ ZIMBABWE 1US$=6.4$

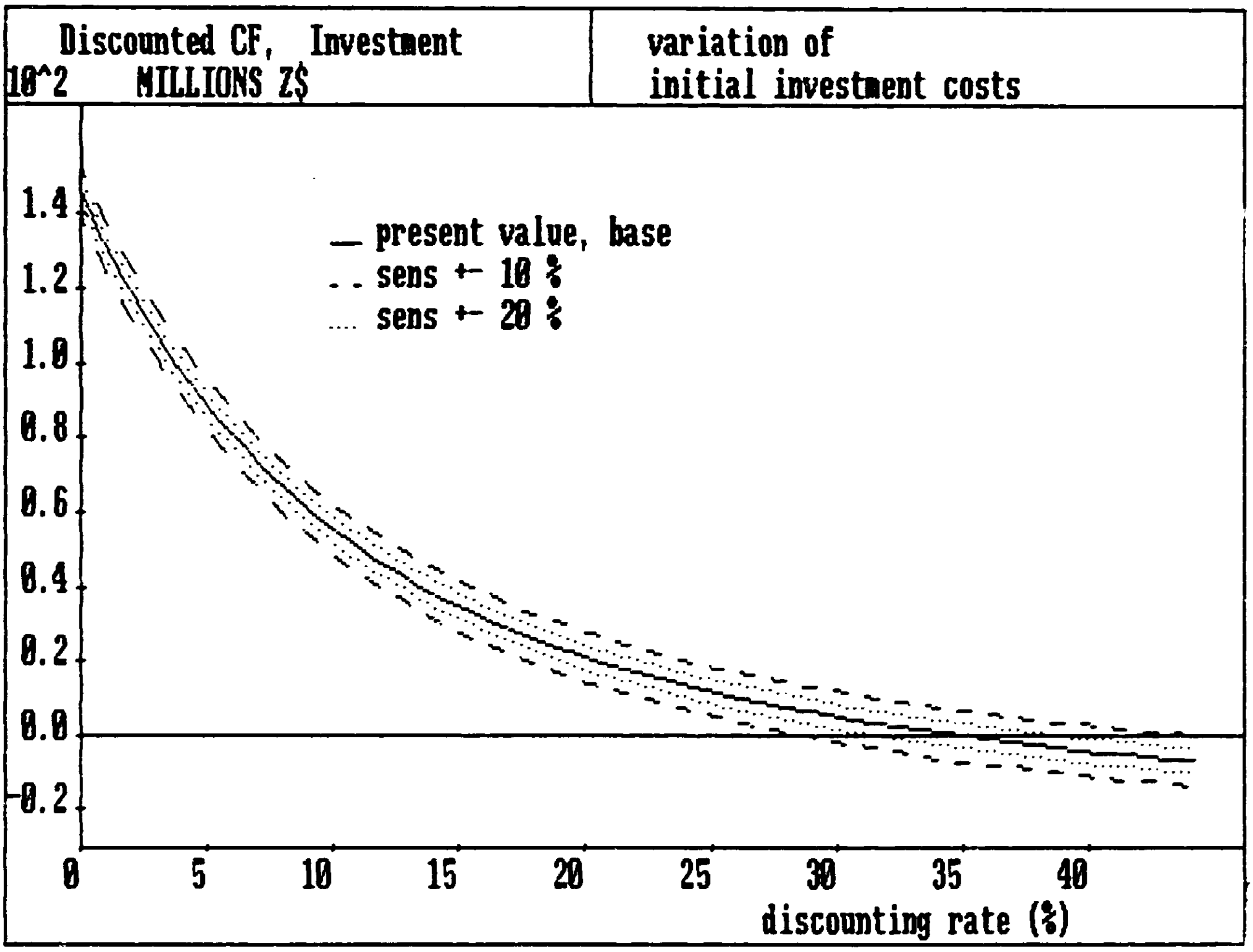
Year	2004	2005	2006	2007	2008
Total assets	77.524	82.384	87.238	92.208	97.174
Fixed assets, net of depreciation	10.947	10.054	9.149	8.454	7.754
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	12.591	12.591	12.591	12.591	12.591
Cash, bank	0.056	0.056	0.056	0.056	0.056
Cash surplus, finance available	53.929	59.683	65.442	71.106	76.773
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	77.524	82.384	87.238	92.208	97.174
Equity capital	18.000	18.000	18.000	18.000	18.000
Reserves, retained profit	46.939	51.800	56.660	61.514	66.484
Profit	9.361	9.361	9.354	9.470	9.466
Long and medium term debt	0.000	0.000	0.000	0.000	0.000
Current liabilities	3.224	3.224	3.224	3.224	3.224
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	3.224	3.224	3.224	3.224	3.224
Equity, % of liabilities	23.219	21.849	20.633	19.521	18.524

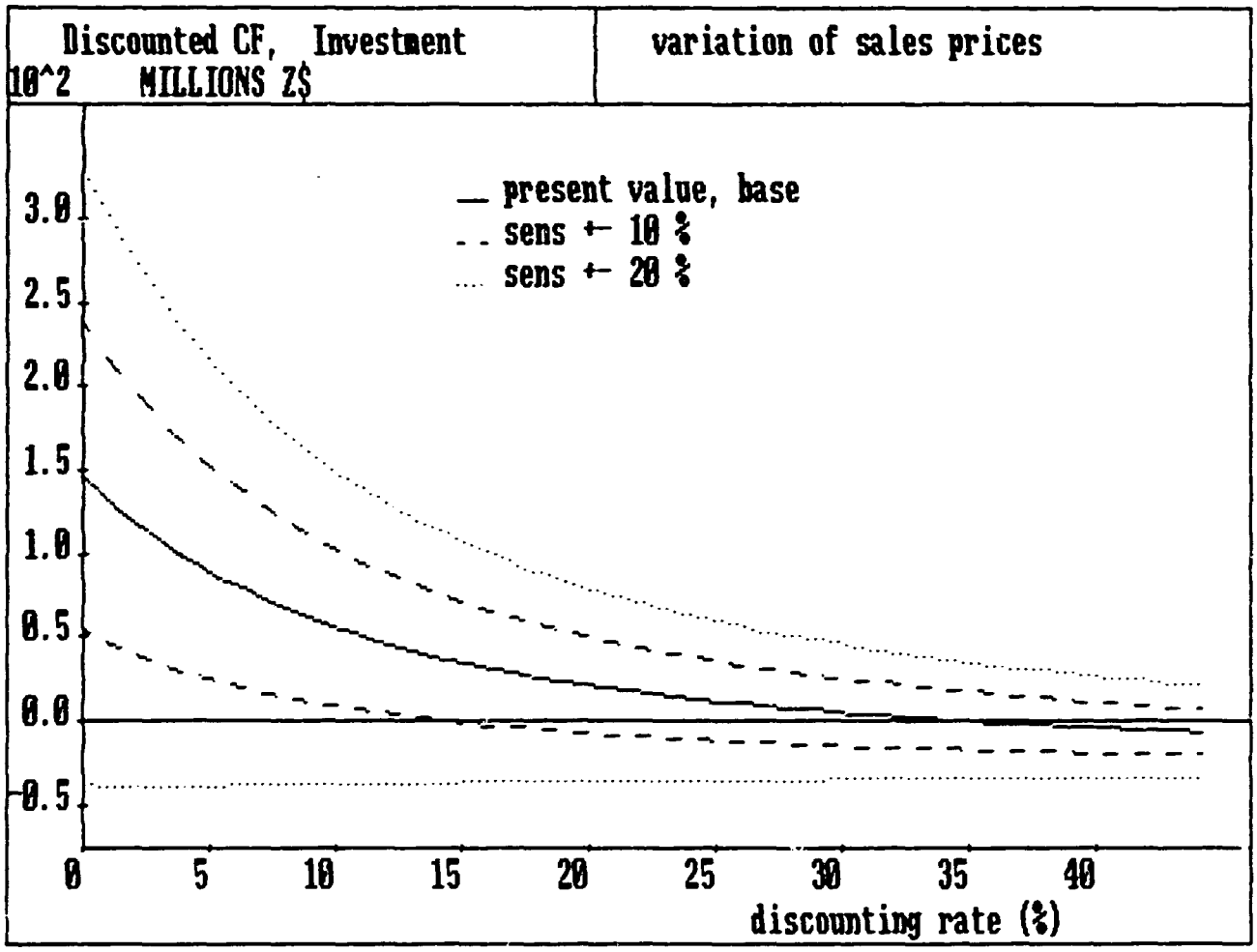

Debt Service Ratio, by year
net CF / debt service
variation of the net cashflow
7.0
6.0
5.0
4.0
3.0
2.0
1.0
base case
± 10 %
± 20 %
± 30 %
± 40 %
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
year

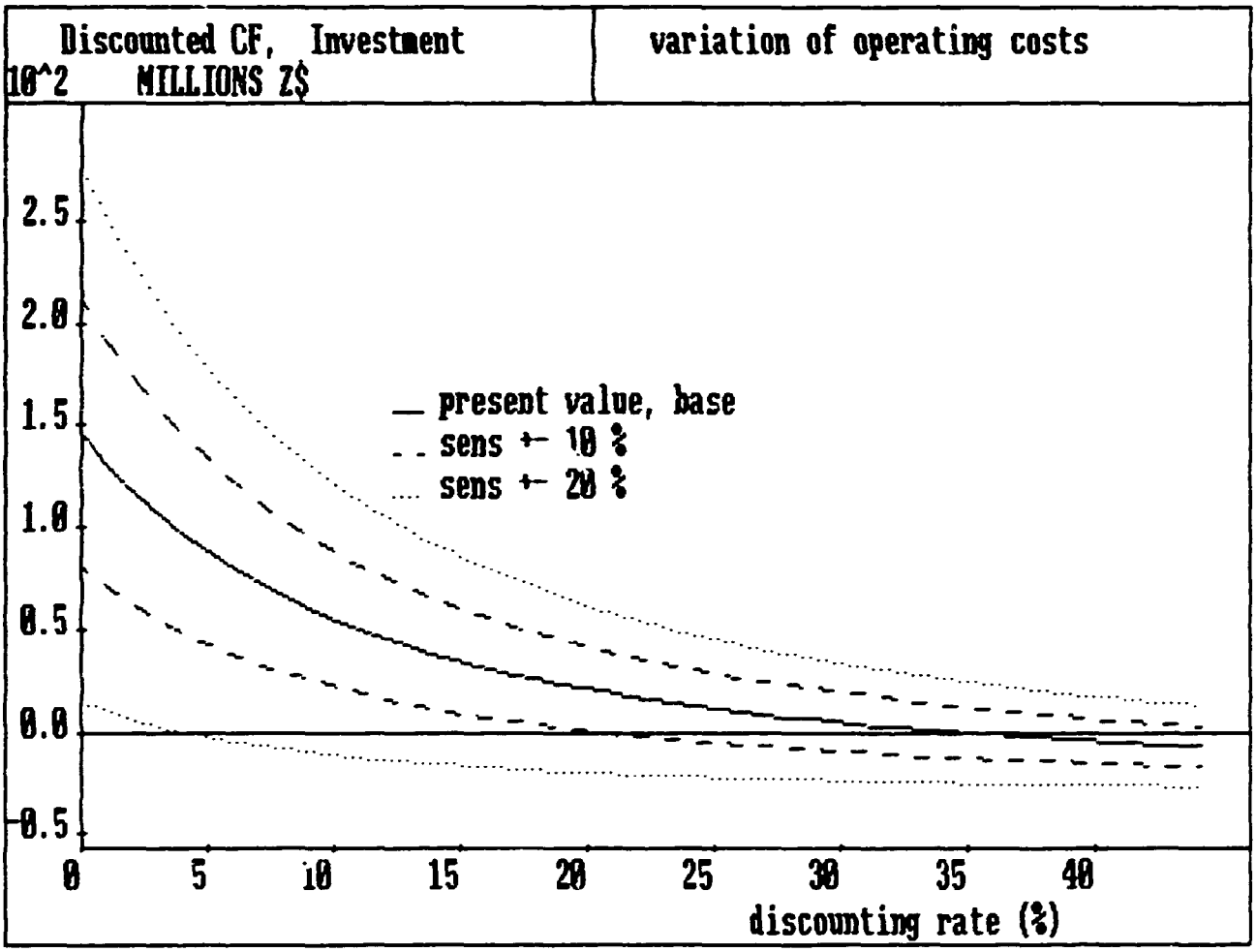

Debt Service Ratio, by year
net CF / debt service
variation of total interest
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
base case
± 10 %
± 20 %
± 30 %
± 45 %
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
year

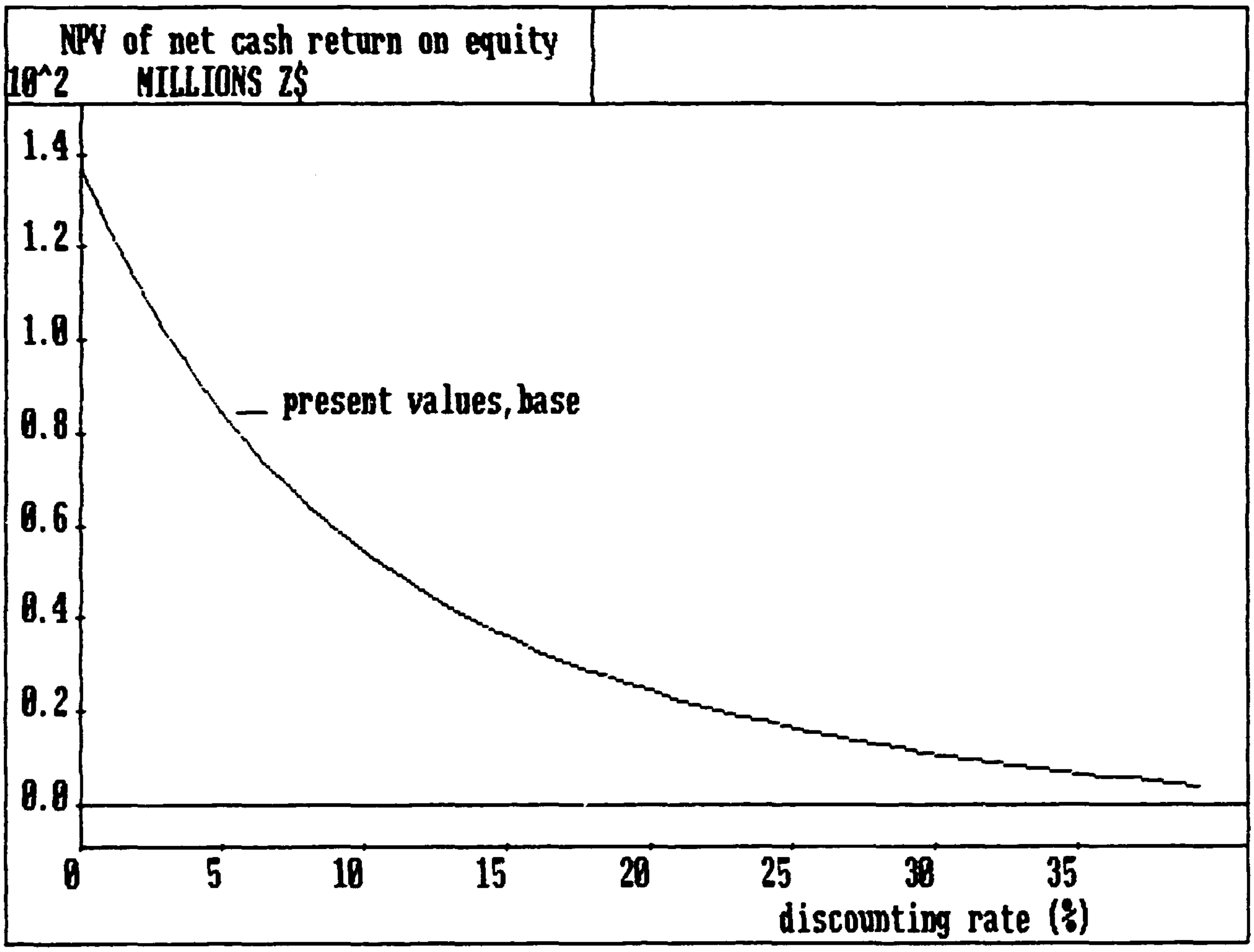

Debt/Equity Ratio, by year
ZECO
10^2 in %
debt
equity
reserves
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1
2
3
4
5
6
7
8
9
10
11
12
Démarrage
year

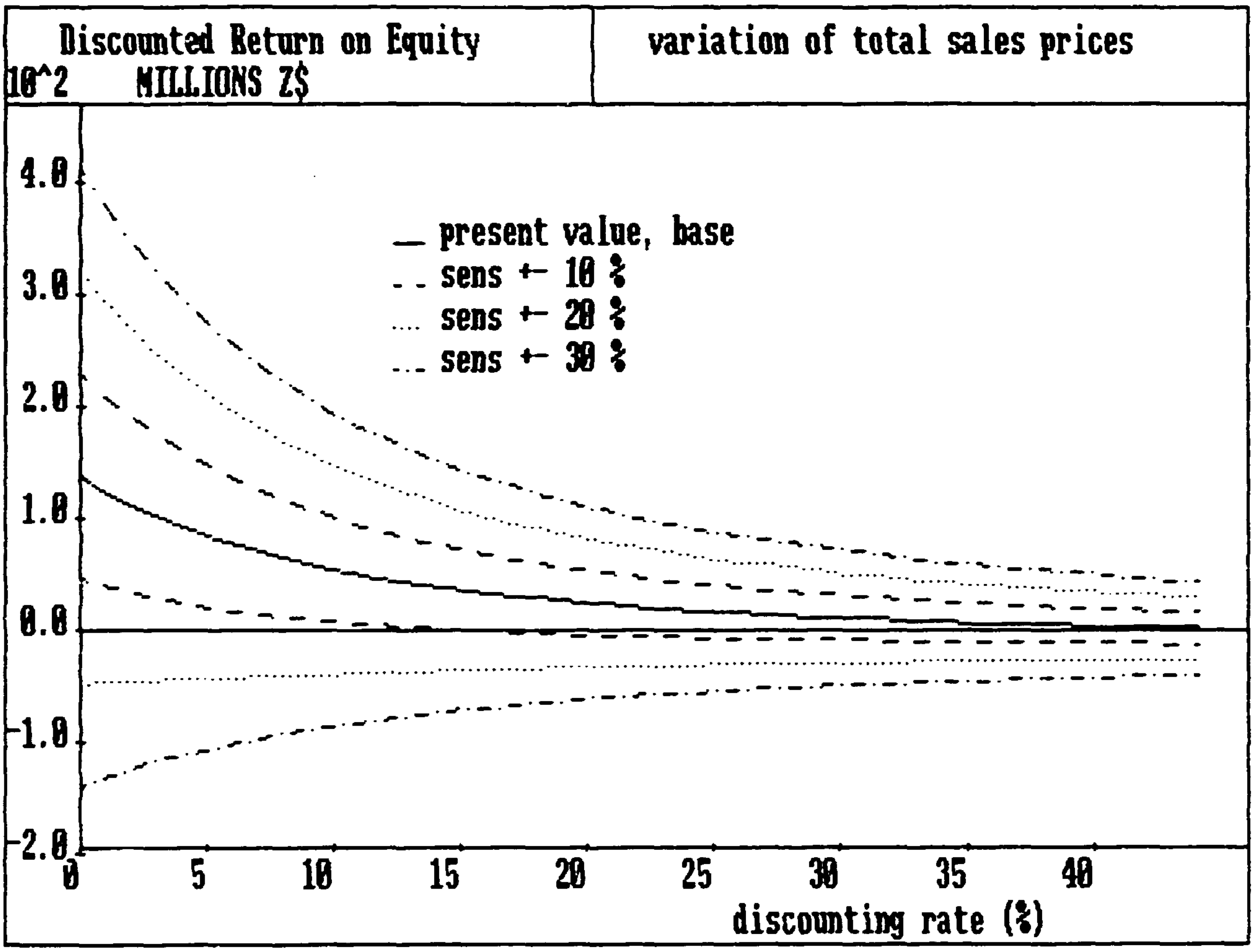

NPV of netCF, total investment
ZECO
10^2 MILLIONS Z$
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
present values, base
0
5
10
15
20
25
30
35
discounting rate (%)

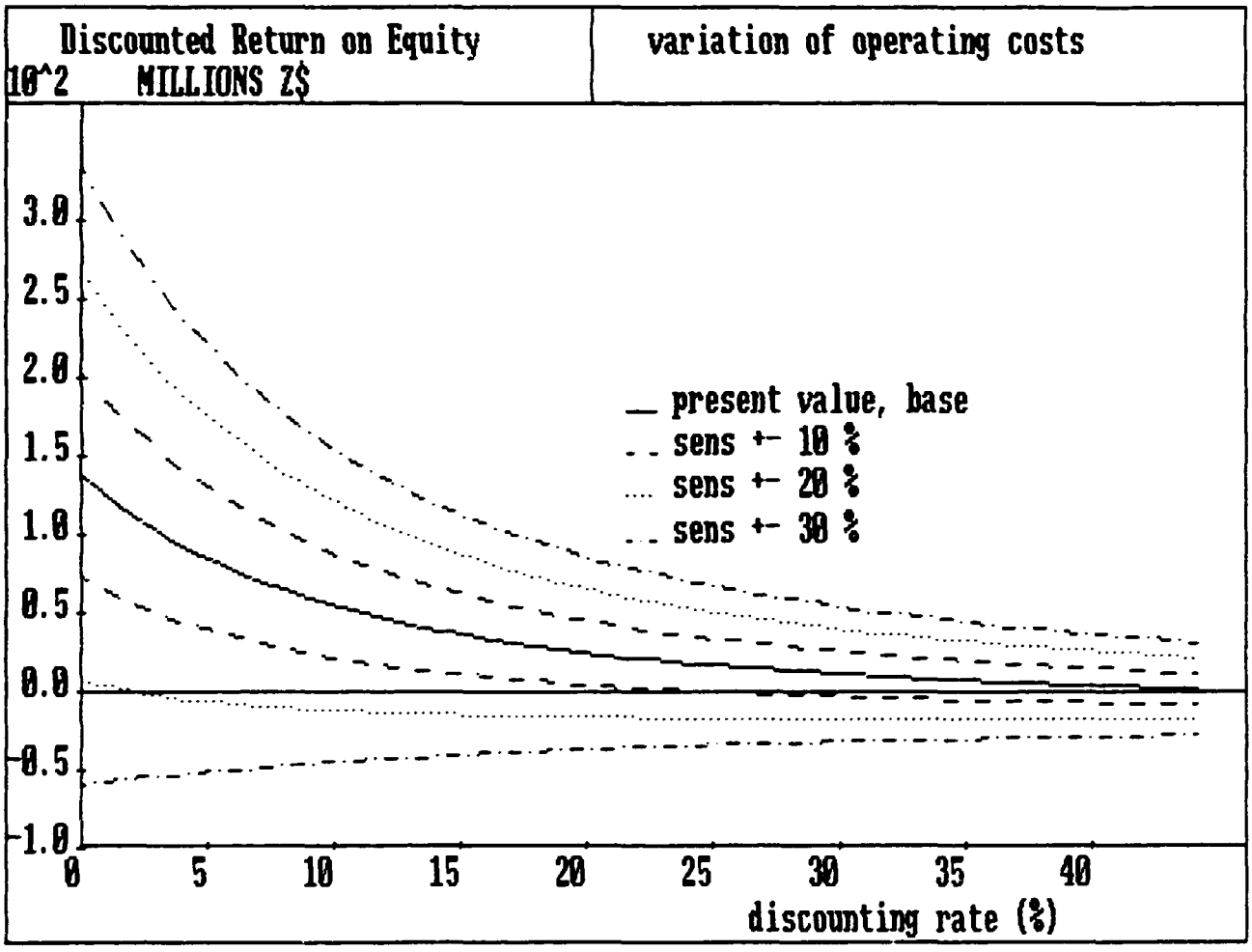

Discounted CF, Investment
10^2 MILLIONS Z$
variation of
initial investment costs
— present value, base
- - sens +- 10 %
.... sens +- 20 %
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
0
5
10
15
20
25
30
35
40
discounting rate (%)

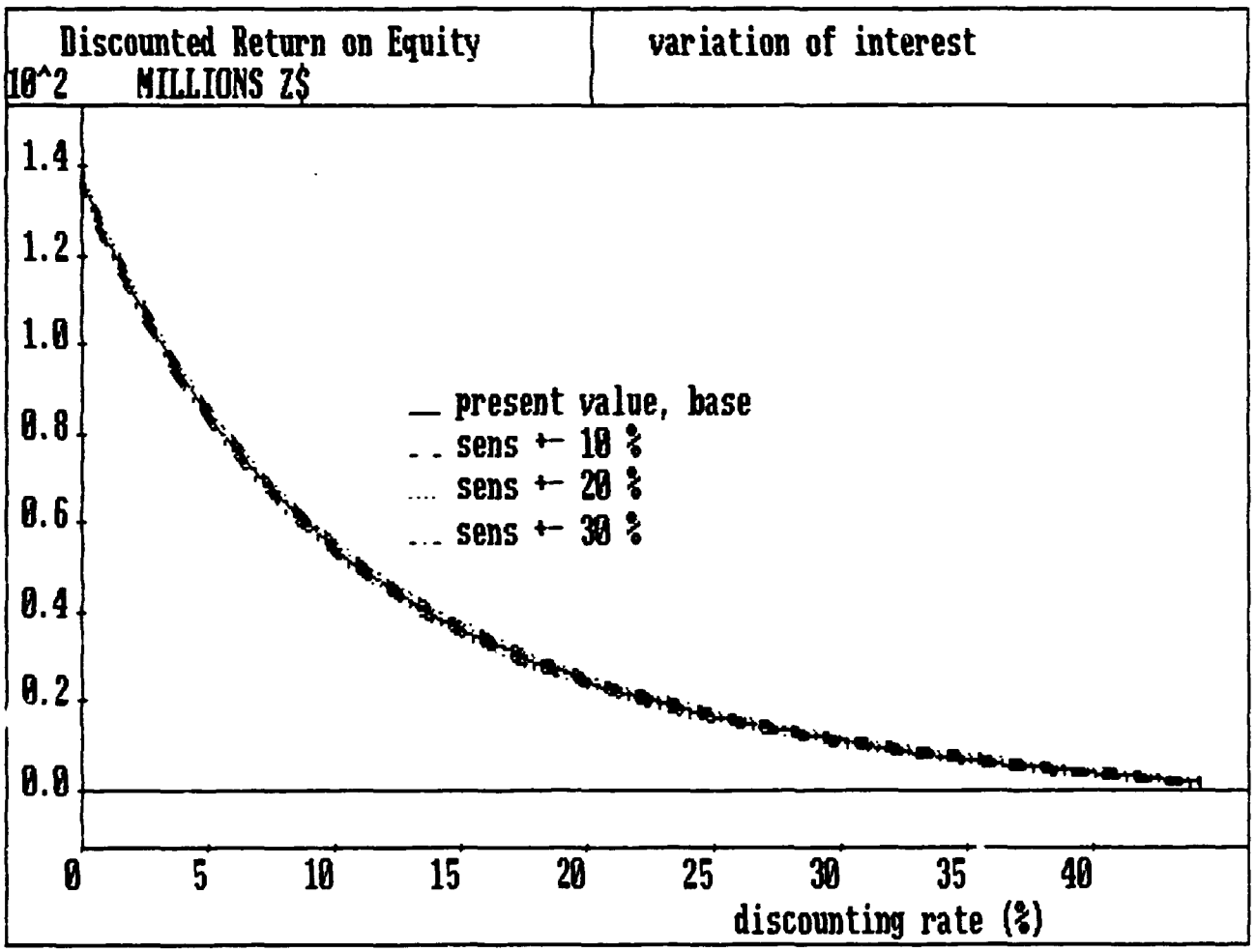

Discounted CF, Investment
10^2 MILLIONS Z$
variation of sales prices
present value, base
sens + 10 %
sens + 20 %
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
0
5
10
15
20
25
30
35
40
discounting rate (%)


Discounted CF, Investment
10^2 MILLIONS Z$
variation of operating costs
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
present value, base
sens +- 10 %
sens +- 20 %
0
5
10
15
20
25
30
35
40
discounting rate (%)


NPV of net cash return on equity
10^2 MILLIONS Z$
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
present values, base
0
5
10
15
20
25
30
35
discounting rate (%)

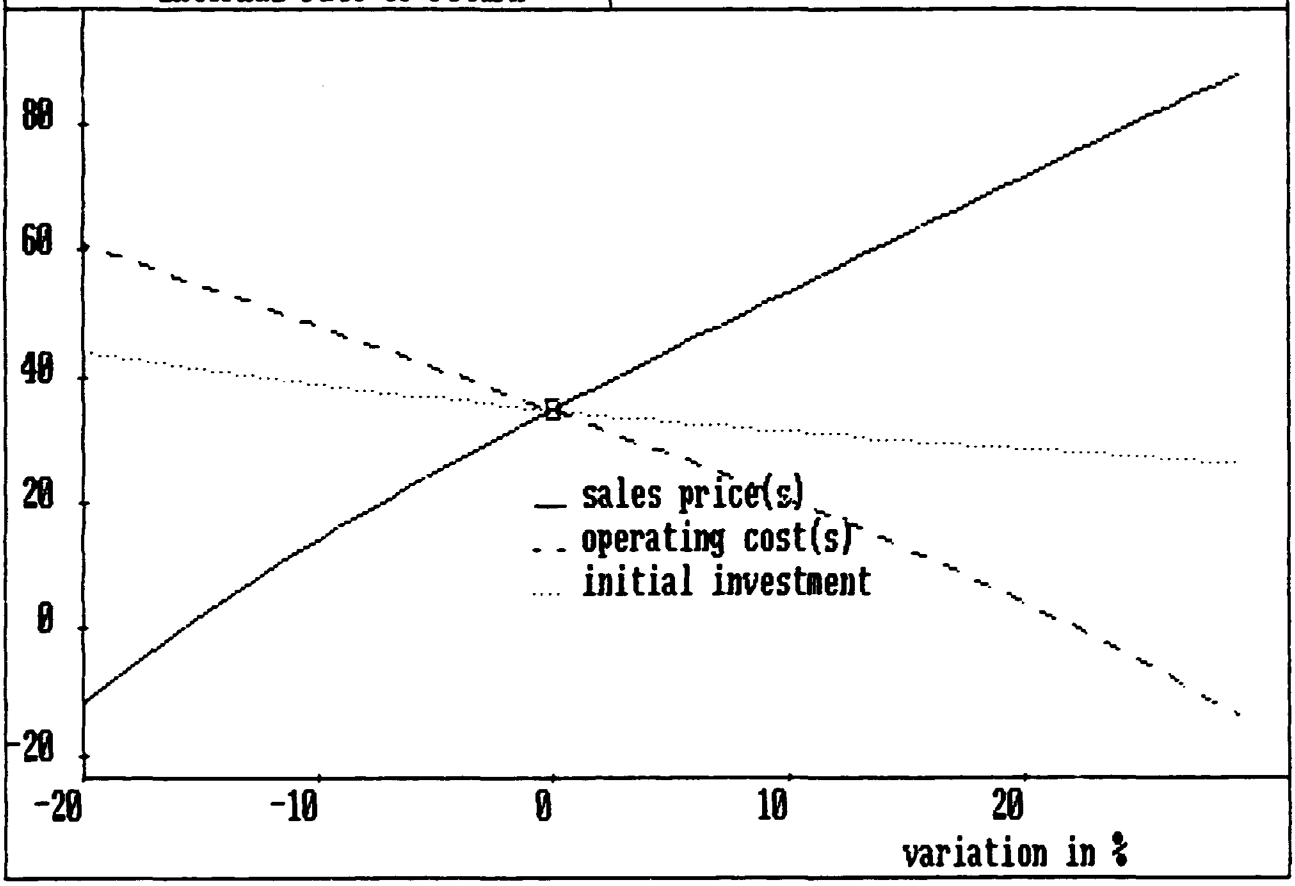

Discounted Return on Equity
10^2 MILLIONS Z$
variation of total sales prices
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
present value, base
sens +- 10 %
sens +- 20 %
sens +- 30 %
0
5
10
15
20
25
30
35
40
discounting rate (%)

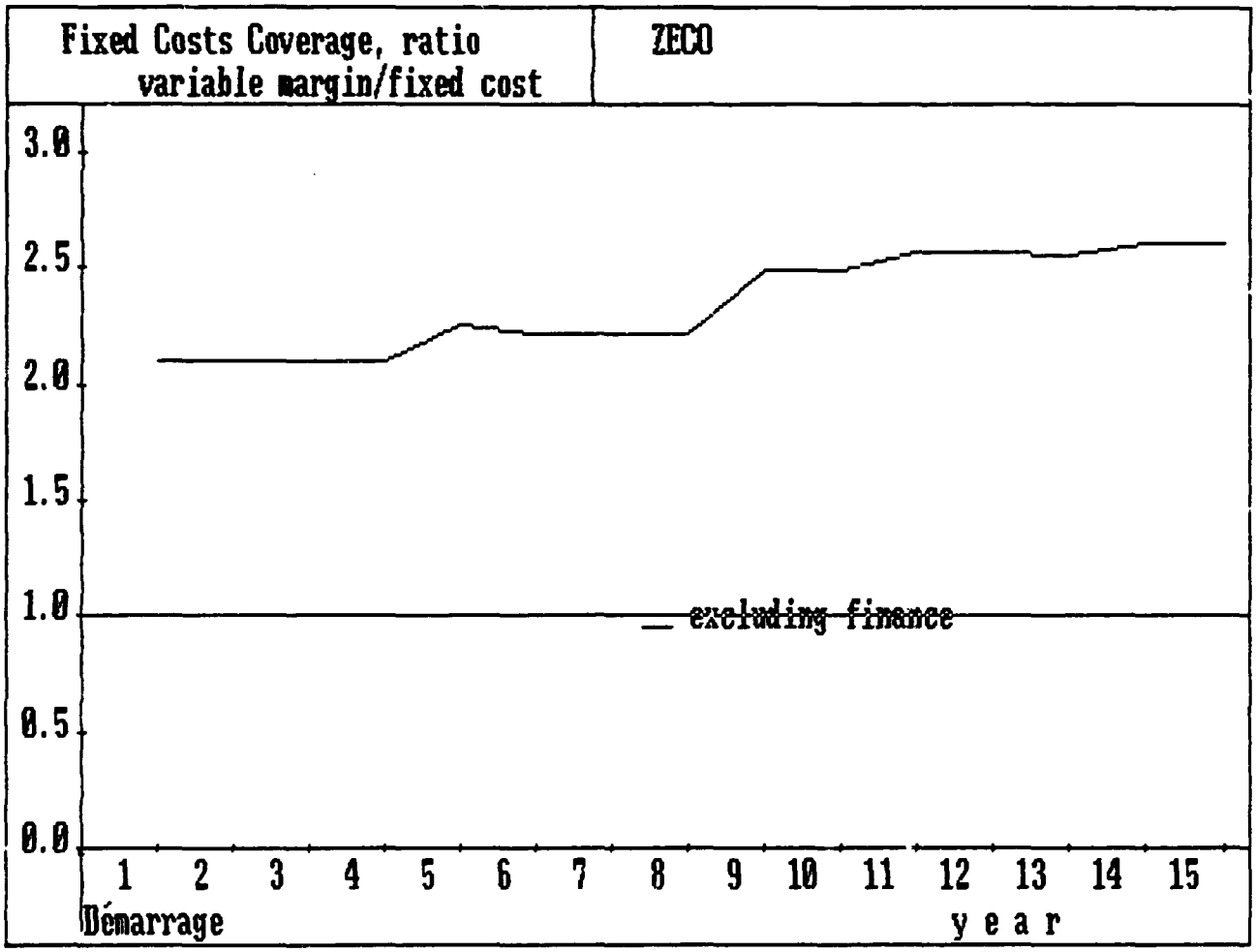

Discounted Return on Equity
10^2 MILLIONS Z$
variation of operating costs
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
0
5
10
15
20
25
30
35
40
discounting rate (%)
present value, base
sens +- 10 %
sens +- 20 %
sens +- 30 %

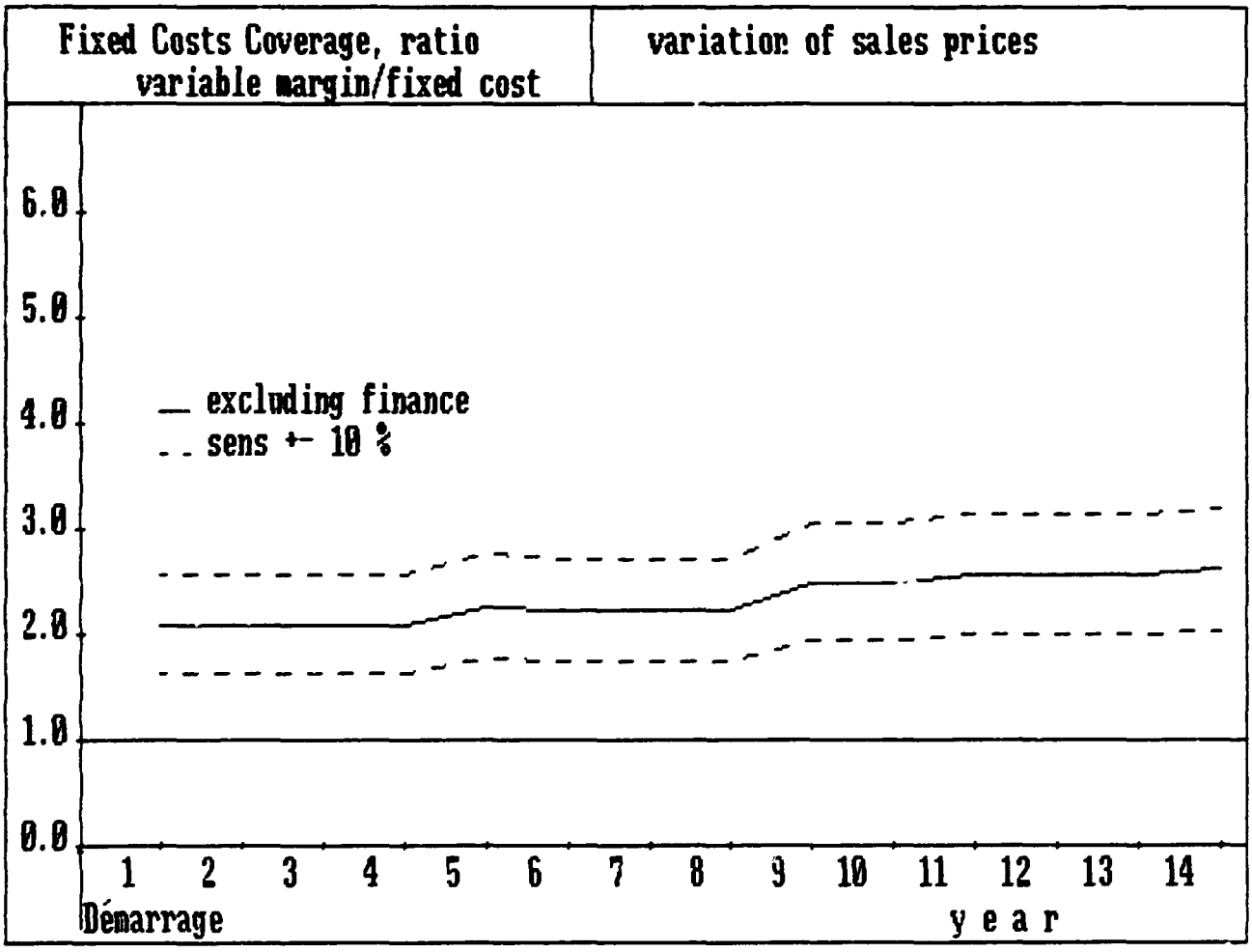

Discounted Return on Equity
10^2 MILLIONS Z$
variation of interest
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
present value, base
sens +- 10 %
sens +- 20 %
sens +- 30 %
0
5
10
15
20
25
30
35
40
discounting rate (%)

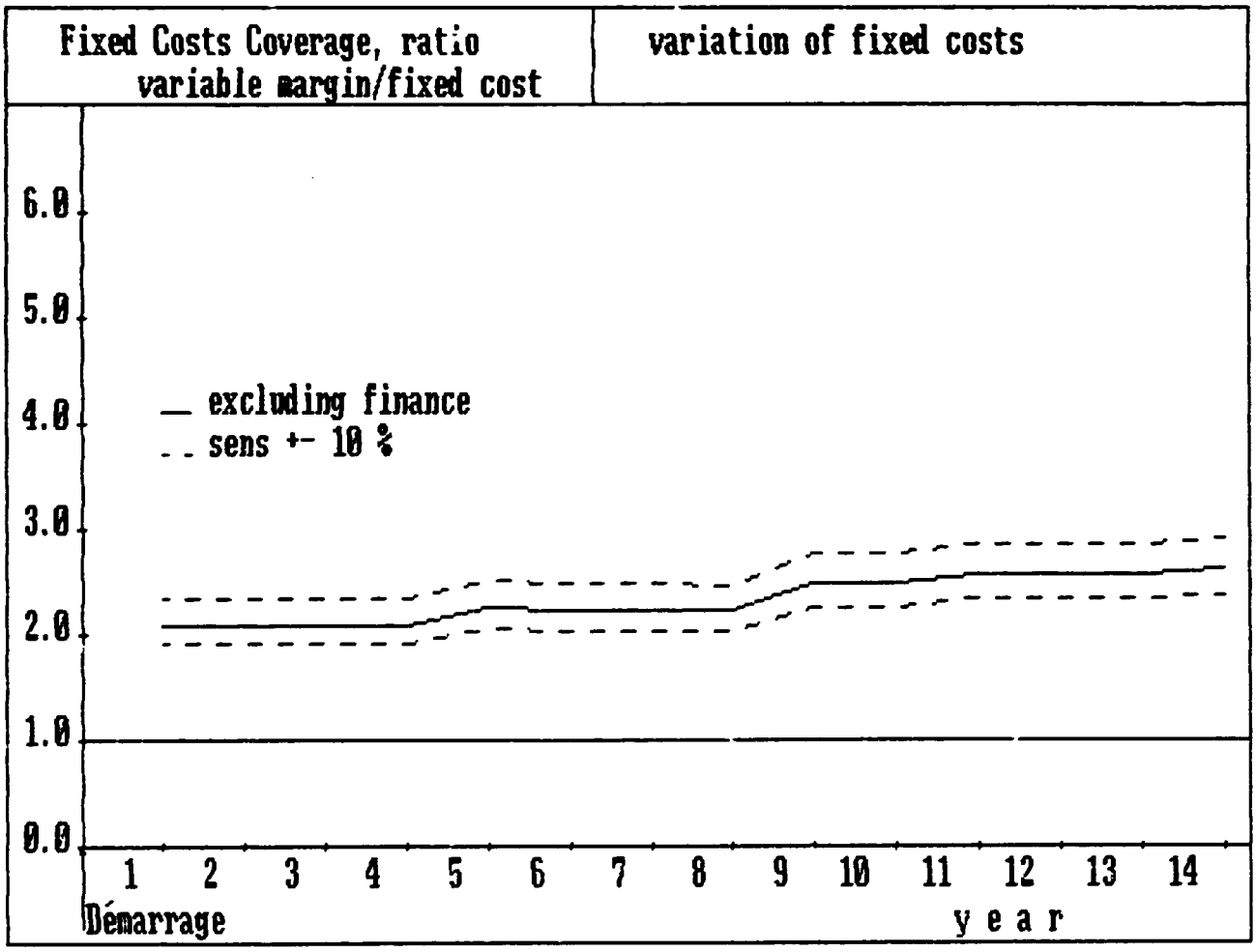
Sensitivity of IRR
internal rate of return

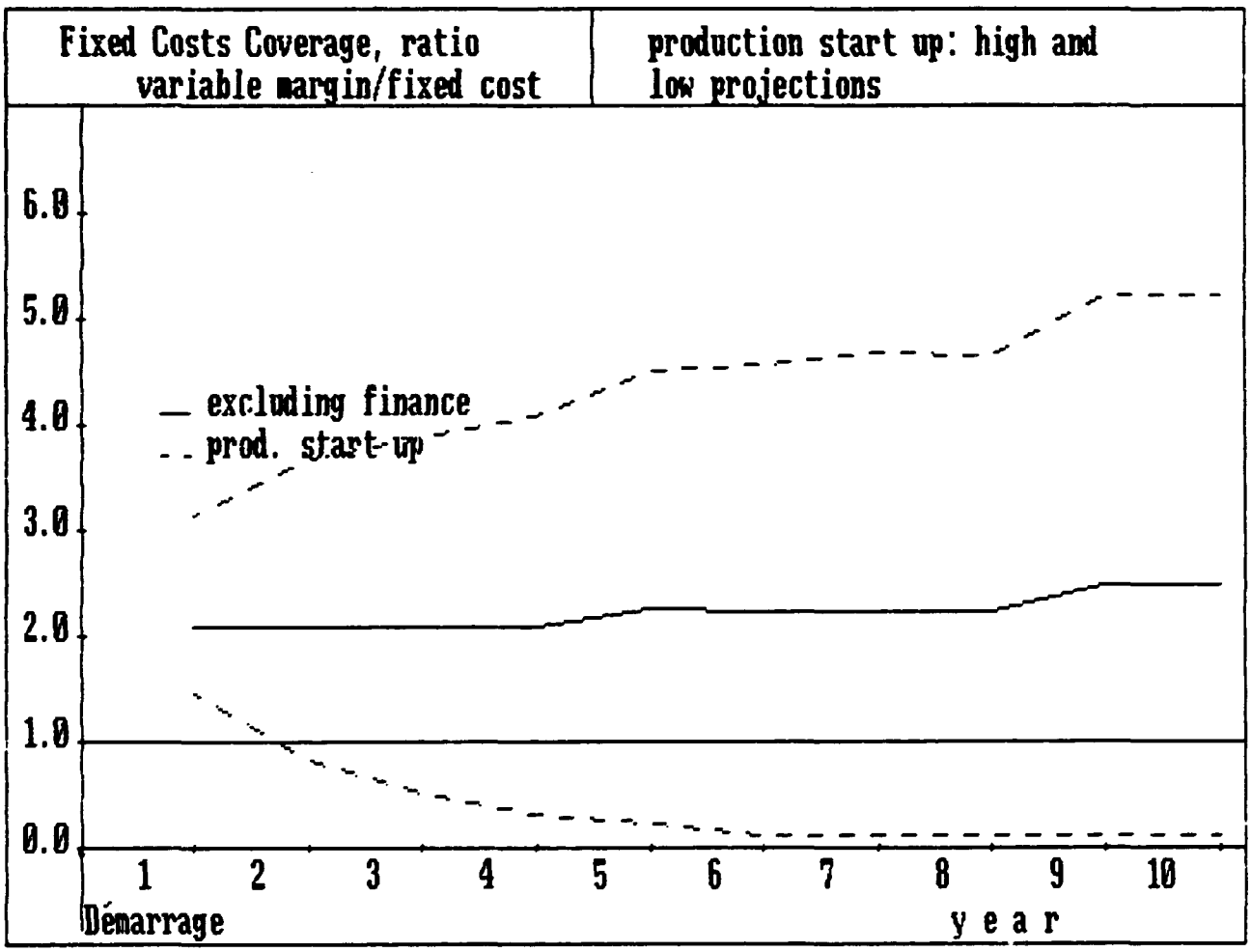
ZECO

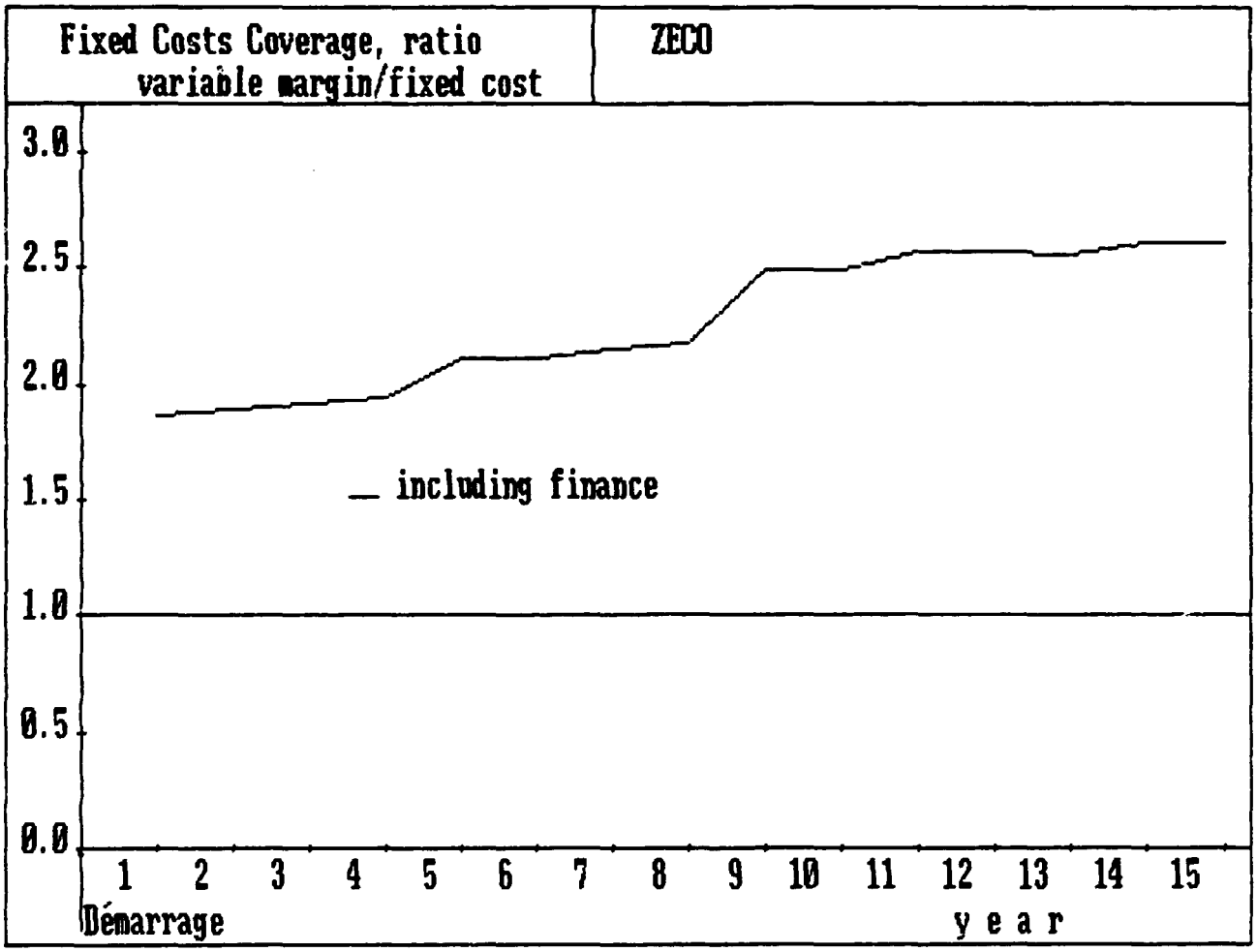


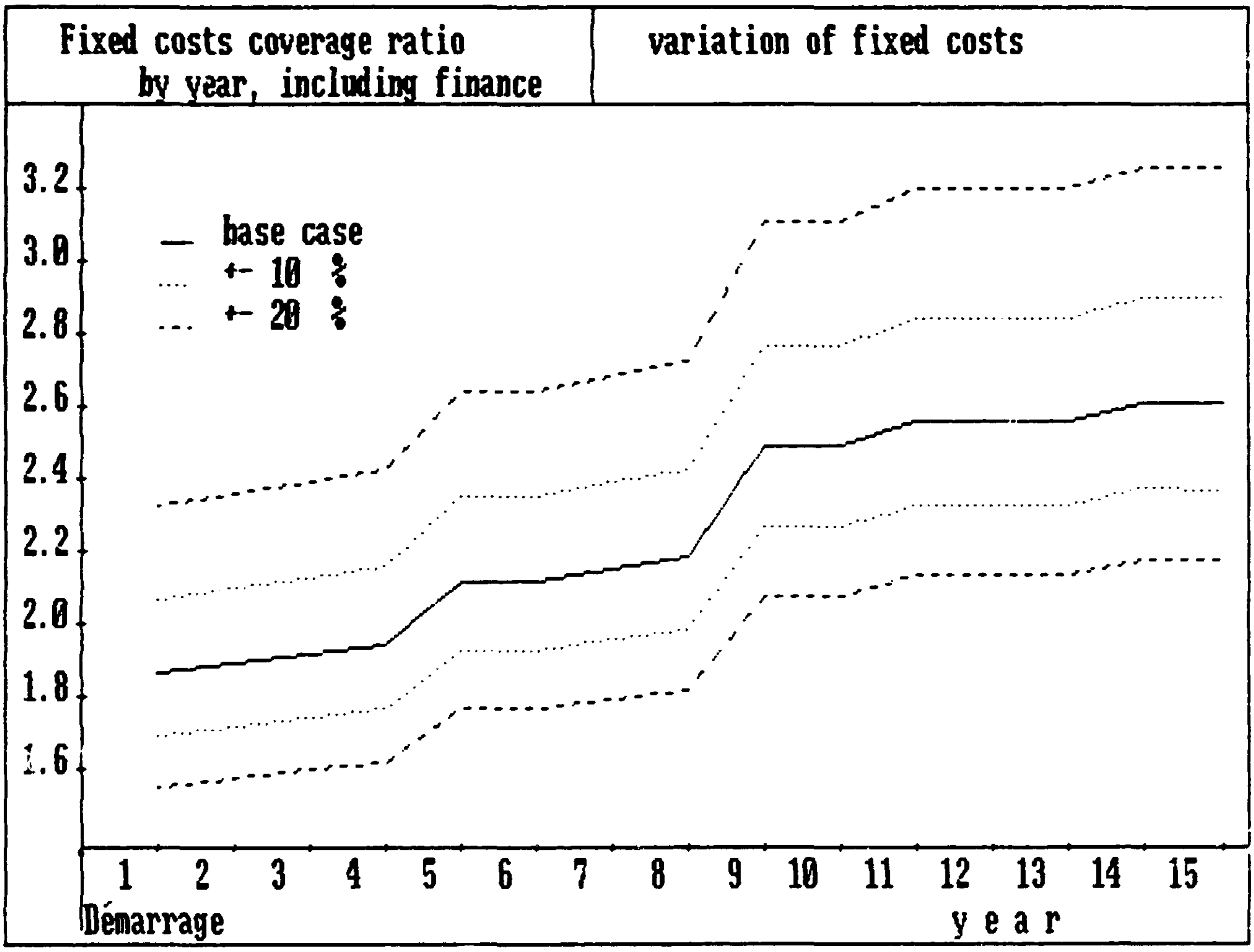

Fixed Costs Coverage, ratio
variable margin/fixed cost
ZECO
3.0
2.5
2.0
1.5
1.0
0.5
0.0
excluding finance
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
year

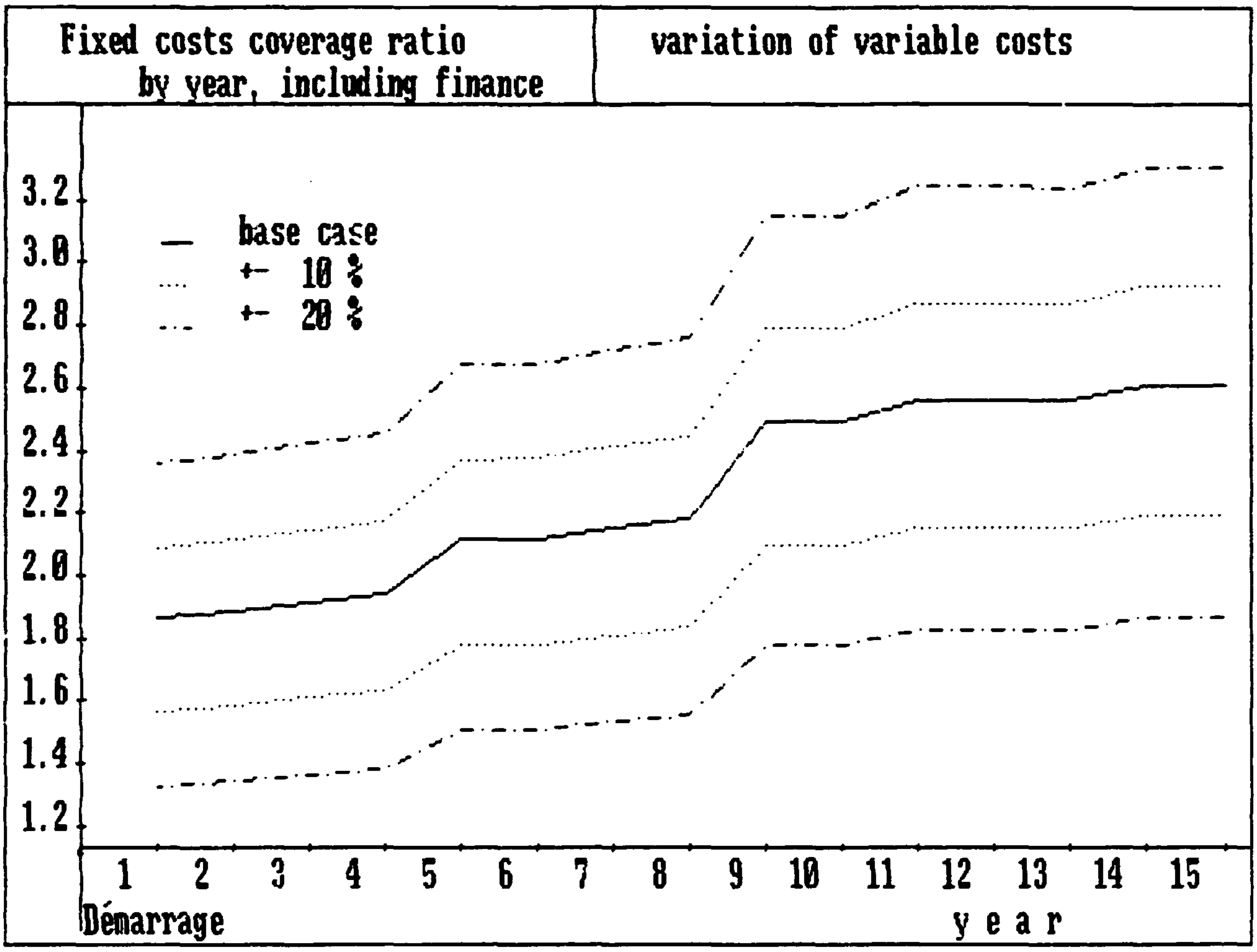

Fixed Costs Coverage, ratio
variable margin/fixed cost
variation of sales prices
6.0
5.0
4.0
3.0
2.0
1.0
0.0
excluding finance
sens +- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Démarrage
year

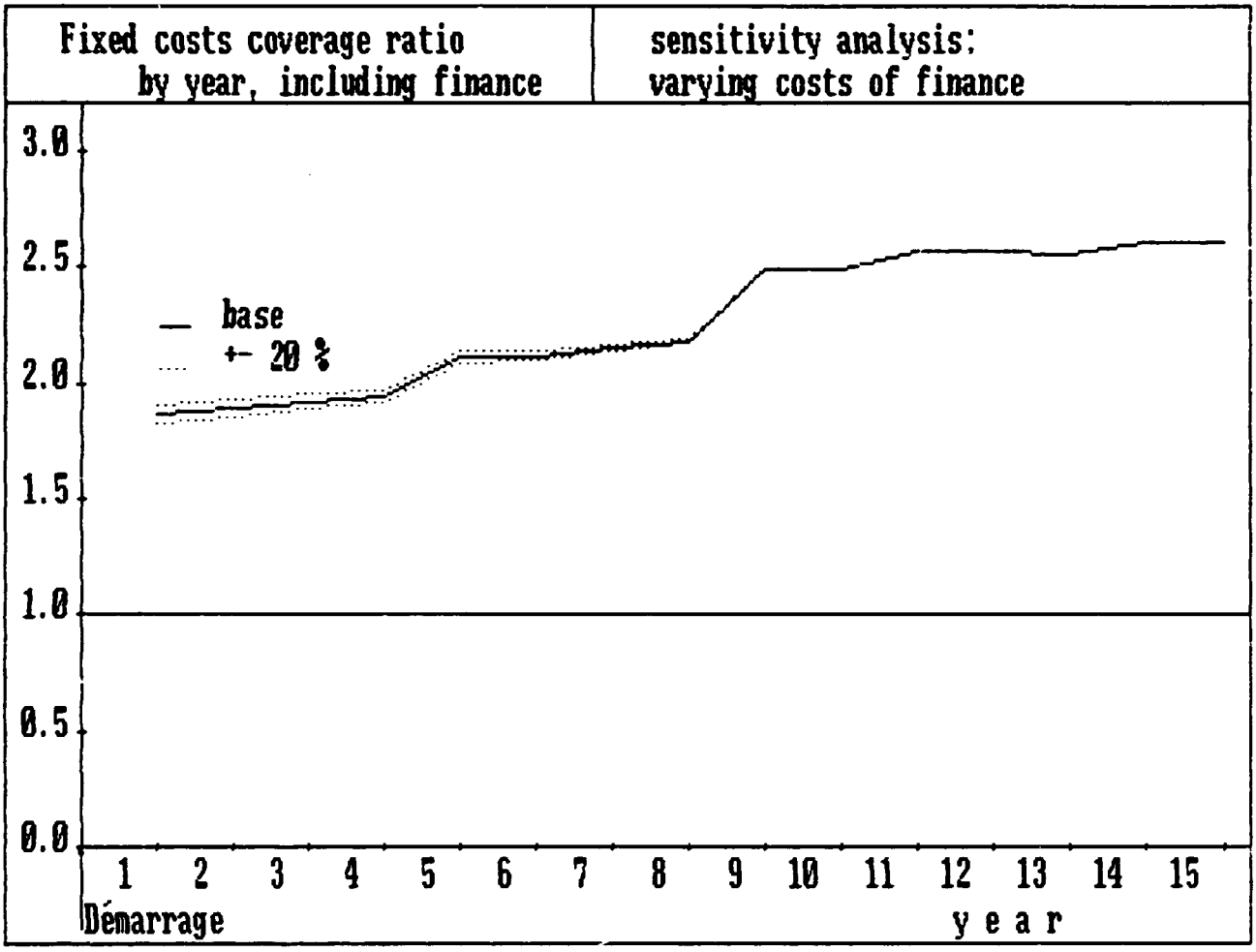

Fixed Costs Coverage, ratio
variable margin/fixed cost
variation of fixed costs
6.0
5.0
4.0
3.0
2.0
1.0
0.0
excluding finance
sens +- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Démarrage
year

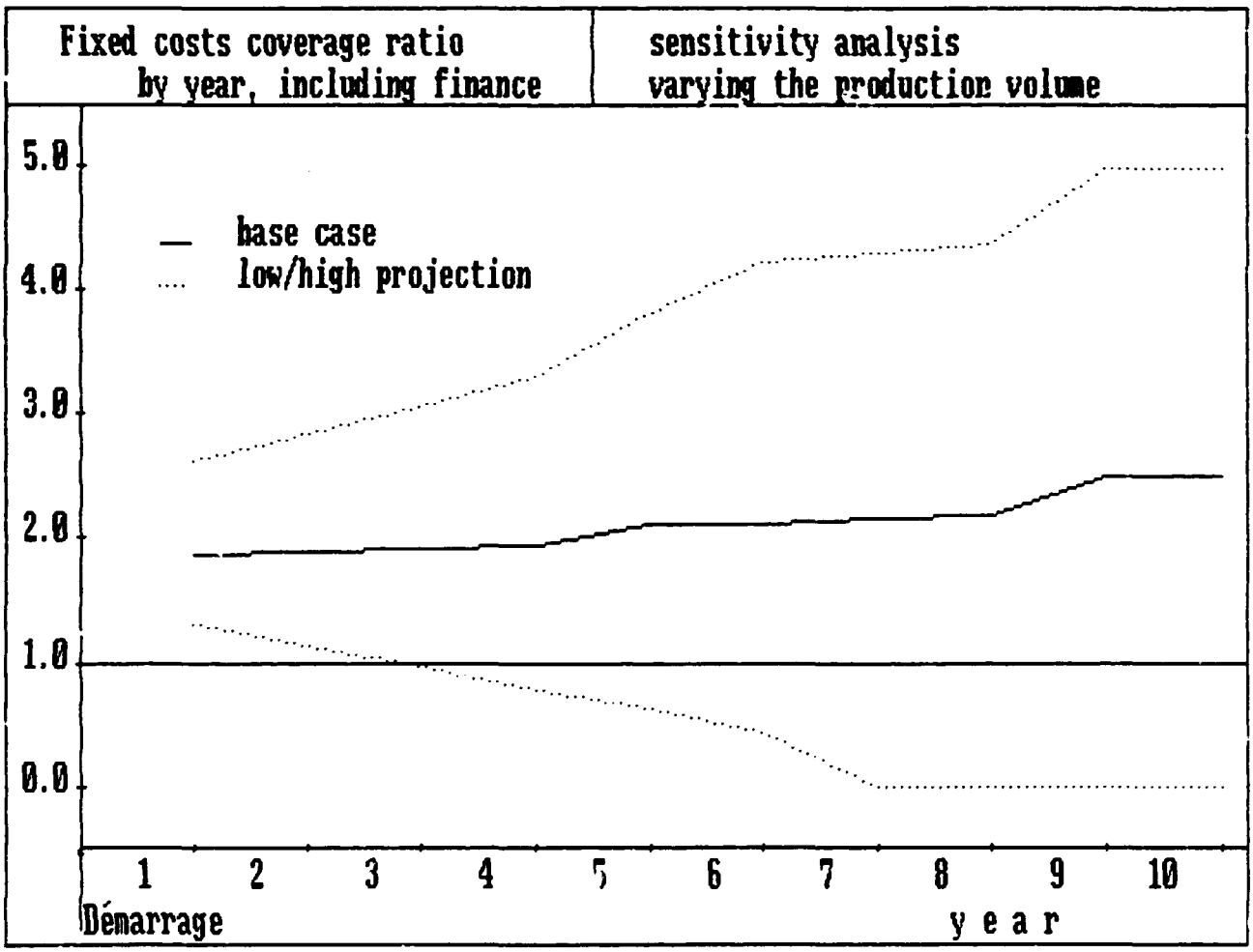

Fixed Costs Coverage, ratio variable margin/fixed cost
production start up: high and low projections
6.0
5.0
4.0
3.0
2.0
1.0
0.0
excluding finance
prod. start-up
1
2
3
4
5
6
7
8
9
10
Démarrage
year

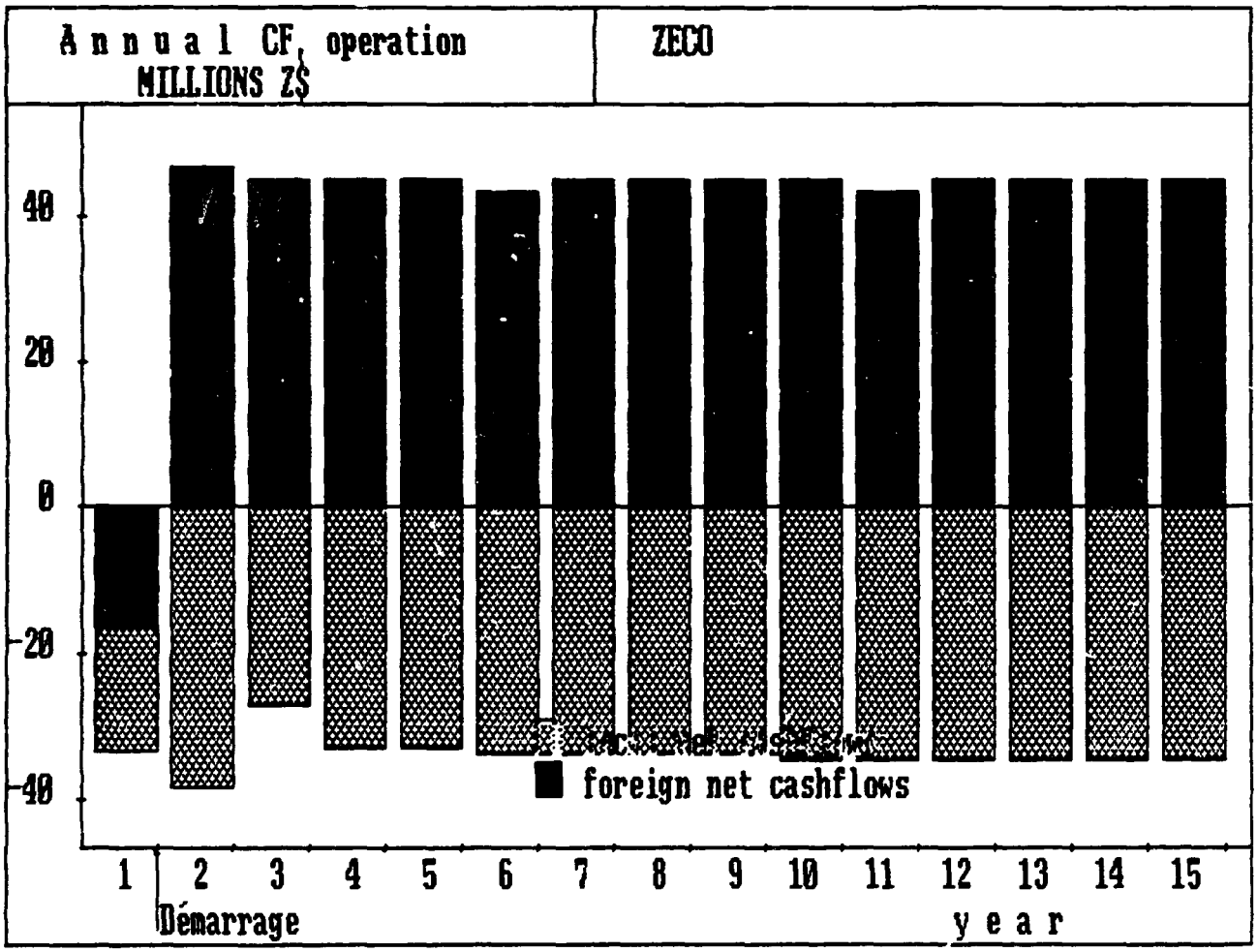

Fixed Costs Coverage, ratio variable margin/fixed cost
ZECO
3.0
2.5
2.0
1.5
1.0
0.5
0.0
including finance
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
year

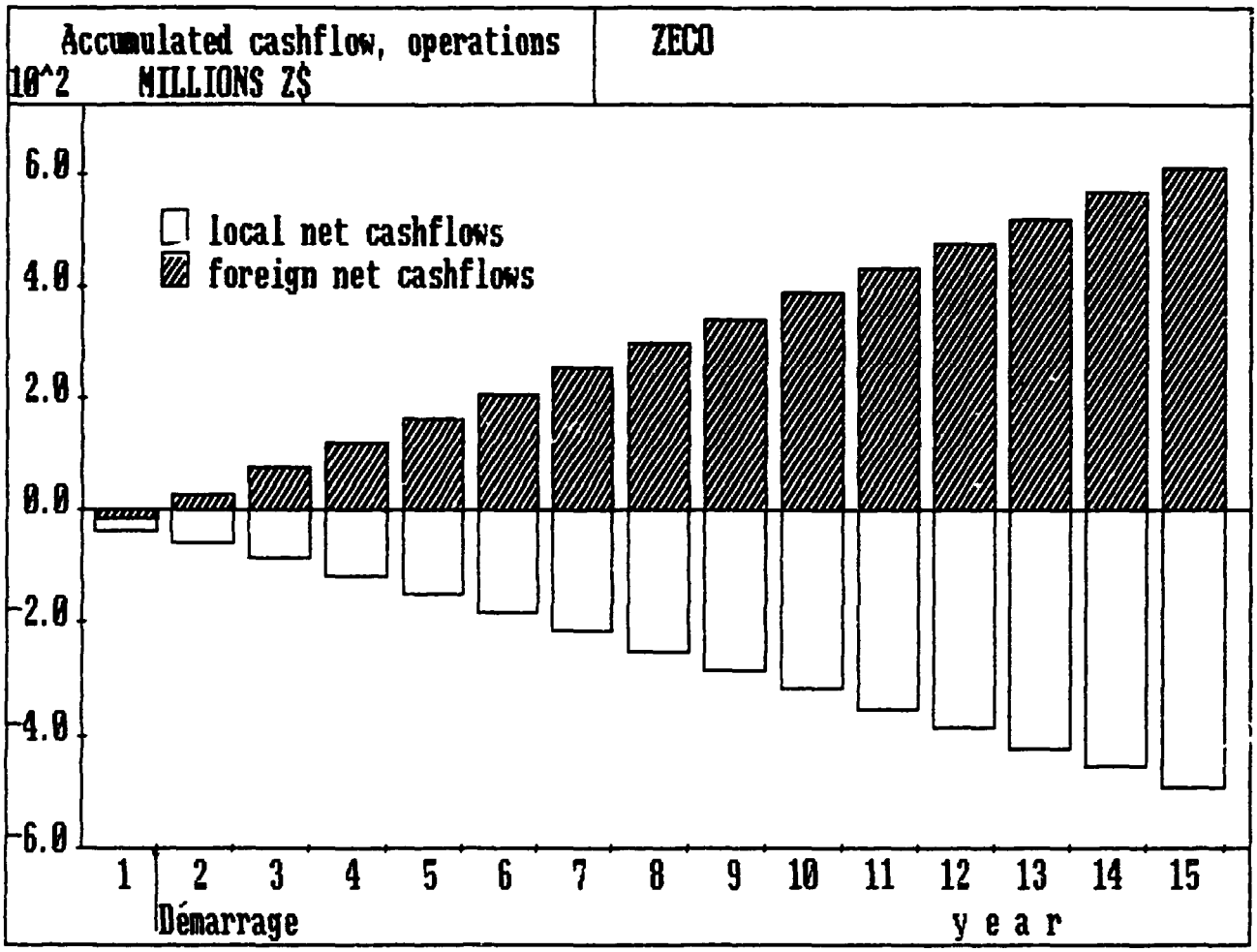

Fixed costs coverage ratio
by year, including finance
variation of fixed costs
base case
+- 10 %
+- 20 %
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
year

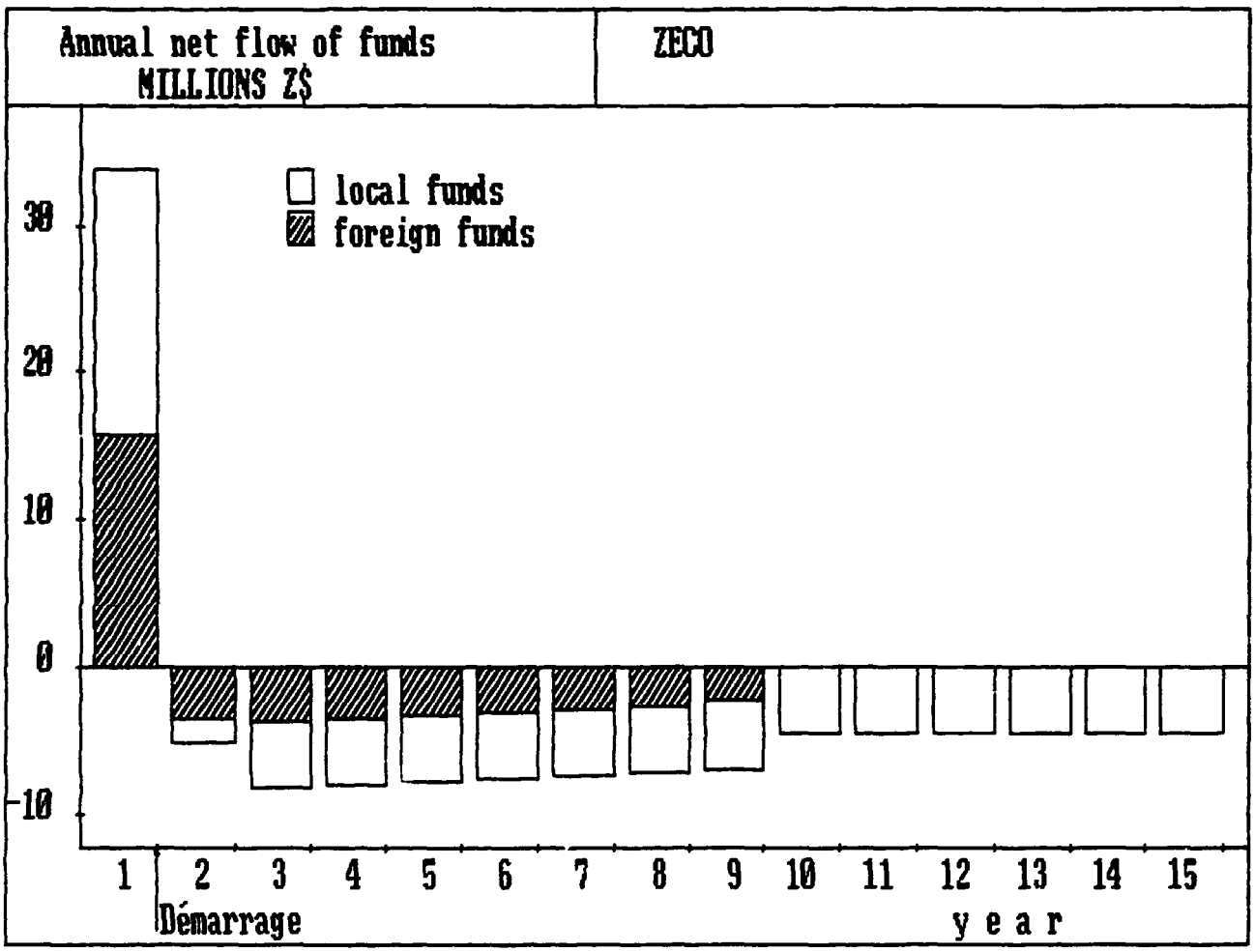

Fixed costs coverage ratio
by year, including finance
variation of variable costs
base case
+- 10 %
+- 20 %
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
y e a r

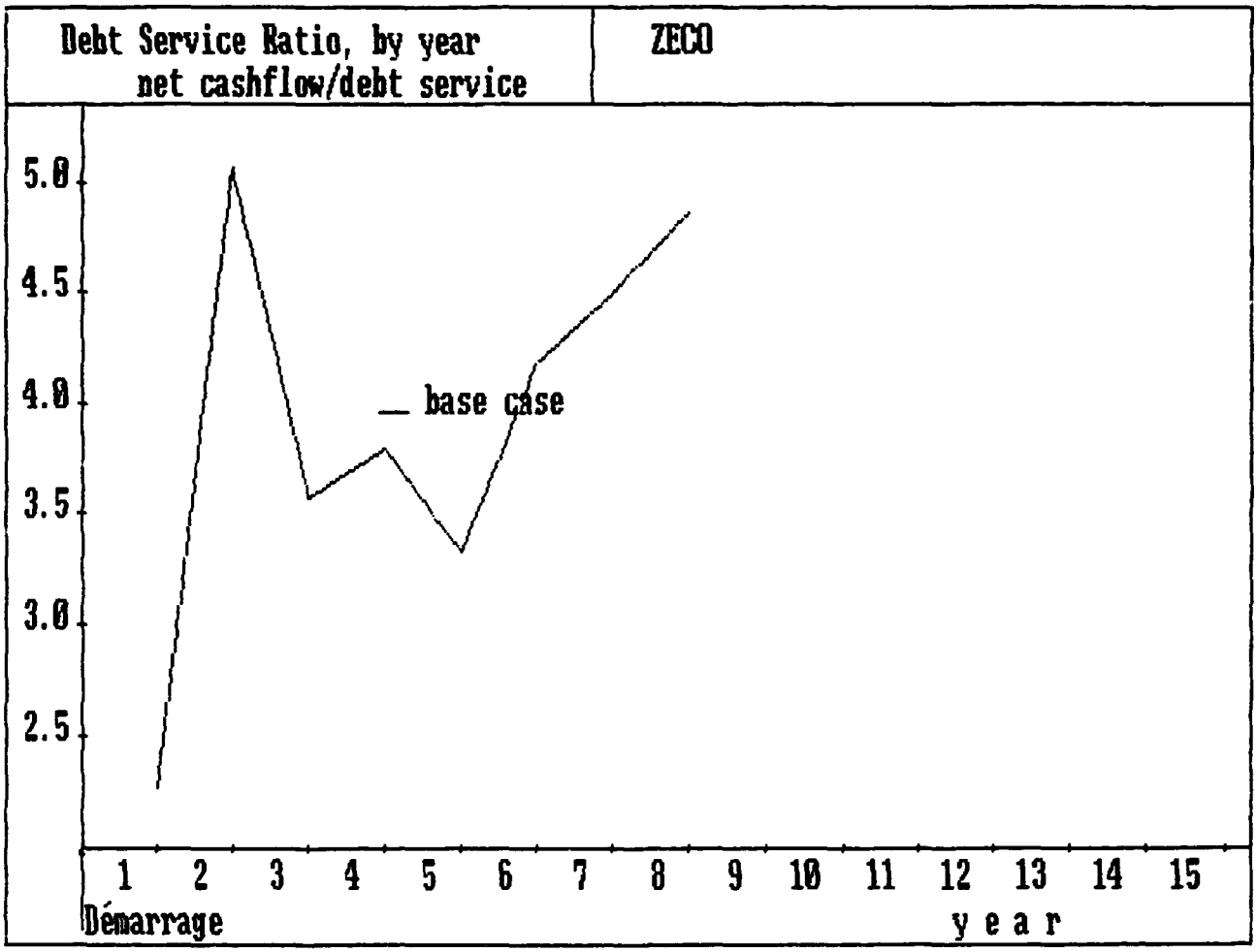

Fixed costs coverage ratio
by year, including finance
sensitivity analysis:
varying costs of finance
3.0
2.5
2.0
1.5
1.0
0.5
0.0
base
+- 20 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
year

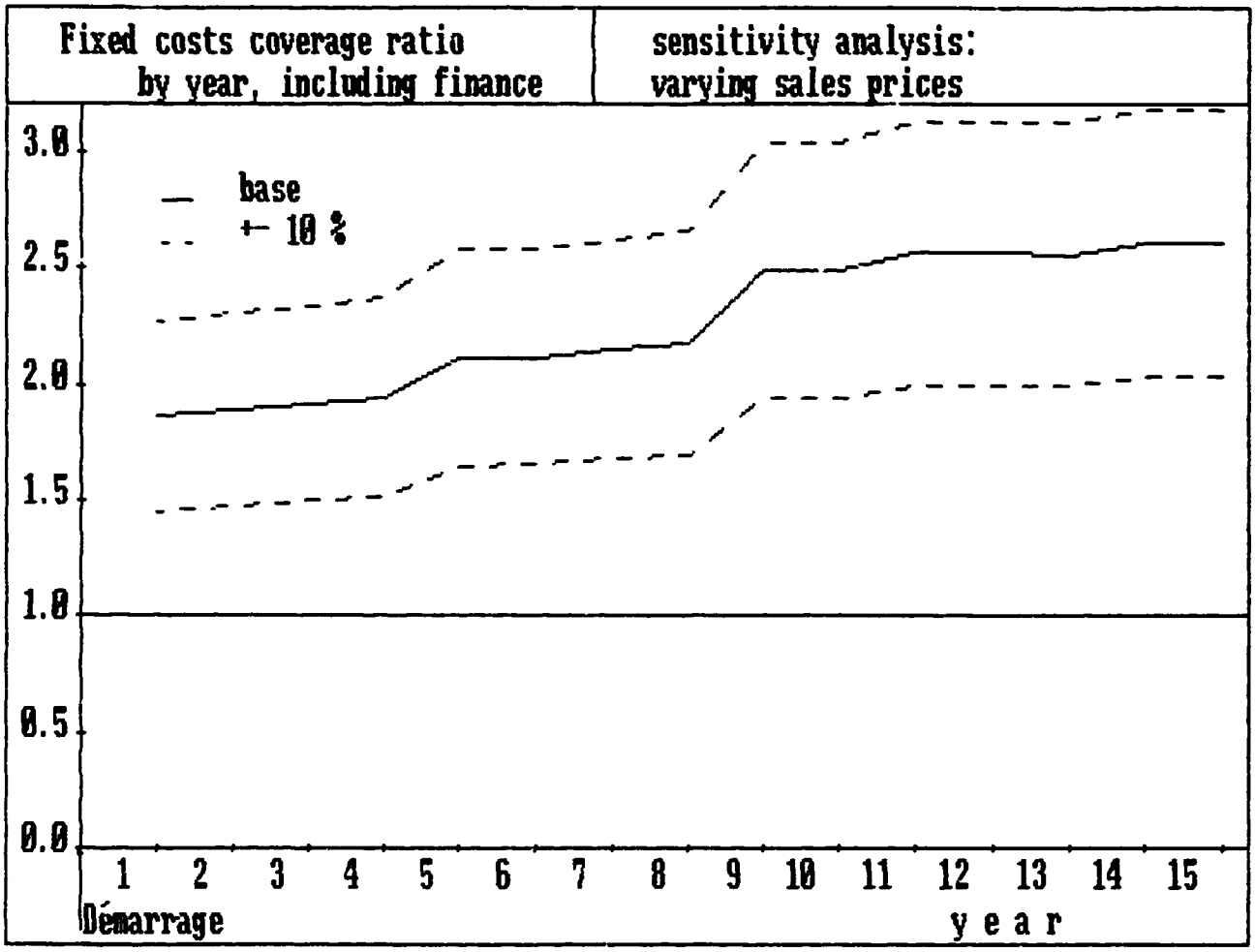

Fixed costs coverage ratio
by year, including finance
sensitivity analysis
varying the production volume
5.0
4.0
3.0
2.0
1.0
0.0
base case
low/high projection
1
2
3
4
5
6
7
8
9
10
Démarrage
year

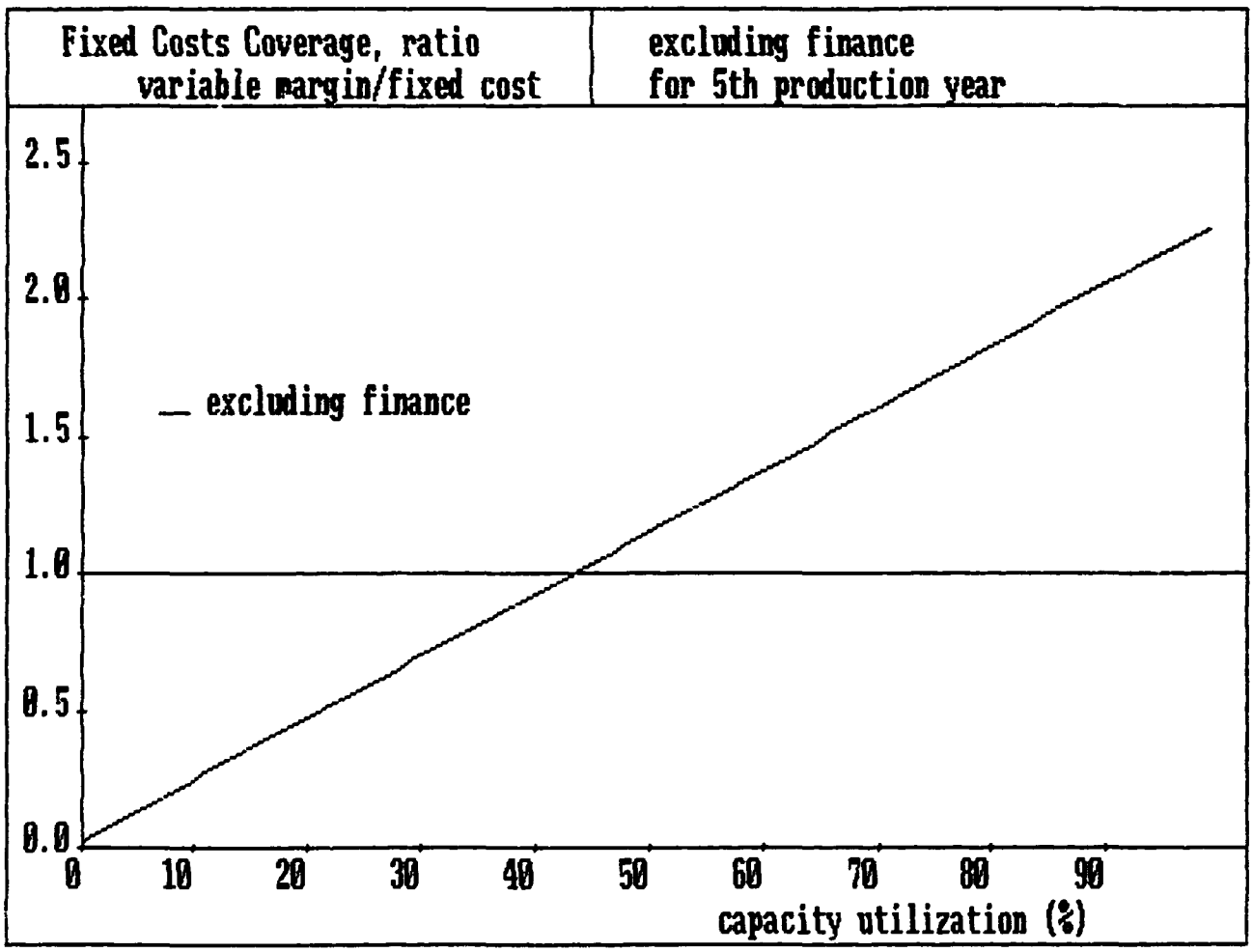

Annual CF, operation
MILLIONS Z$
ZECO
40
20
0
-20
-40
foreign net cashflows
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
year

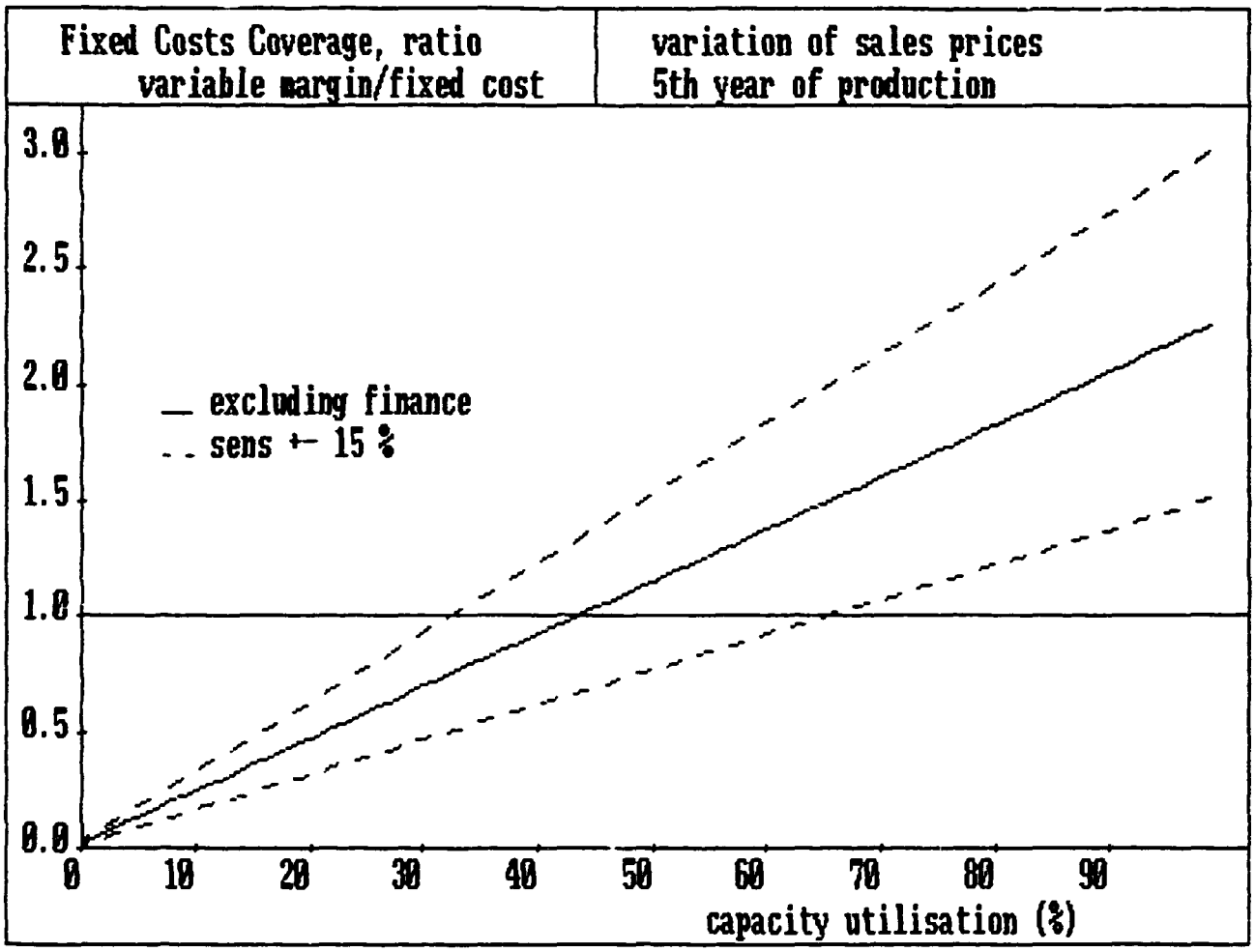

Accumulated cashflow, operations
ZECO
10^2 MILLIONS Z$
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
local net cashflows
foreign net cashflows
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
year

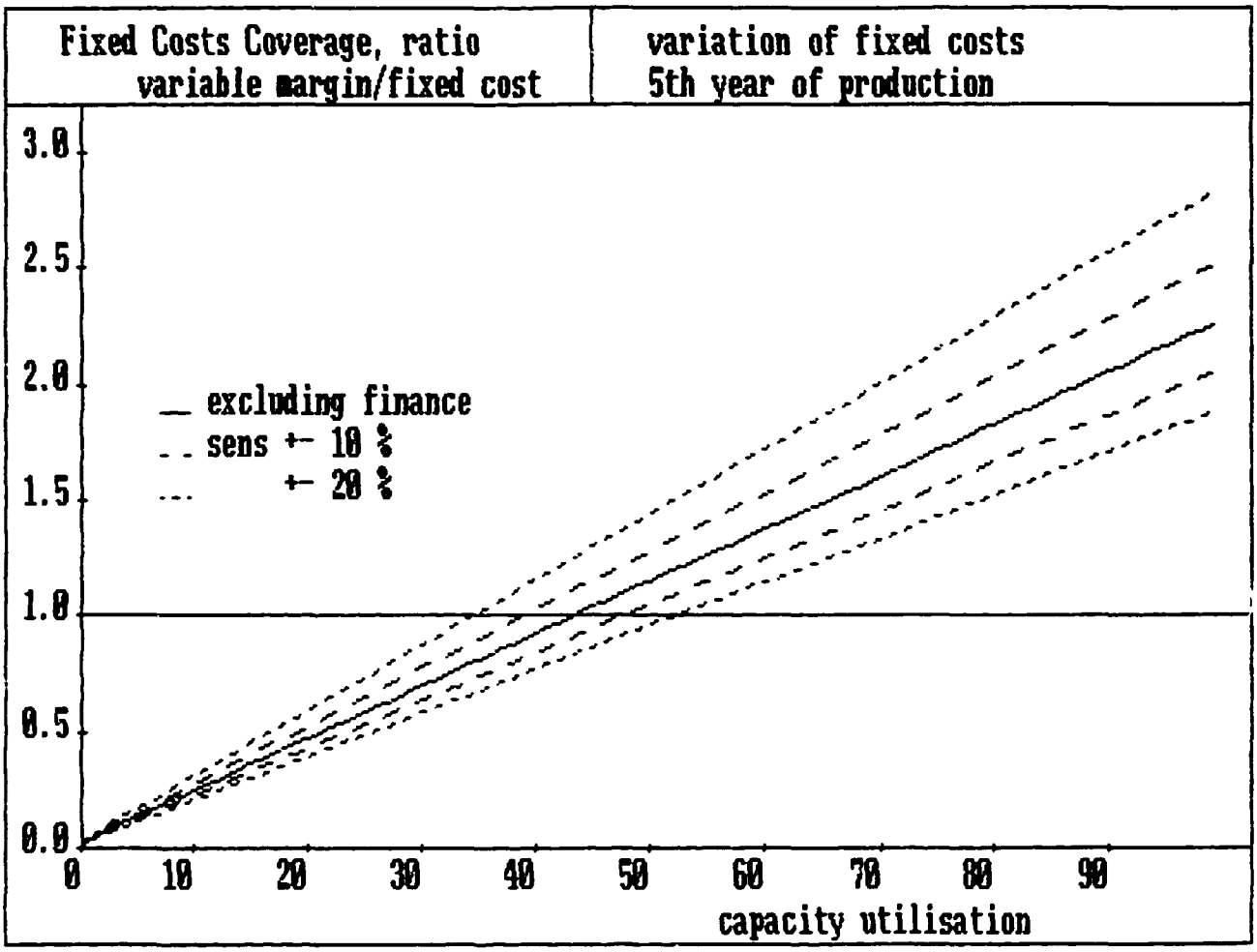

Annual net flow of funds
MILLIONS Z$
ZECO
local funds
foreign funds
30
20
10
0
-10
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
year

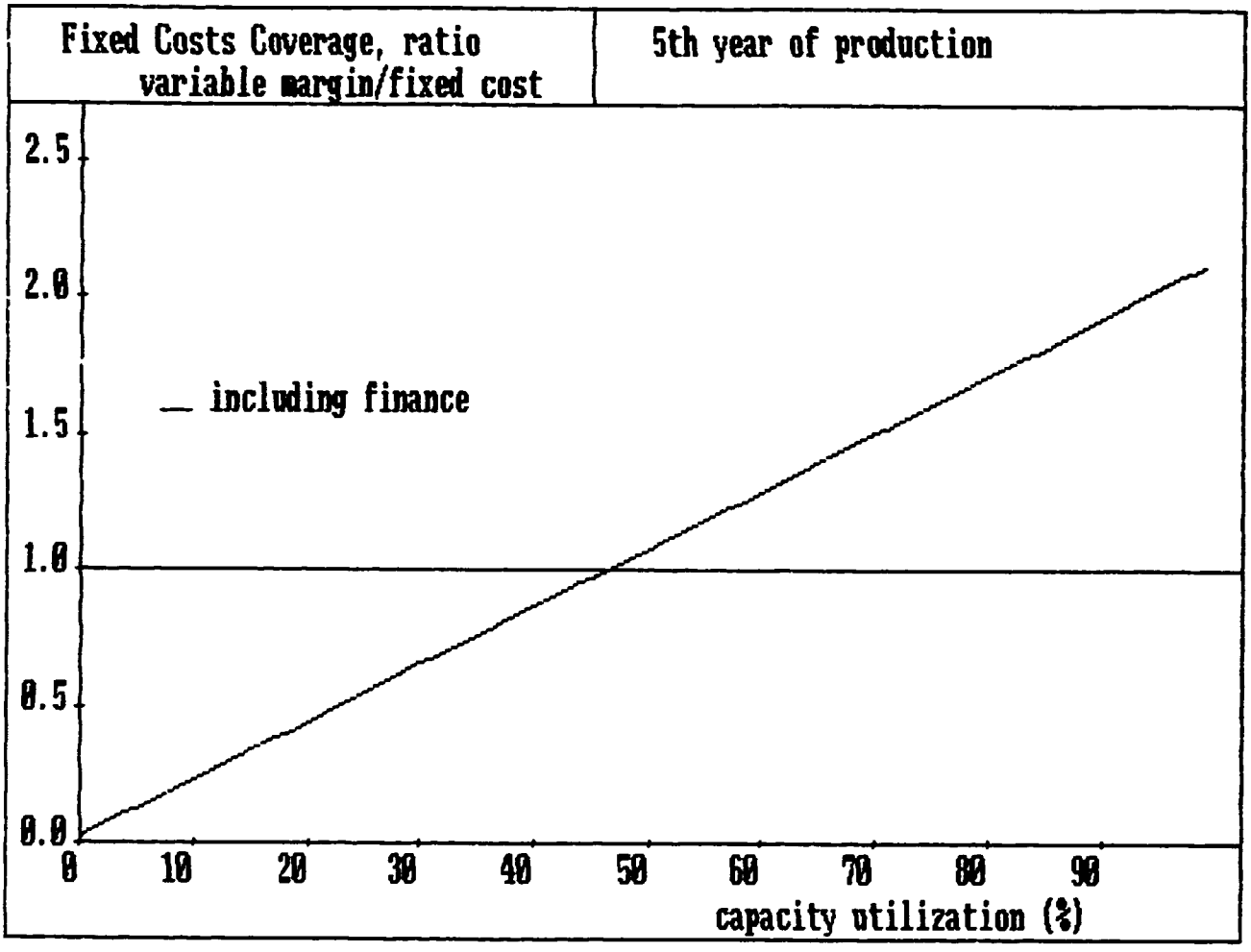

Debt Service Ratio, by year
net cashflow/debt service
ZECO
5.0
4.5
4.0
3.5
3.0
2.5
base case
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
year

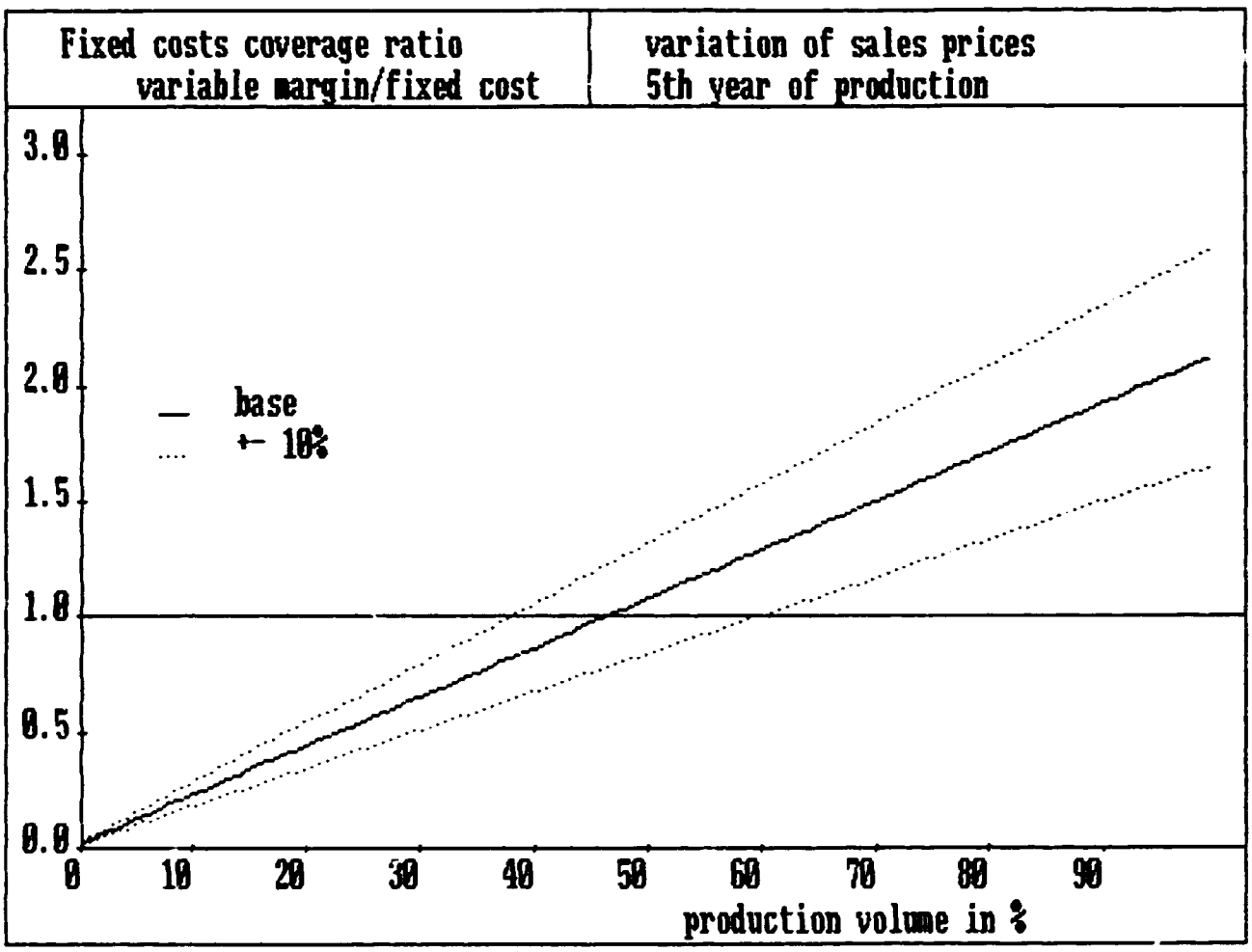

Fixed costs coverage ratio
by year, including finance
sensitivity analysis:
varying sales prices
base
+- 10 %
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
year

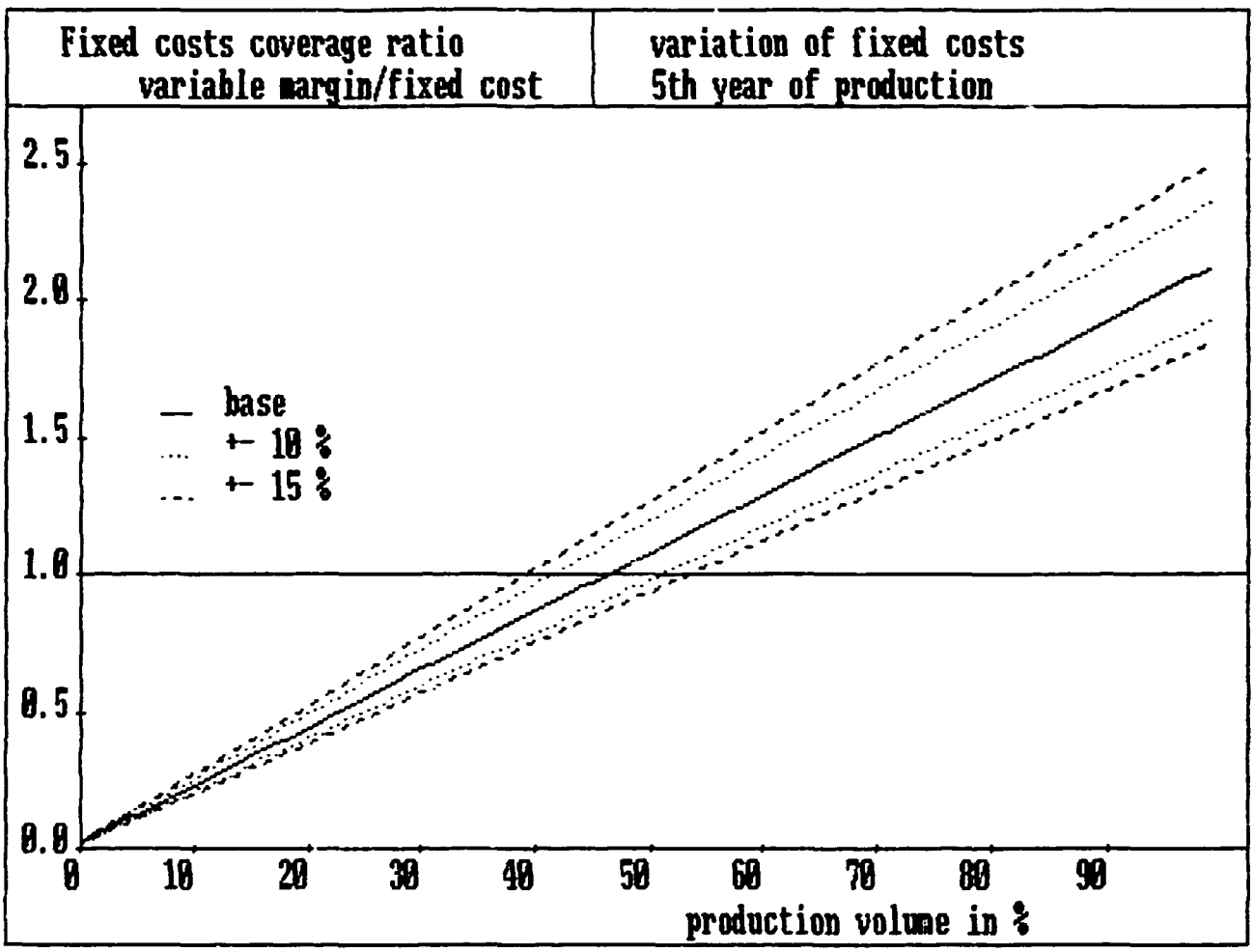

Fixed Costs Coverage, ratio
variable margin/fixed cost
excluding finance
for 5th production year
2.5
2.0
1.5
1.0
0.5
0.0
excluding finance
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)

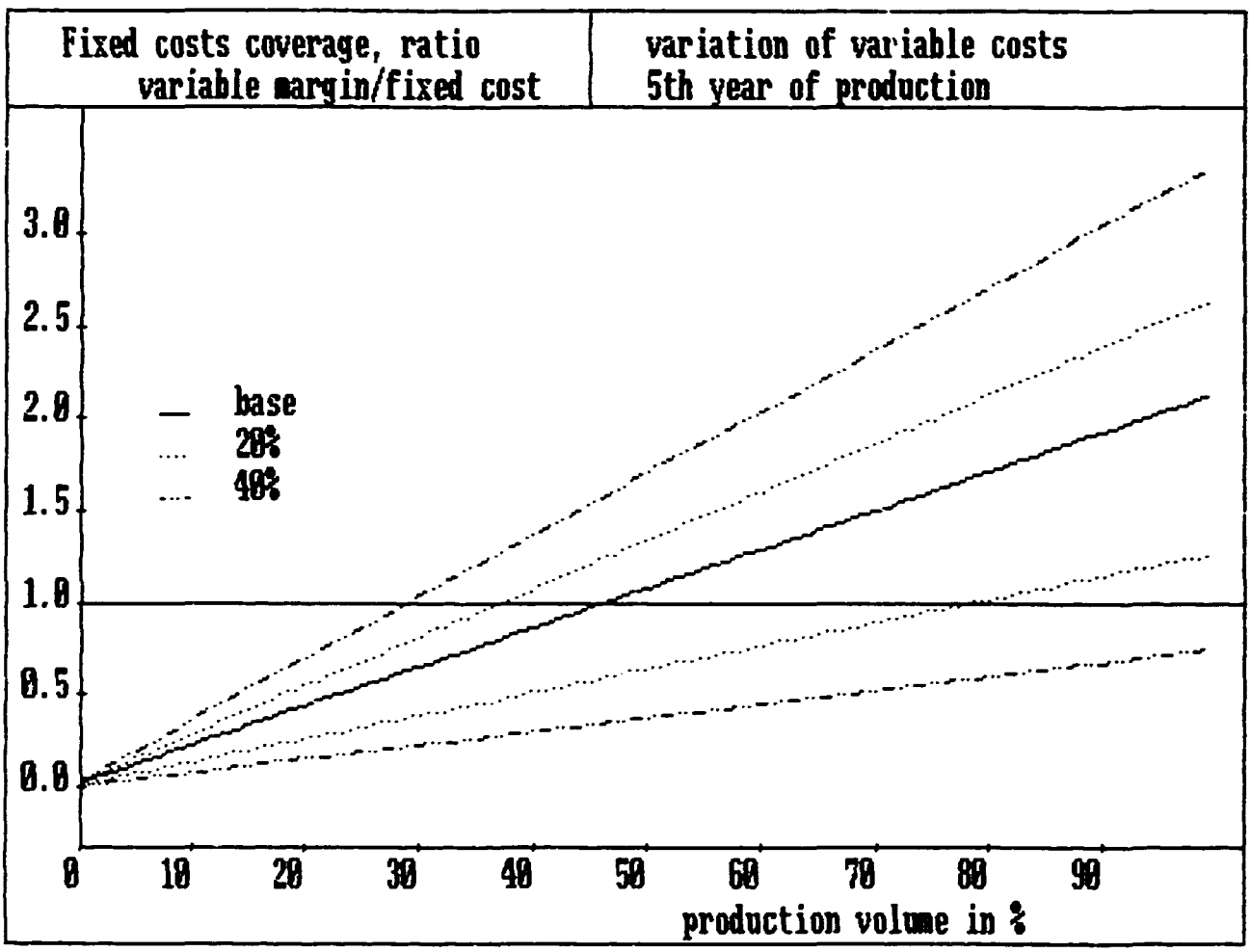

Fixed Costs Coverage, ratio
variable margin/fixed cost
variation of sales prices
5th year of production
3.0
2.5
2.0
1.5
1.0
0.5
0.0
excluding finance
sens +- 15 %
0
10
20
30
40
50
60
70
80
90
capacity utilisation (%)

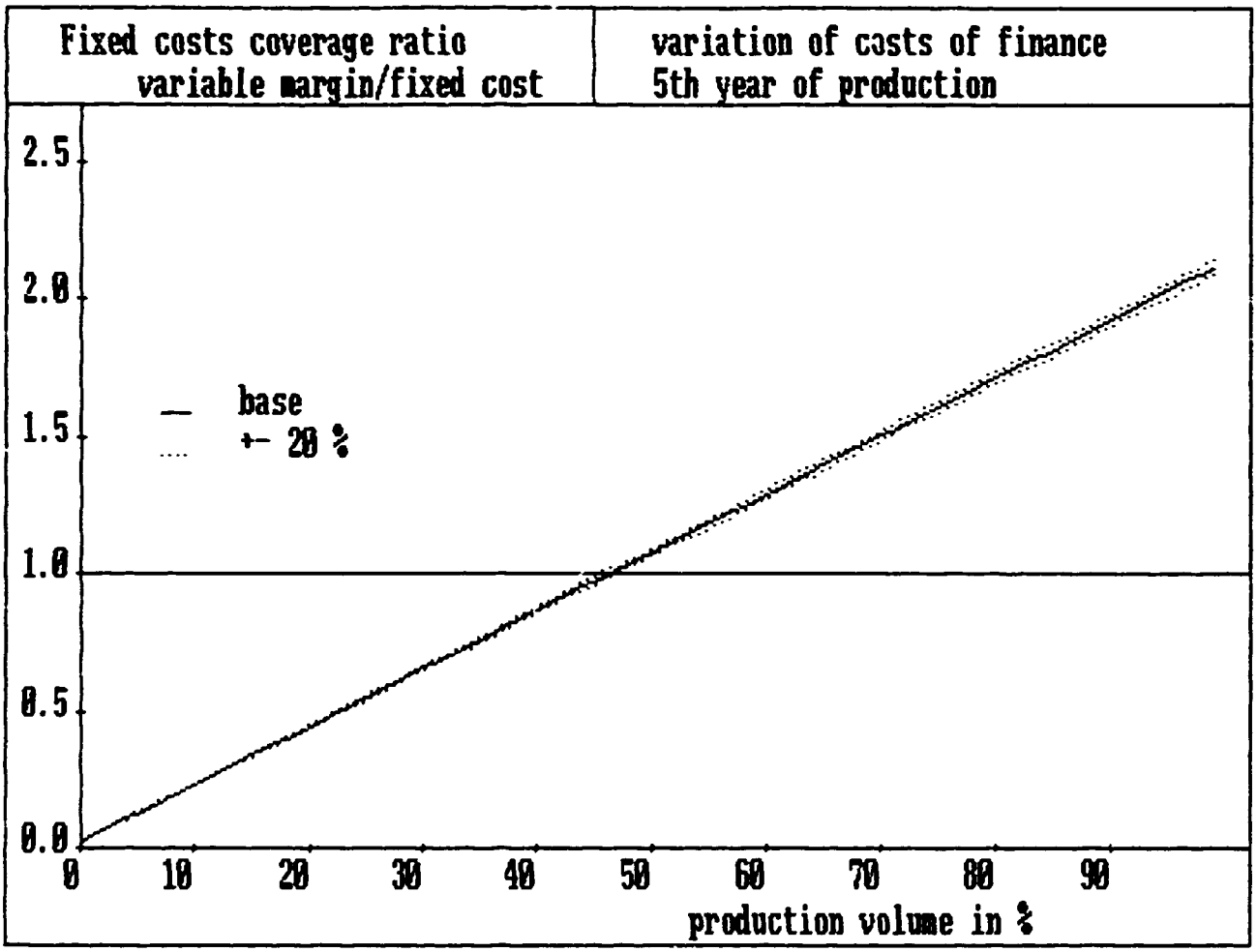

Fixed Costs Coverage, ratio
variable margin/fixed cost
variation of fixed costs
5th year of production
3.0
2.5
2.0
1.5
1.0
0.5
0.0
excluding finance
sens +- 10 %
+- 20 %
0
10
20
30
40
50
60
70
80
90
capacity utilisation

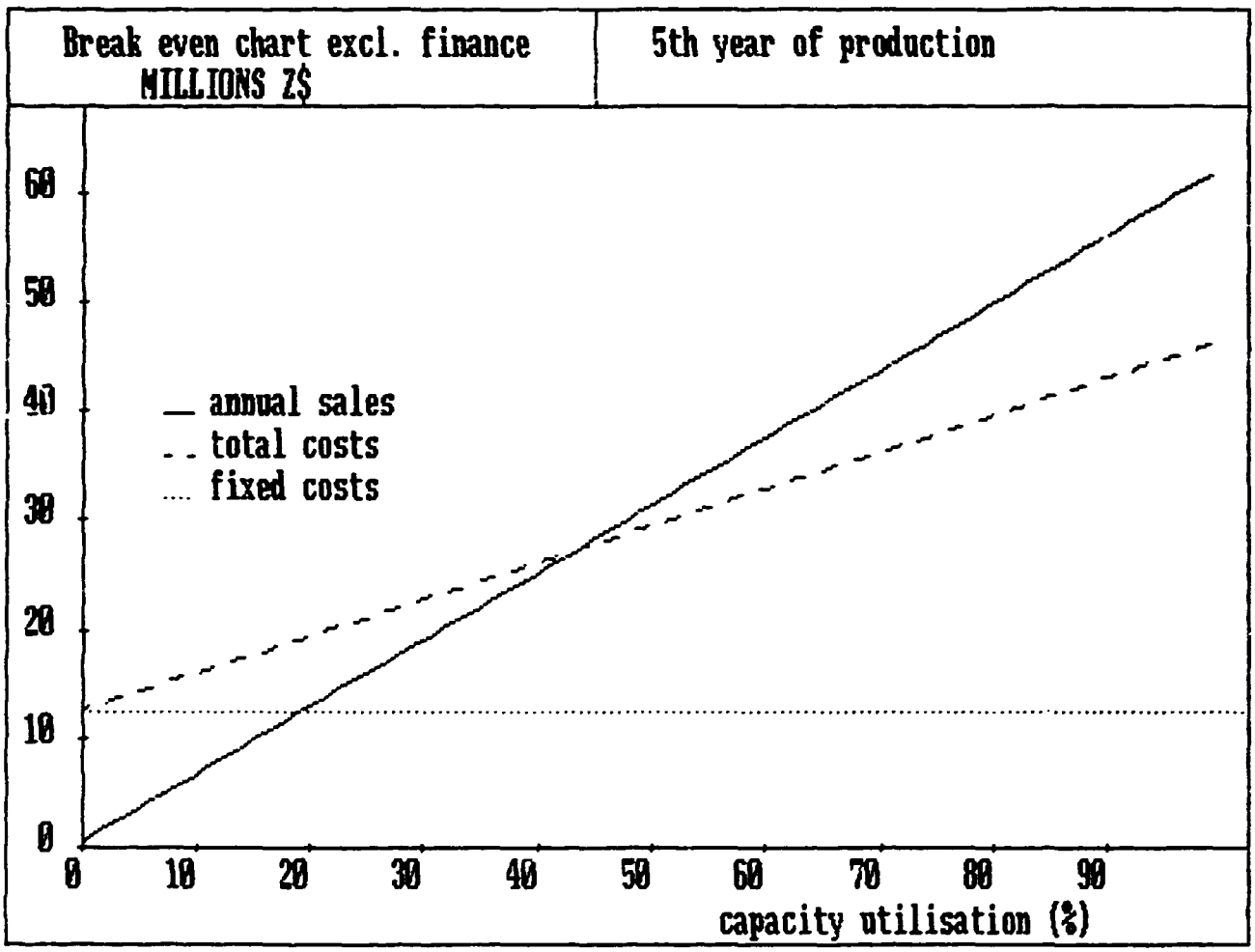

Fixed Costs Coverage, ratio
variable margin/fixed cost
5th year of production
2.5
2.0
1.5
1.0
0.5
0.0
— including finance
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)

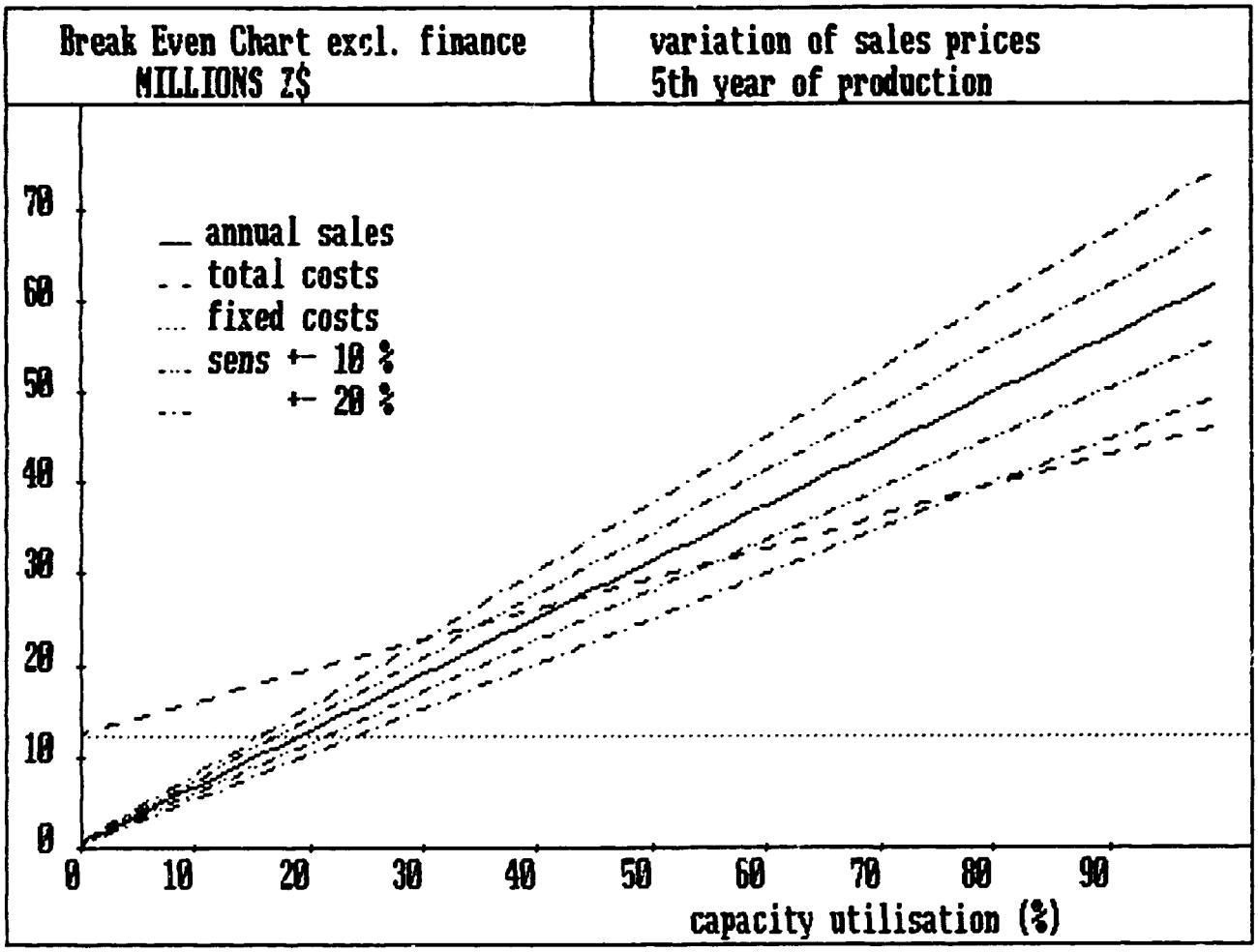

Fixed costs coverage ratio
variable margin/fixed cost
variation of sales prices
5th year of production
3.0
2.5
2.0
1.5
1.0
0.5
0.0
base
+- 10%
0
10
20
30
40
50
60
70
80
90
production volume in %

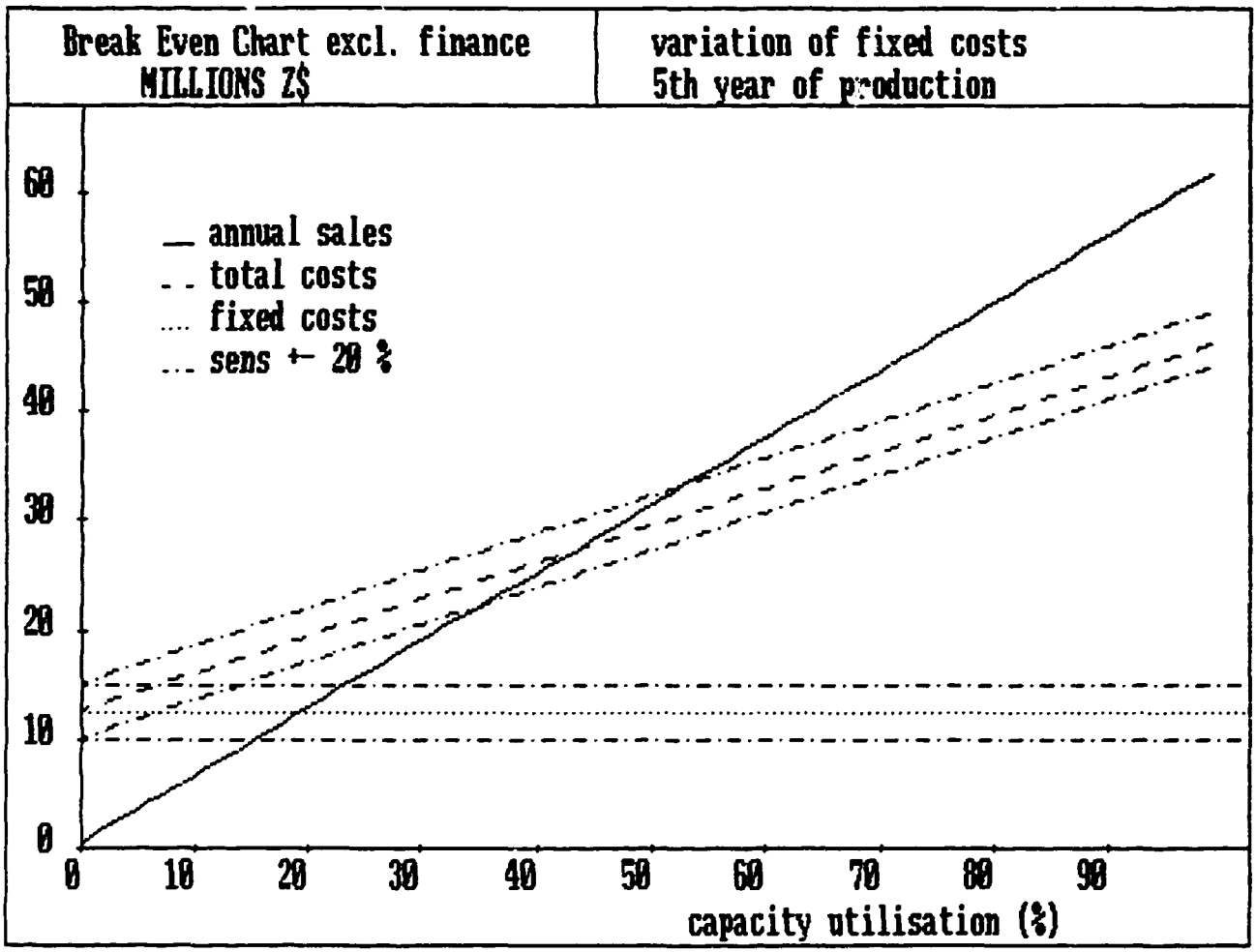

Fixed costs coverage ratio
variable margin/fixed cost
variation of fixed costs
5th year of production
2.5
2.0
1.5
1.0
0.5
0.0
base
+- 10 %
+- 15 %
0
10
20
30
40
50
60
70
80
90
production volume in %

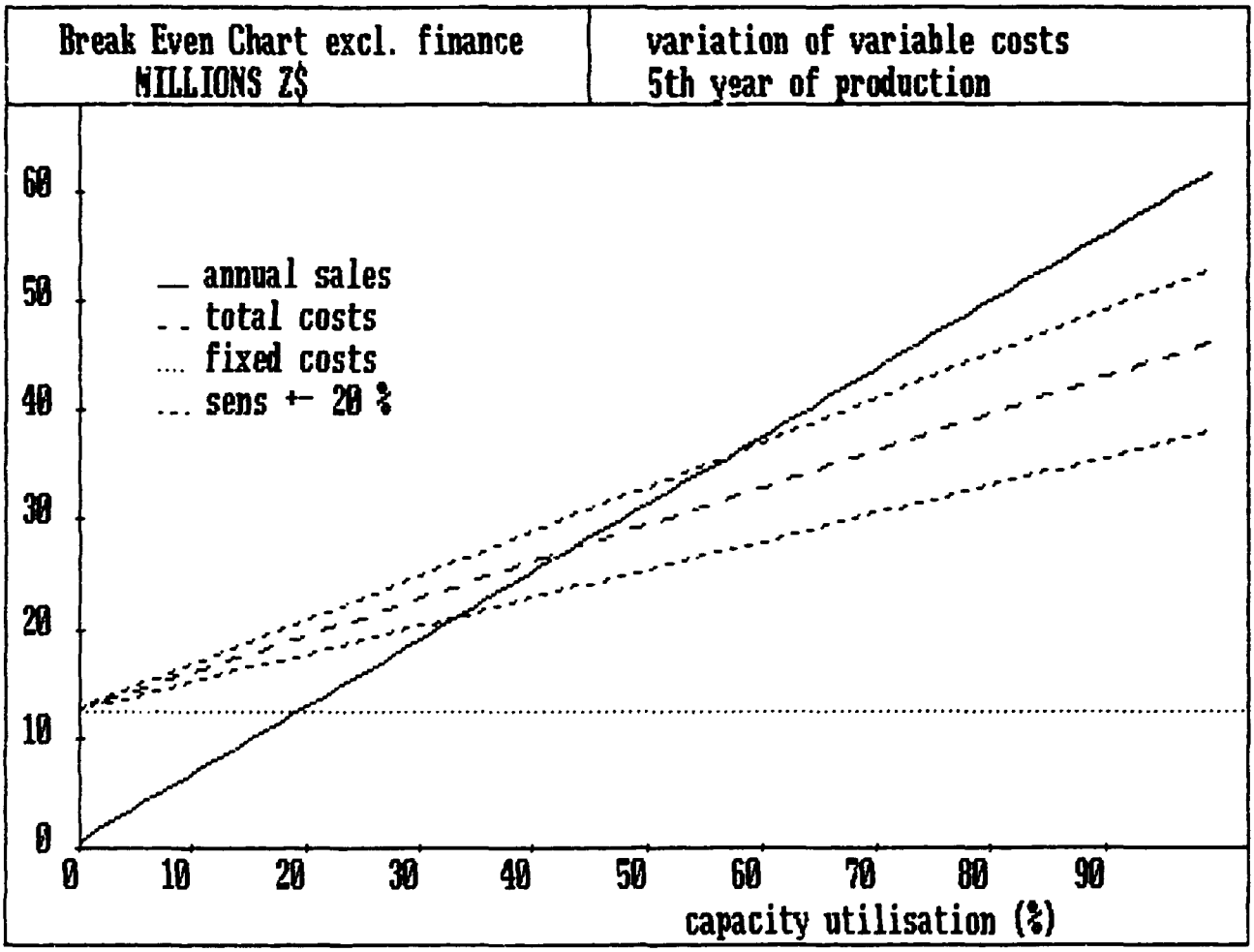

Fixed costs coverage, ratio
variable margin/fixed cost
variation of variable costs
5th year of production
3.0
2.5
2.0
1.5
1.0
0.5
0.0
base
20%
40%
0
10
20
30
40
50
60
70
80
90
production volume in %

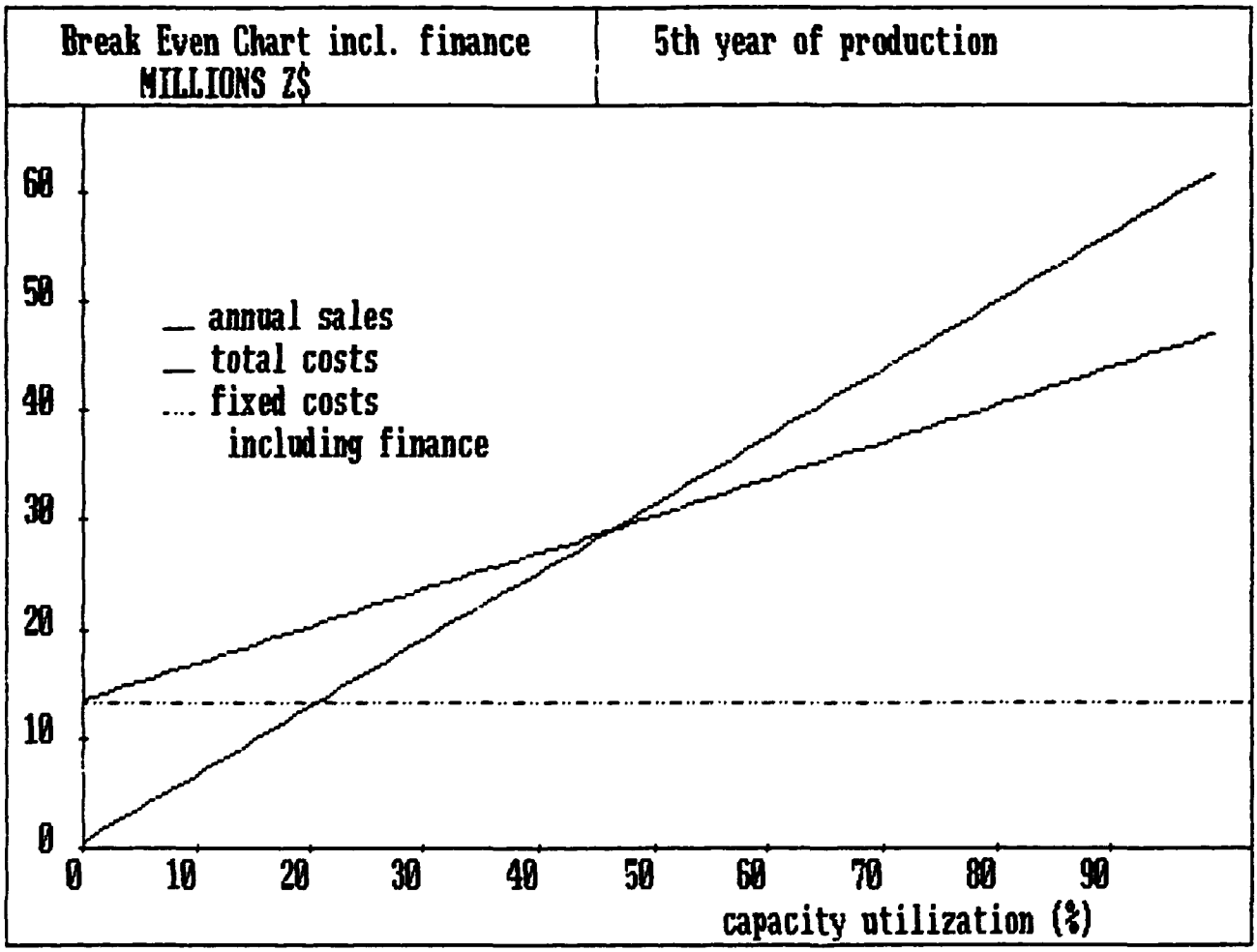

Fixed costs coverage ratio
variable margin/fixed cost
variation of costs of finance
5th year of production
2.5
2.0
1.5
1.0
0.5
0.0
base
+- 20 %
0
10
20
30
40
50
60
70
80
90
production volume in %

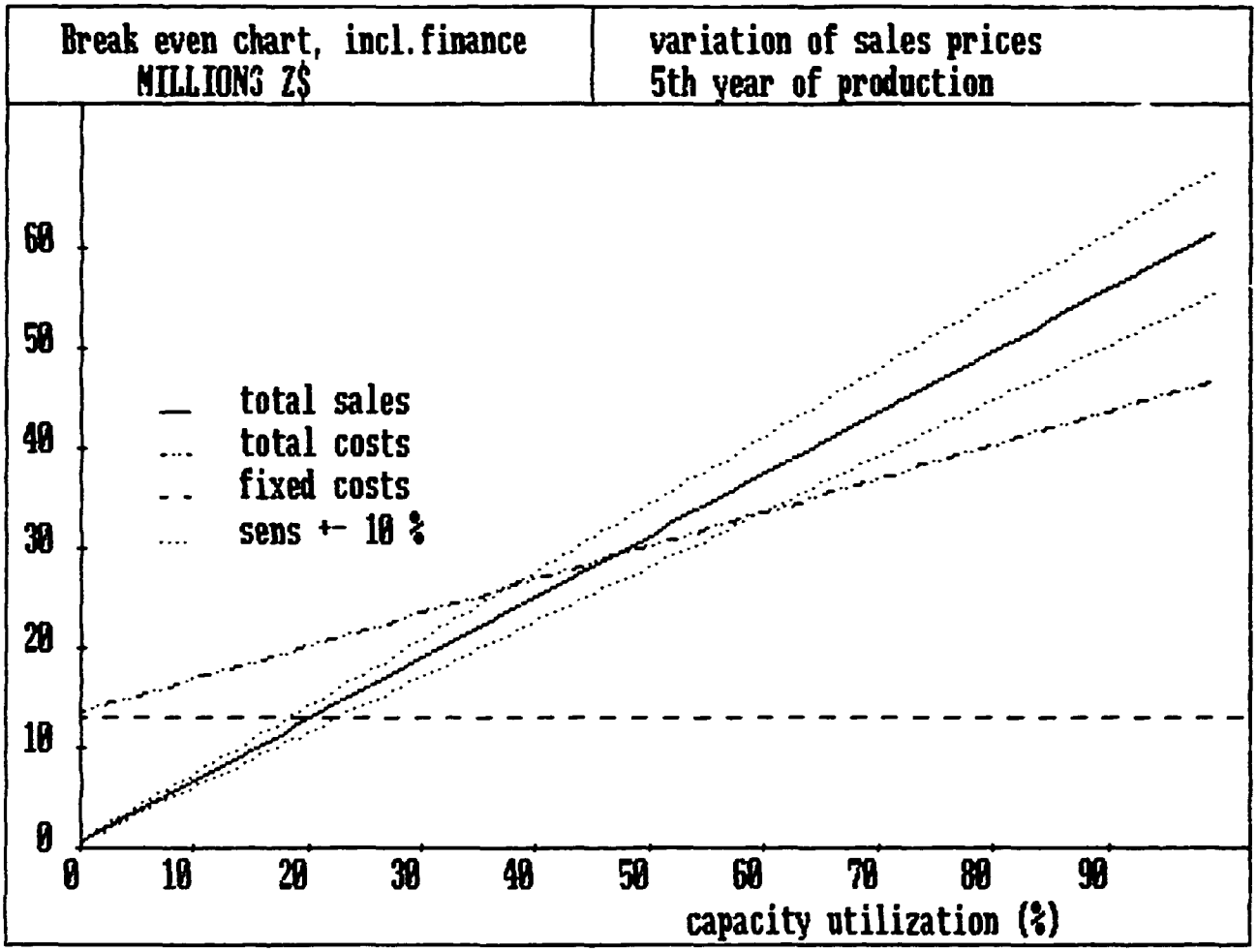

Break even chart excl. finance
MILLIONS Z$
5th year of production
60
50
40
30
20
10
0
annual sales
total costs
fixed costs
0
10
20
30
40
50
60
70
80
90
capacity utilisation (%)

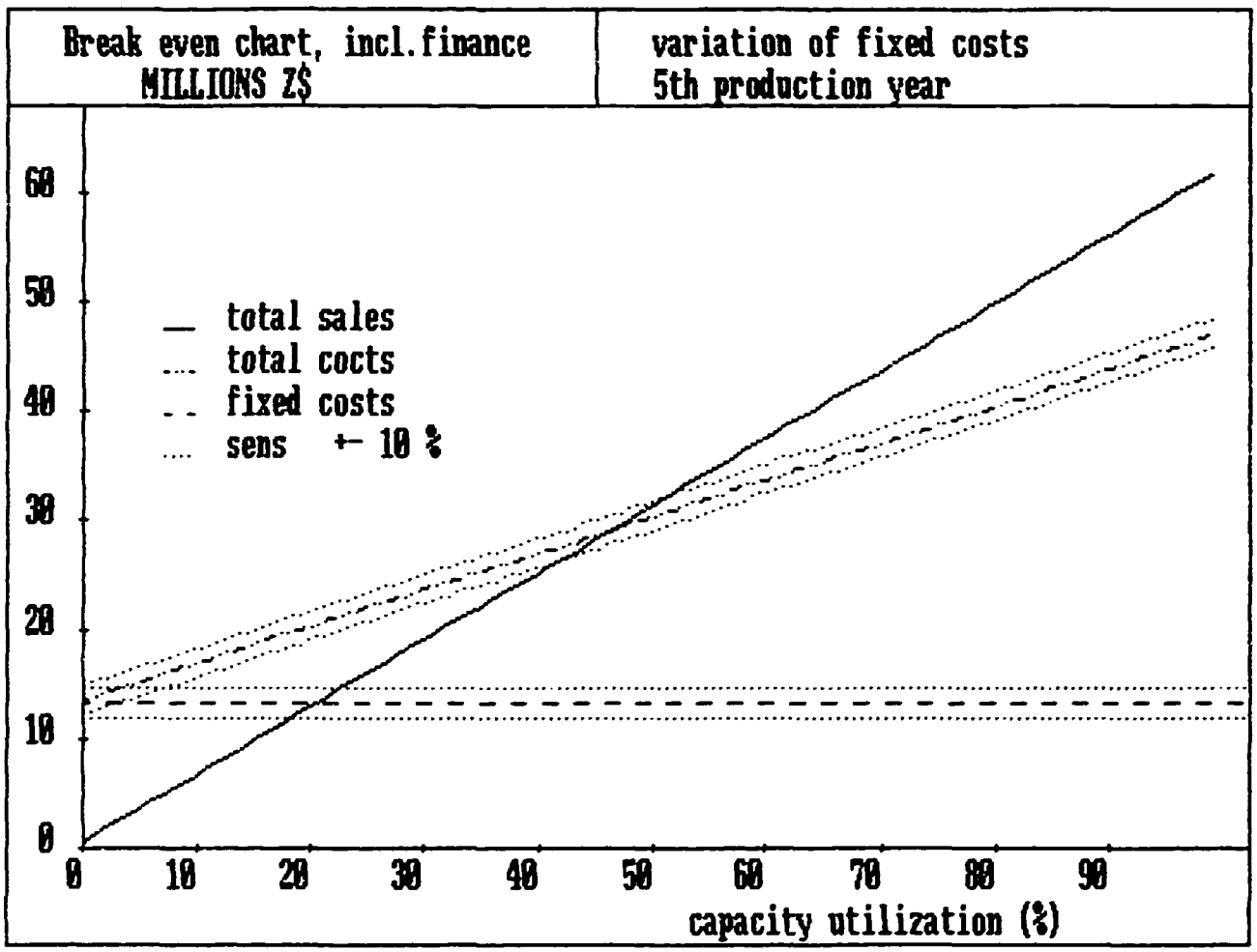

Break Even Chart excl. finance
MILLIONS Z$
variation of sales prices
5th year of production
annual sales
total costs
fixed costs
sens +- 10 %
+- 20 %
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
capacity utilisation (%)

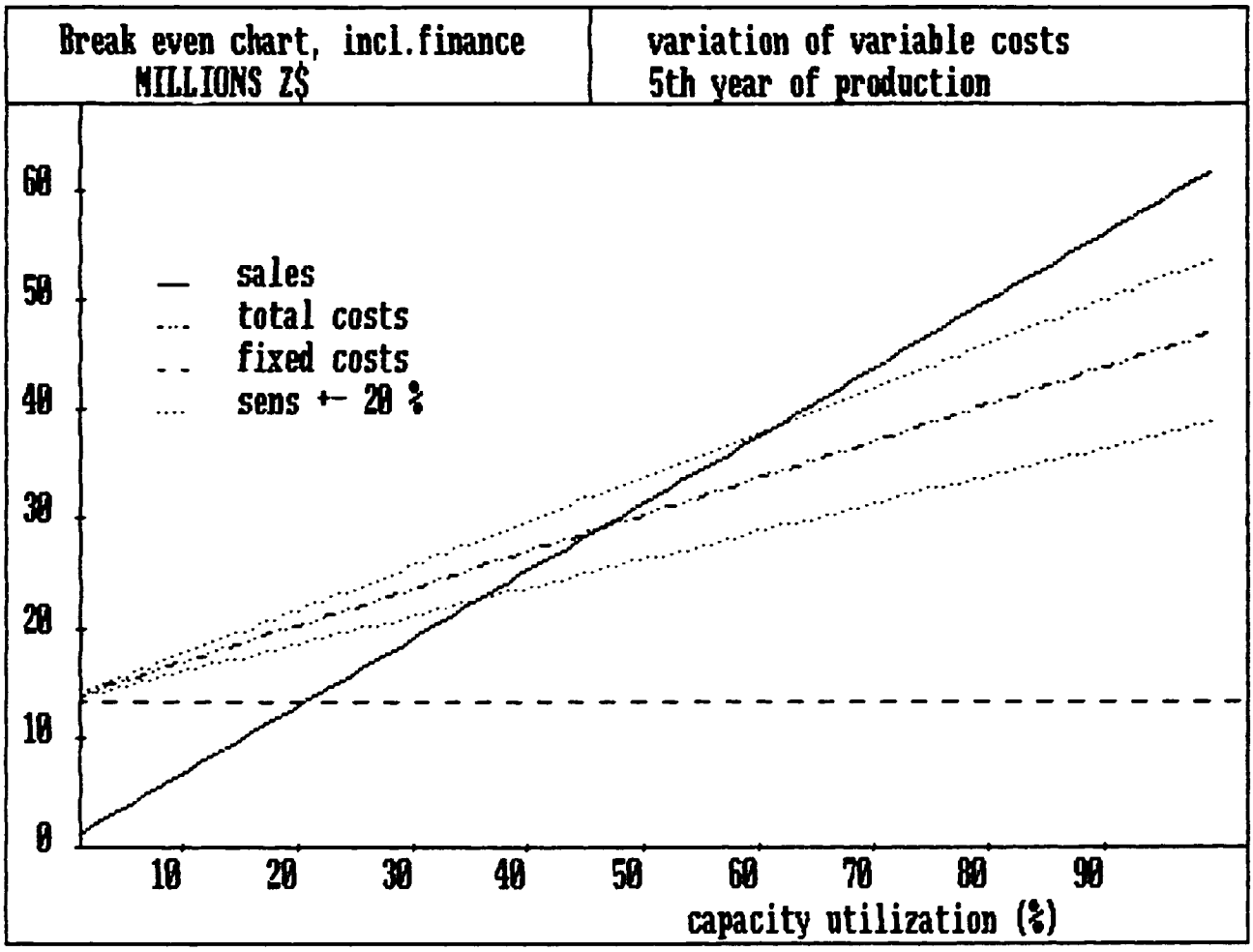

Break Even Chart excl. finance
MILLIONS Z$
variation of fixed costs
5th year of production
annual sales
total costs
fixed costs
sens +- 20 %
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
capacity utilisation (%)

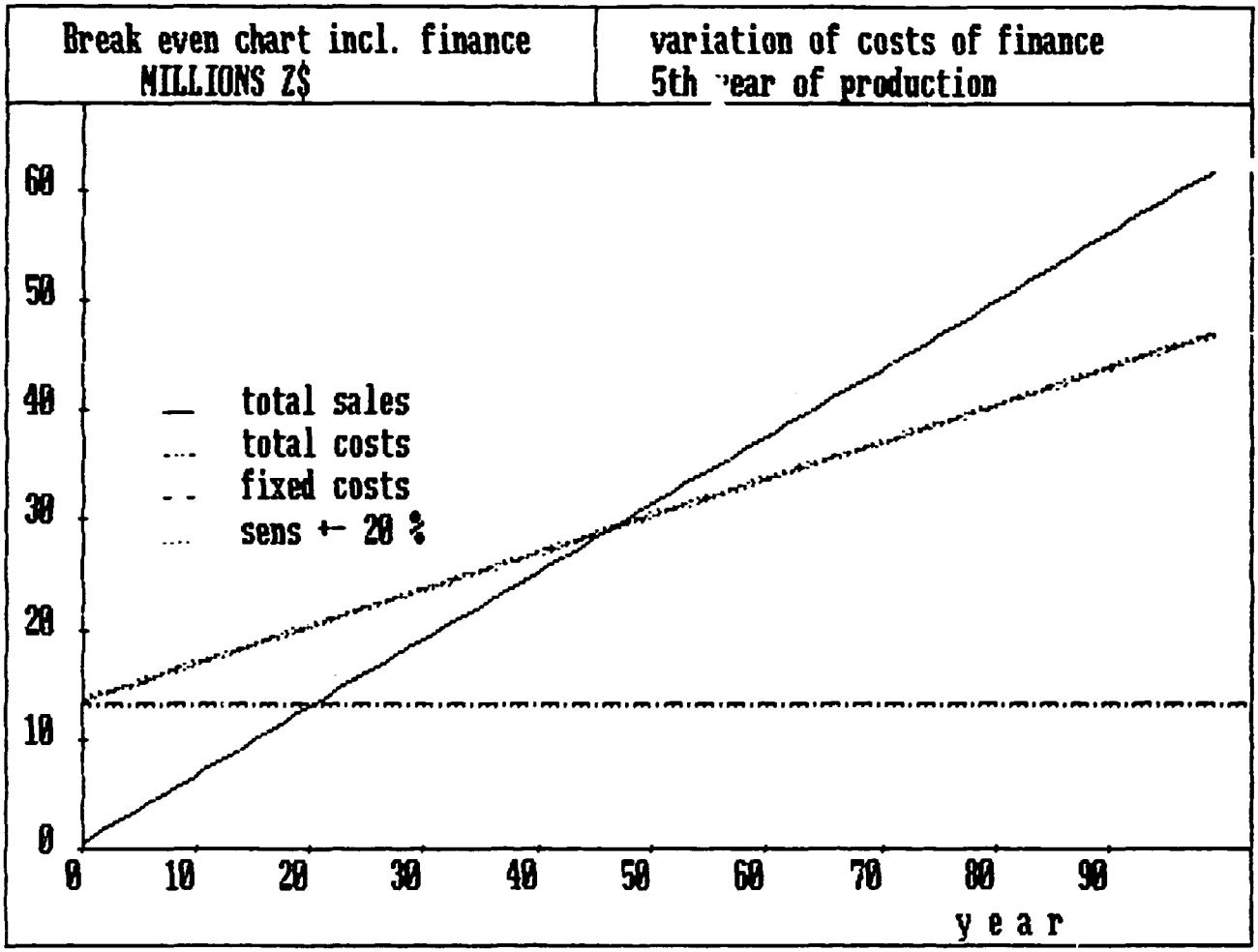

Break Even Chart excl. finance
MILLIONS Z$
variation of variable costs
5th year of production
60
50
40
30
20
10
0
annual sales
total costs
fixed costs
sens +- 20 %
0
10
20
30
40
50
60
70
80
90
capacity utilisation (%)


Break Even Chart incl. finance
MILLIONS Z$
5th year of production
60
50
40
30
20
10
0
annual sales
total costs
fixed costs
including finance
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)


Break even chart, incl.finance
MILLIONS Z$
variation of sales prices
5th year of production
60
50
40
30
20
10
0
total sales
total costs
fixed costs
sens +- 10 %
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)

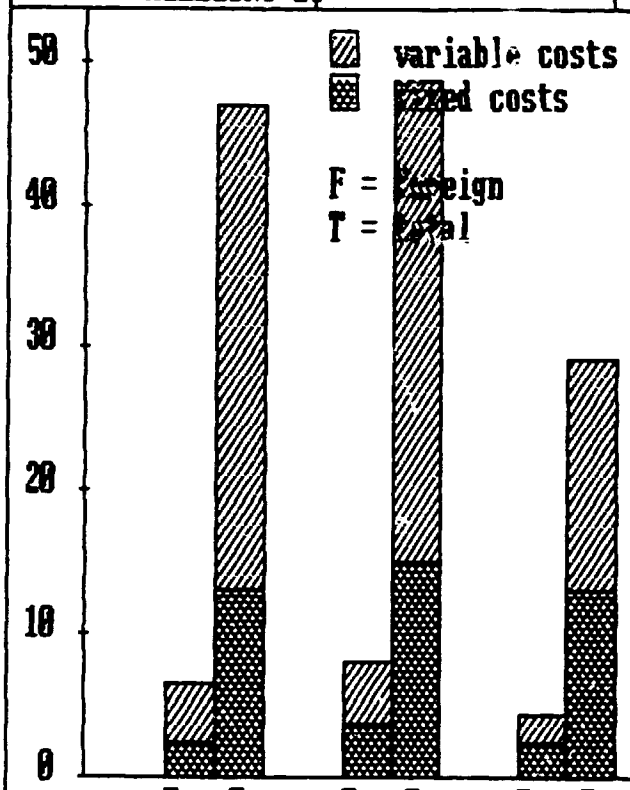

Break even chart, incl.finance
MILLIONS Z$
variation of fixed costs
5th production year
60
50
40
30
20
10
0
total sales
total cocts
fixed costs
sens +- 10 %
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)


Break even chart, incl.finance
MILLIONS Z$
variation of variable costs
5th year of production
60
50
40
30
20
10
0
sales
total costs
fixed costs
sens +- 20 %
10
20
30
40
50
60
70
80
90
capacity utilization (%)

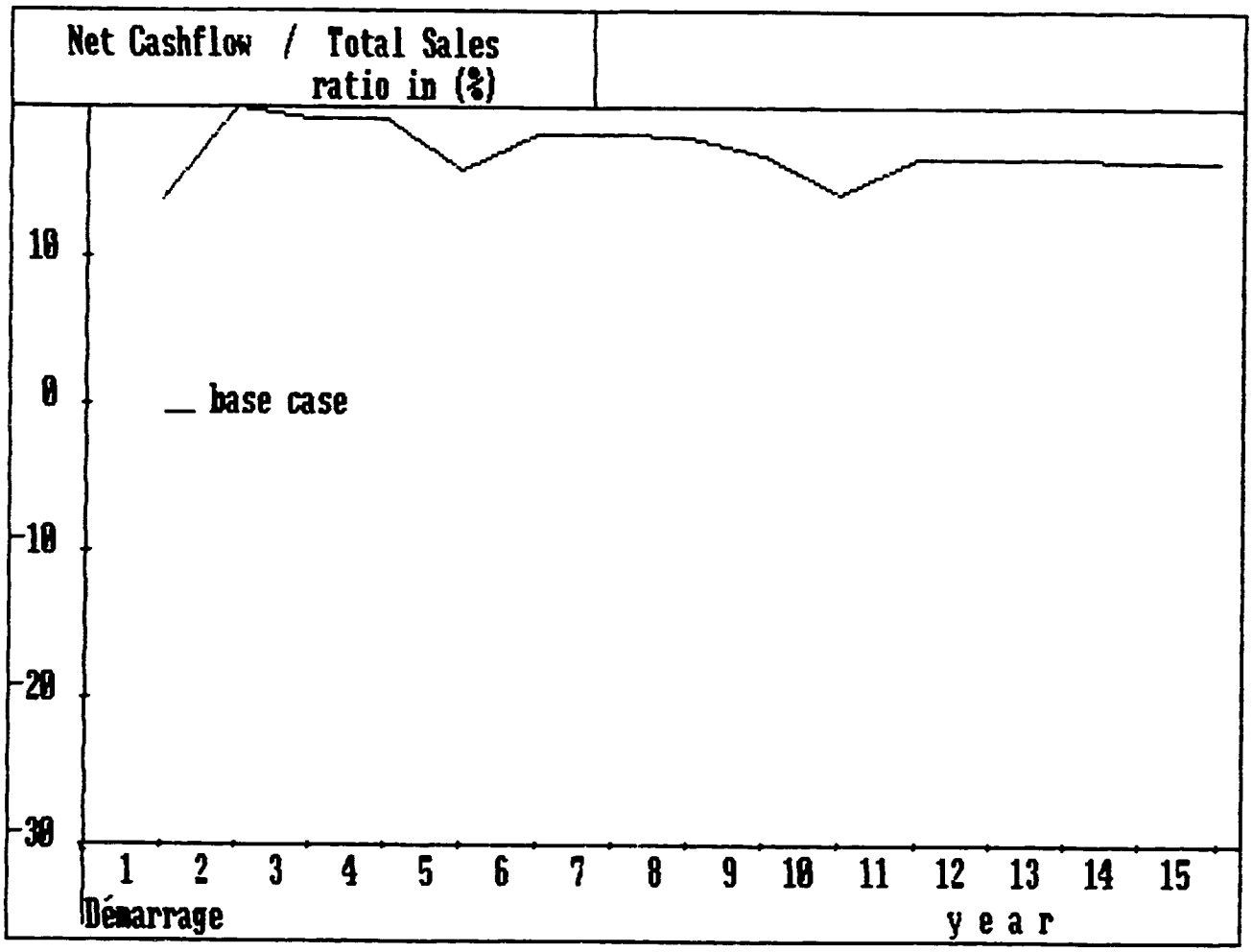

Break even chart incl. finance
MILLIONS Z$
variation of costs of finance
5th year of production
60
50
40
30
20
10
0
total sales
total costs
fixed costs
sens +- 20 %
0
10
20
30
40
50
60
70
80
90
year

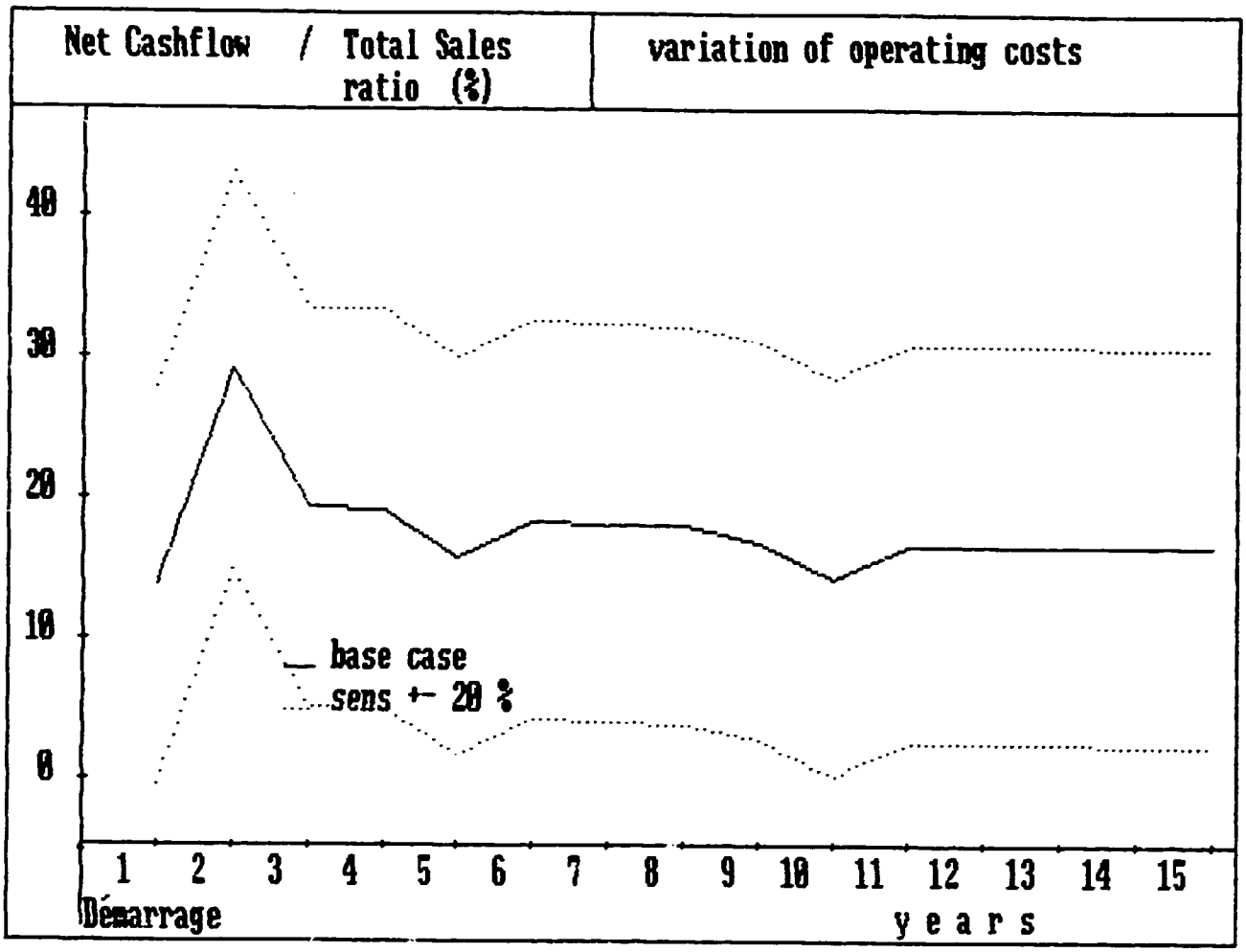
Structure of Production Costs
MILLIONS Z$

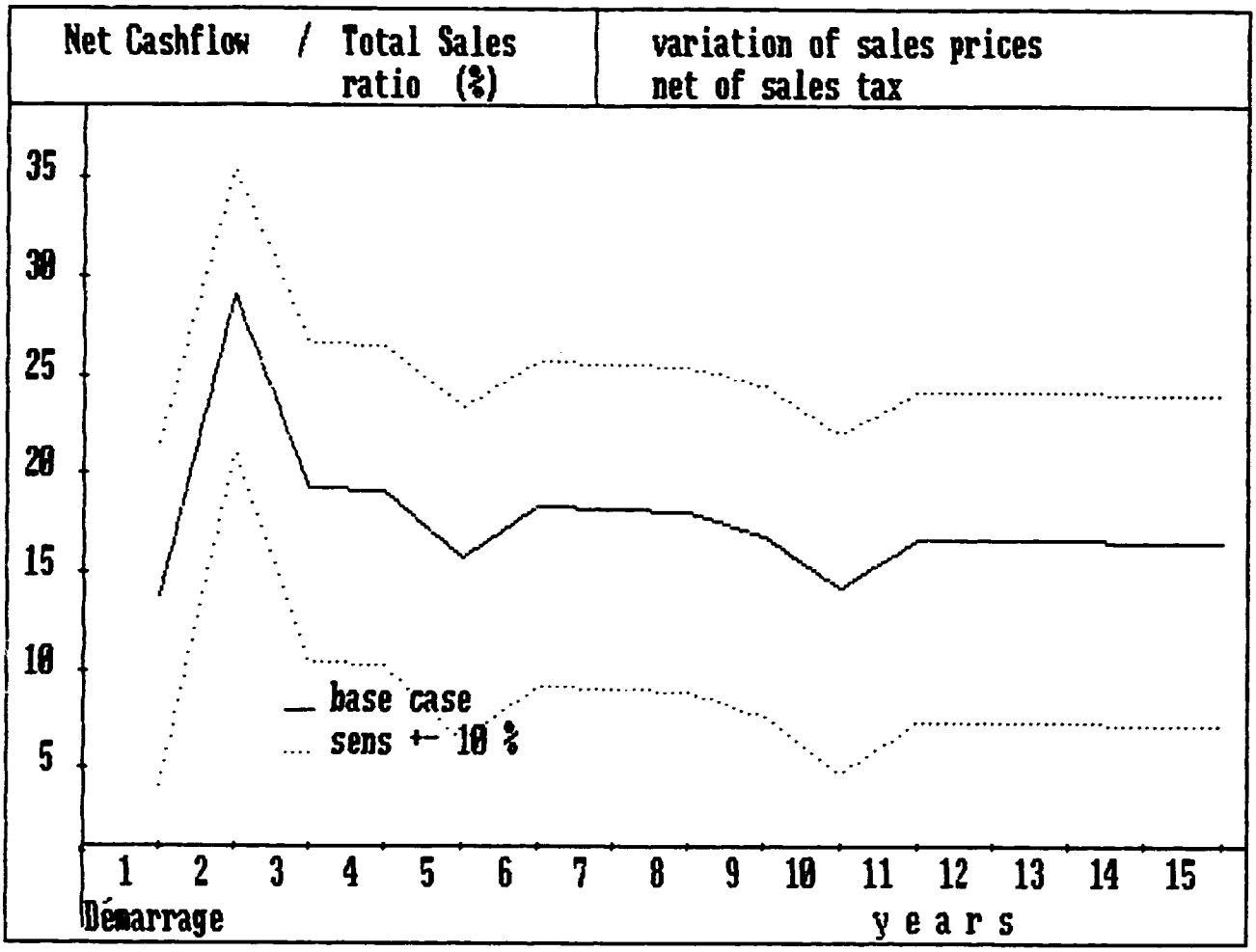
5th year of production

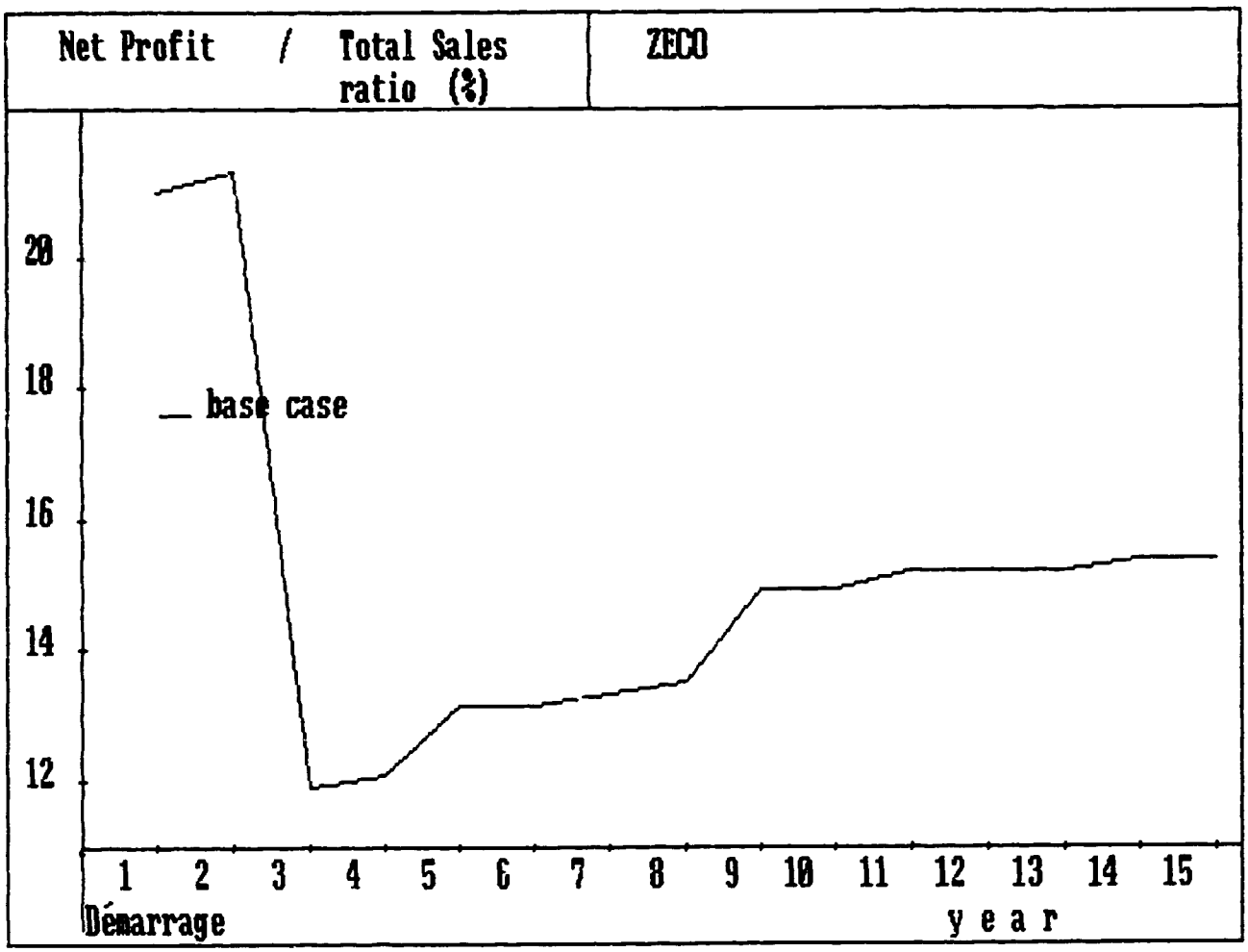


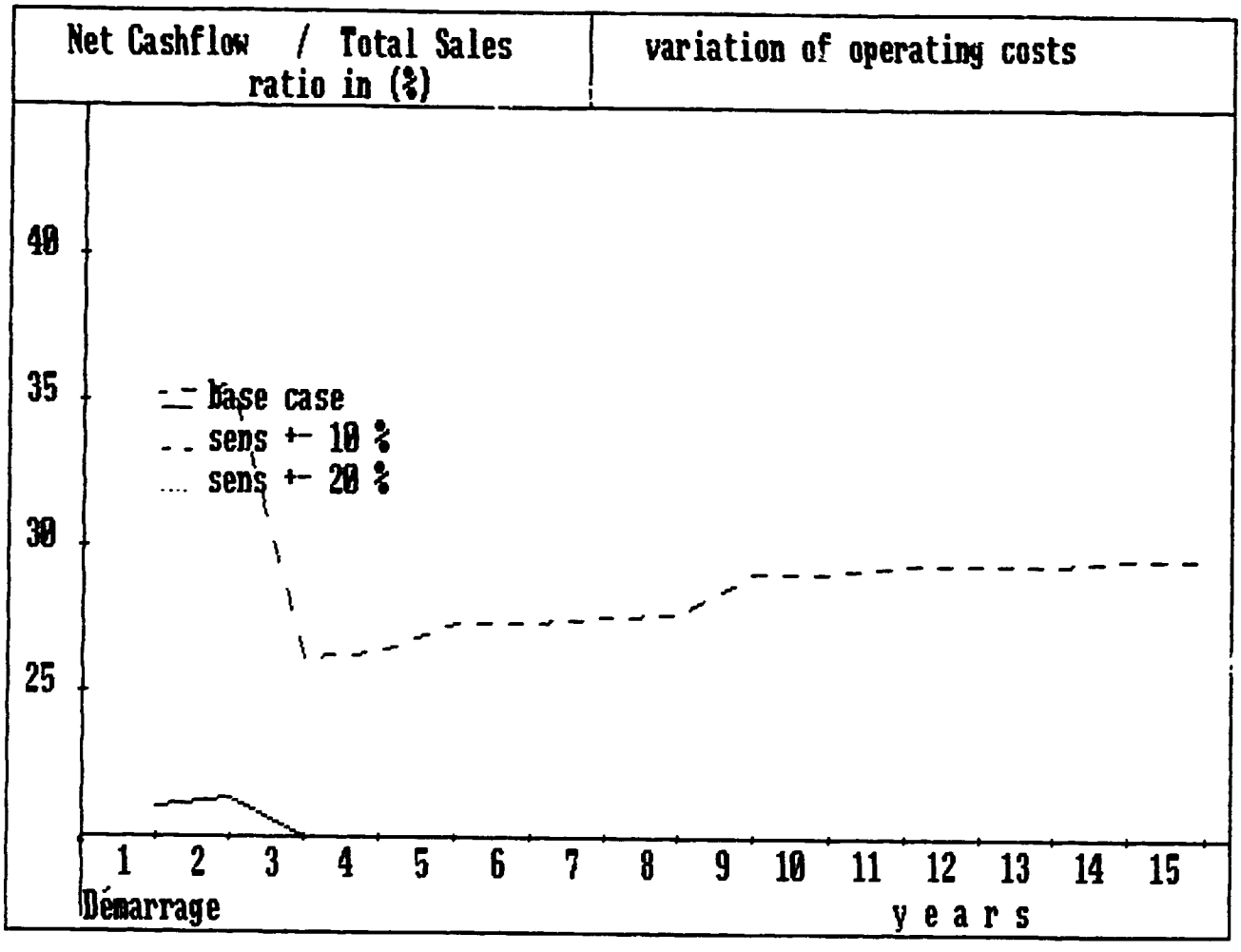
Nominal	Démarrage	
8.19	7.89	matière pre.
30.03	28.93	autres MP
1.07	1.03	service pub.
4.27	4.11	énergie
26.28	25.31	main d'oeuv.
0.00	0.00	maintenance
2.02	1.95	pièces rech.
21.33	20.55	frais gener.
5.04	6.82	amortissem.
1.77	3.42	intérêt
100.00	100.00	Total C.Prod.

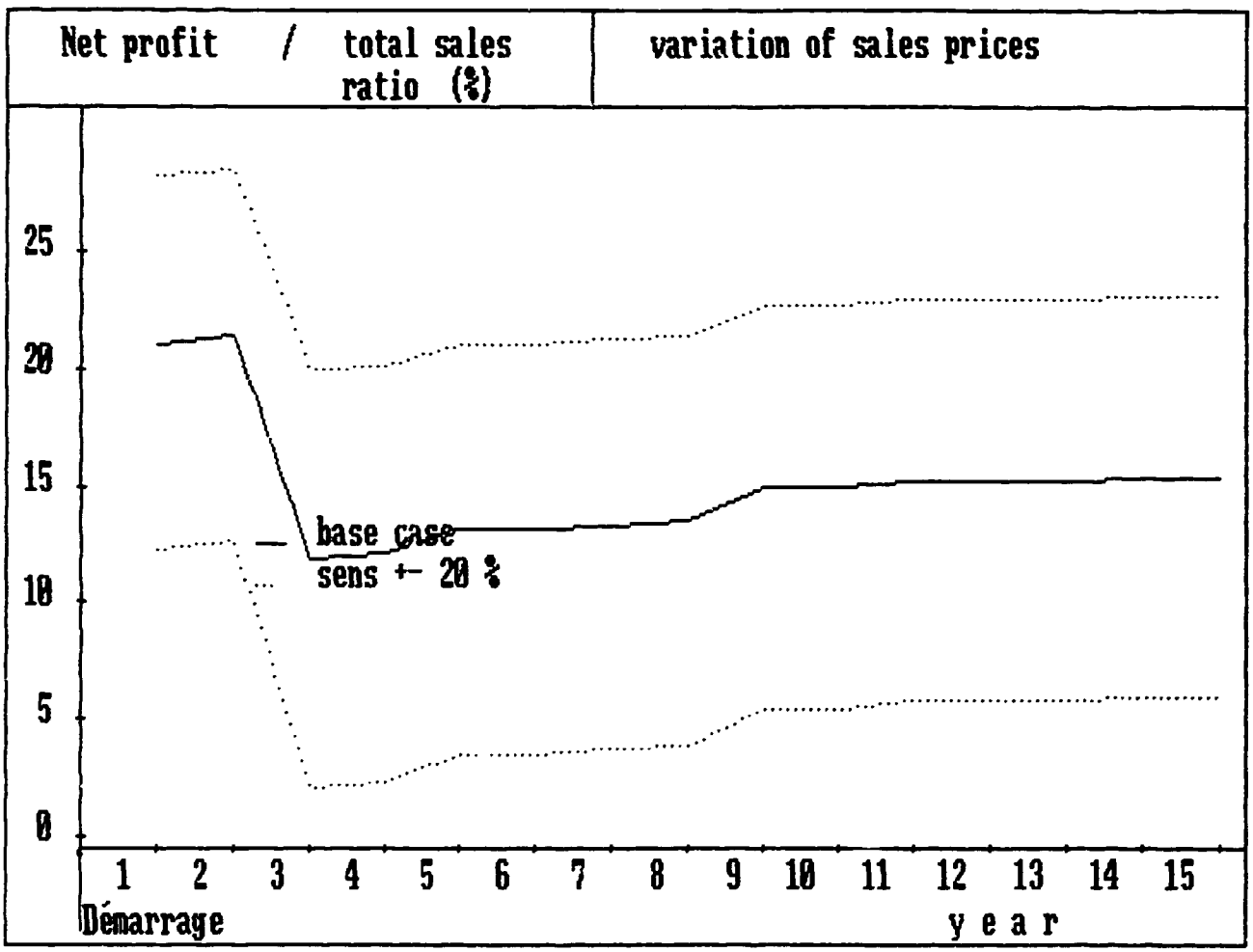

Net Cashflow / Total Sales
ratio in (%)
10
0
-10
-20
-30
base case
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
year

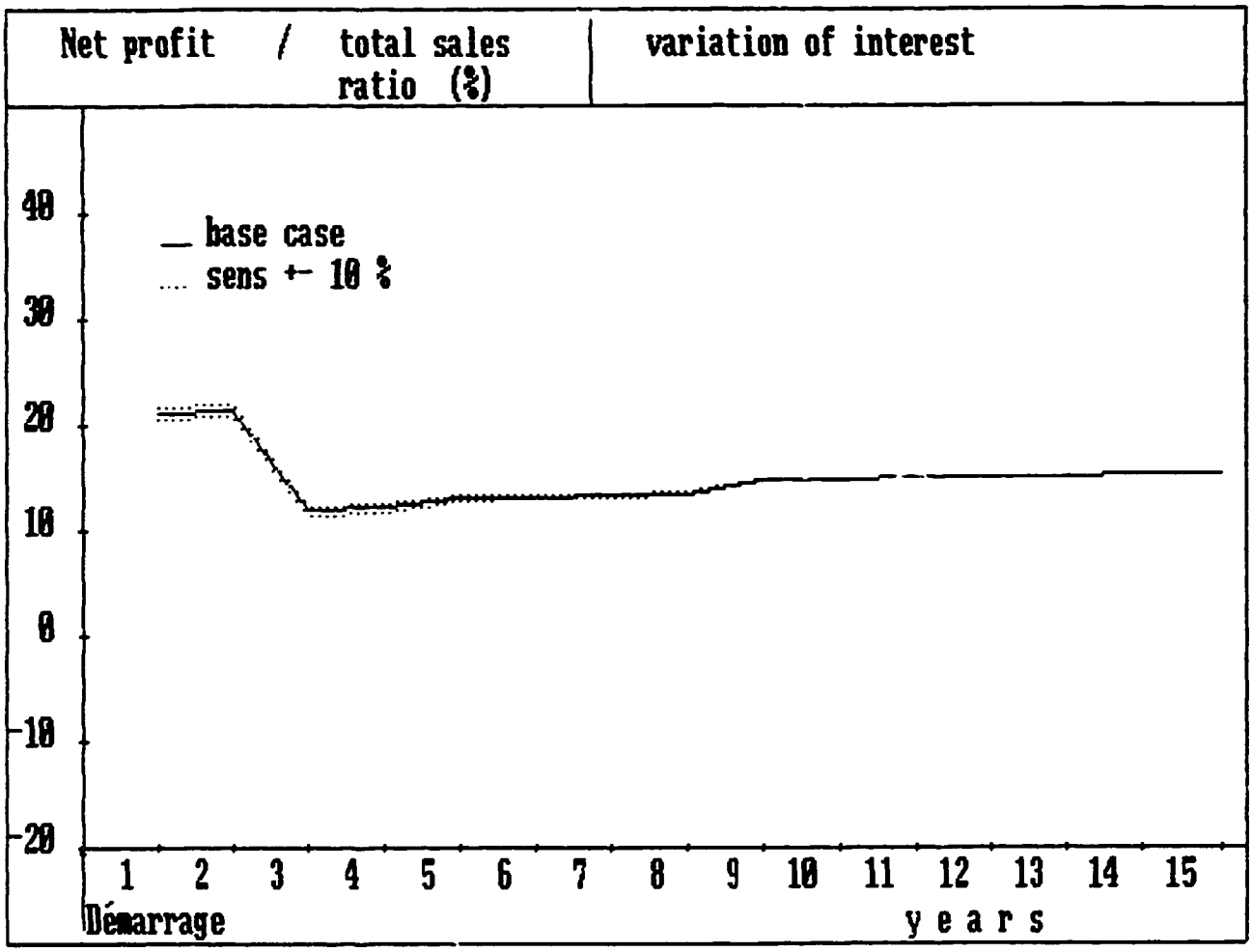

Net Cashflow / Total Sales ratio (%)
variation of operating costs
40
30
20
10
0
base case
sens +- 20 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
years


Net Cashflow / Total Sales ratio (%)
variation of sales prices net of sales tax
35
30
25
20
15
10
5
base case
sens +- 10 %
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
years

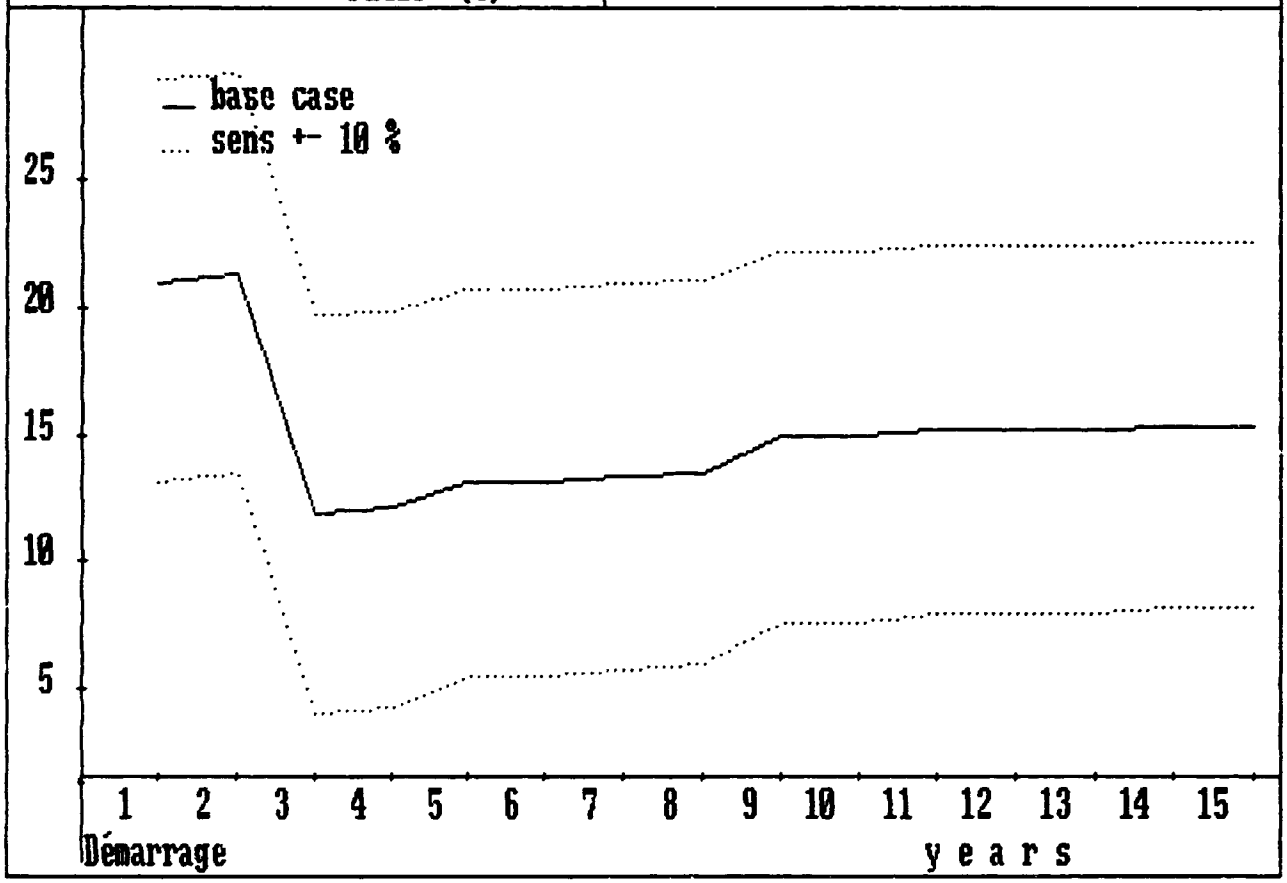

Net Profit / Total Sales ratio (%)
ZECO
20
18
16
14
12
base case
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
year

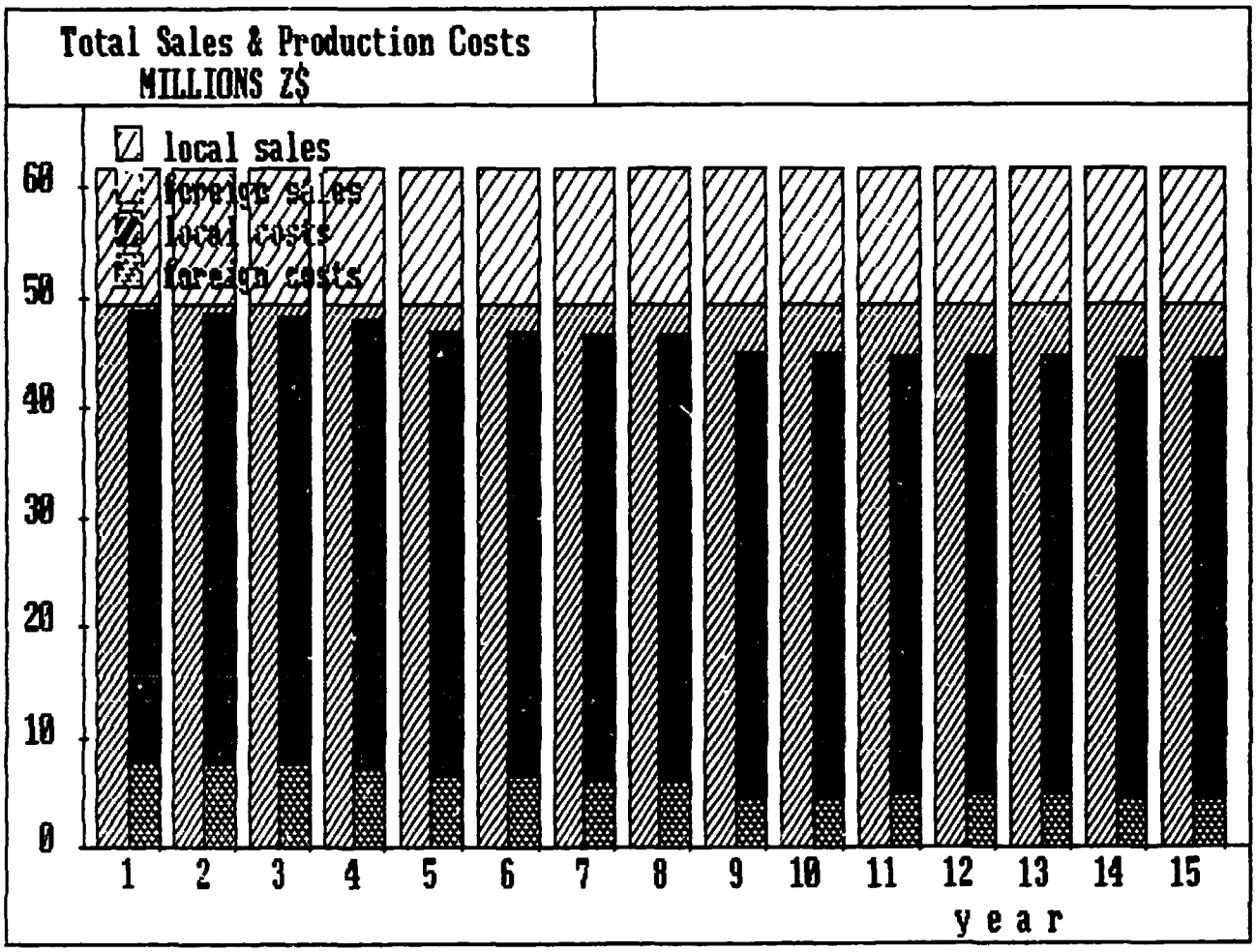

Net Cashflow / Total Sales ratio in (%)
variation of operating costs
40
35
30
25
Base case
sens +- 10 %
sens +- 20 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
years


Net profit / total sales ratio (%)
variation of sales prices
25
20
15
10
5
0
base case
sens +- 20 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
year


Net profit / total sales ratio (%)
variation of interest
40
30
20
10
0
-10
-20
base case
sens +- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
years

Net Profit / Total Sales ratio (%)	variation of production costs




Total Sales & Production Costs
MILLIONS Z$
local sales
foreign sales
local costs
foreign costs
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
year

ZIMBABWE ZECO EXTENSION DE L'USINE
08/06/1993 VAR INFLATION 10 % ZECOB2
PRODUCTION DE WAGONS

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 6.4000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: MILLIONS DE $ ZIMBABWE 1US$=6.4$

Total initial investment during construction phase

fixed assets:	34.43	49.814 % foreign
current assets:	0.00	0.000 % foreign
total assets:	34.43	49.814 % foreign

Source of funds during construction phase

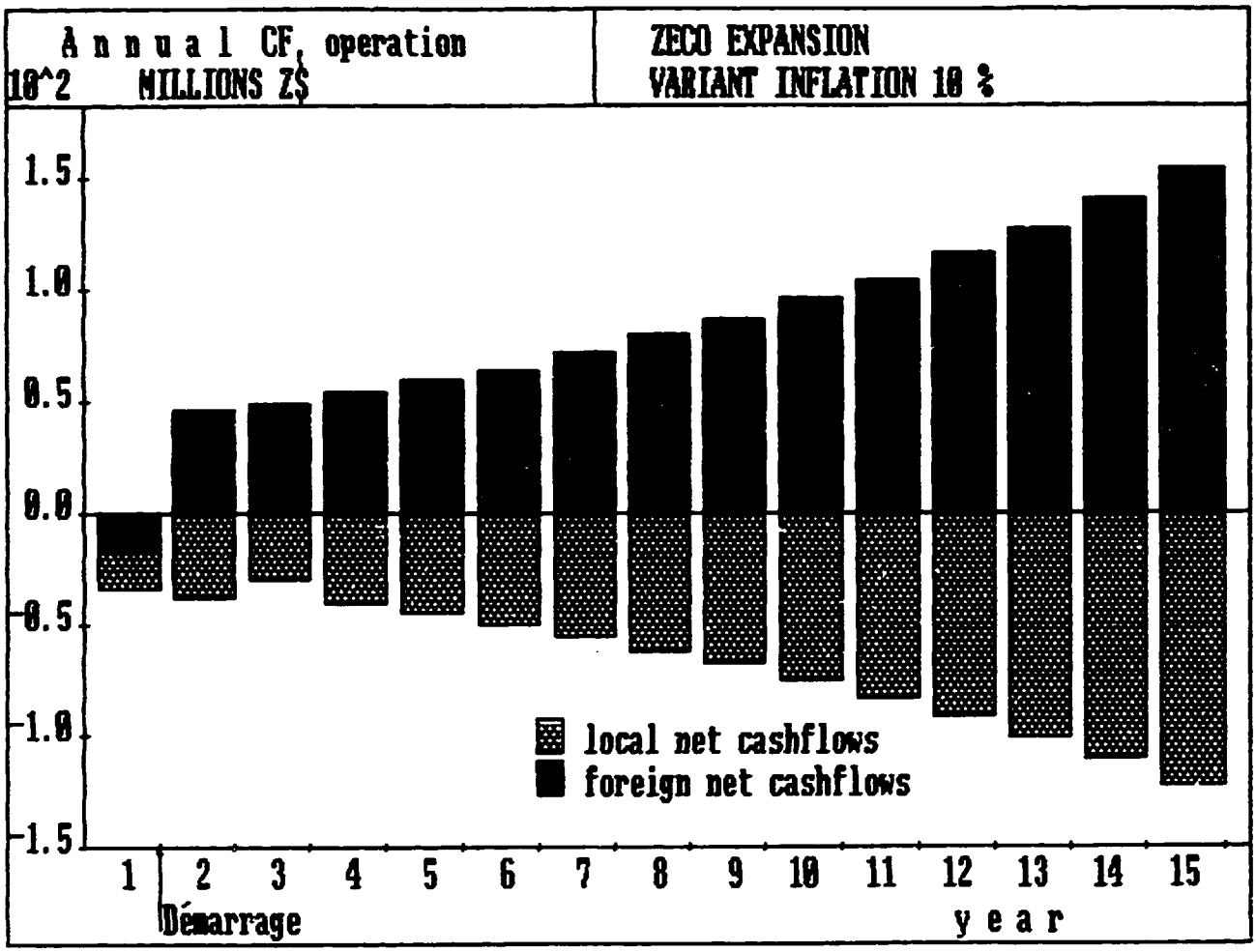
equity & grants:	18.00	0.000 % foreign
foreign loans :	16.64	
local loans :	0.00	
total funds :	34.64	48.037 % foreign

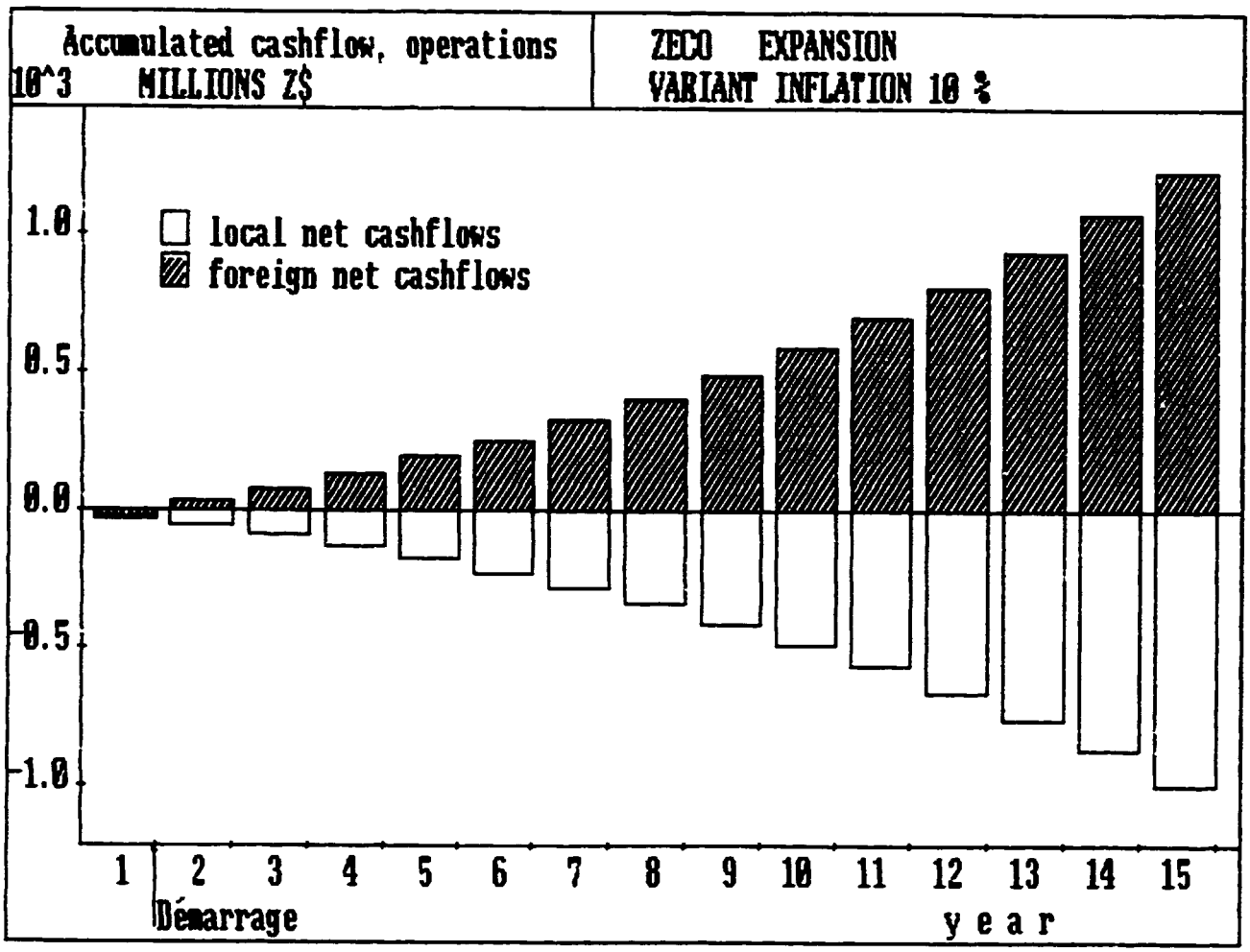
Cashflow from operations

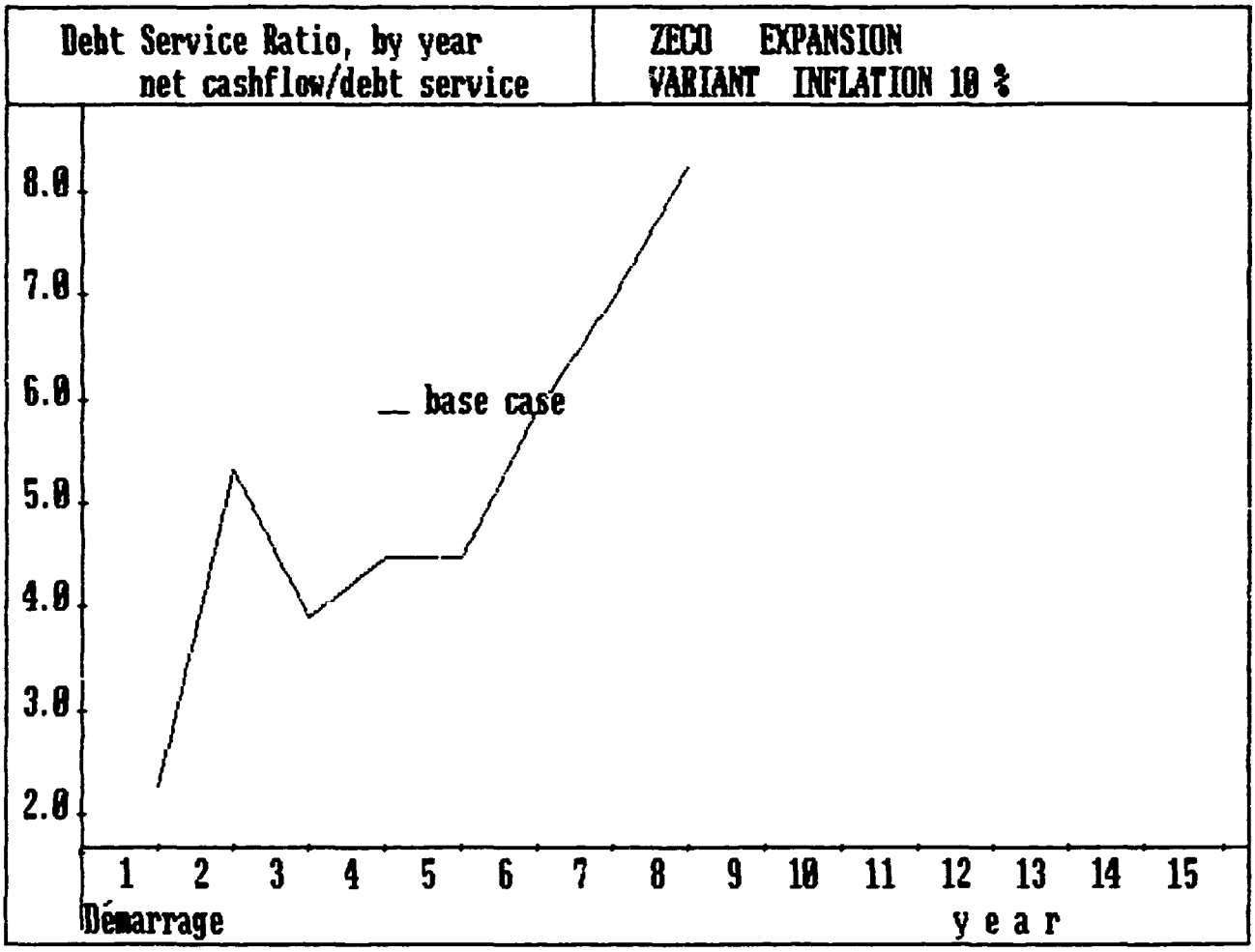
Year:	1	5	10
operating costs:	43.64	63.89	102.89
depreciation :	3.32	2.36	1.21
interest :	1.66	0.83	0.00
production costs	48.62	67.08	104.10
thereof foreign	17.43 %	13.84 %	11.07 %
total sales :	61.60	90.19	145.25
gross income :	12.98	23.10	41.15
net income :	12.98	12.71	22.63
cash balance :	4.78	10.14	20.22
net cashflow :	8.52	13.05	20.22

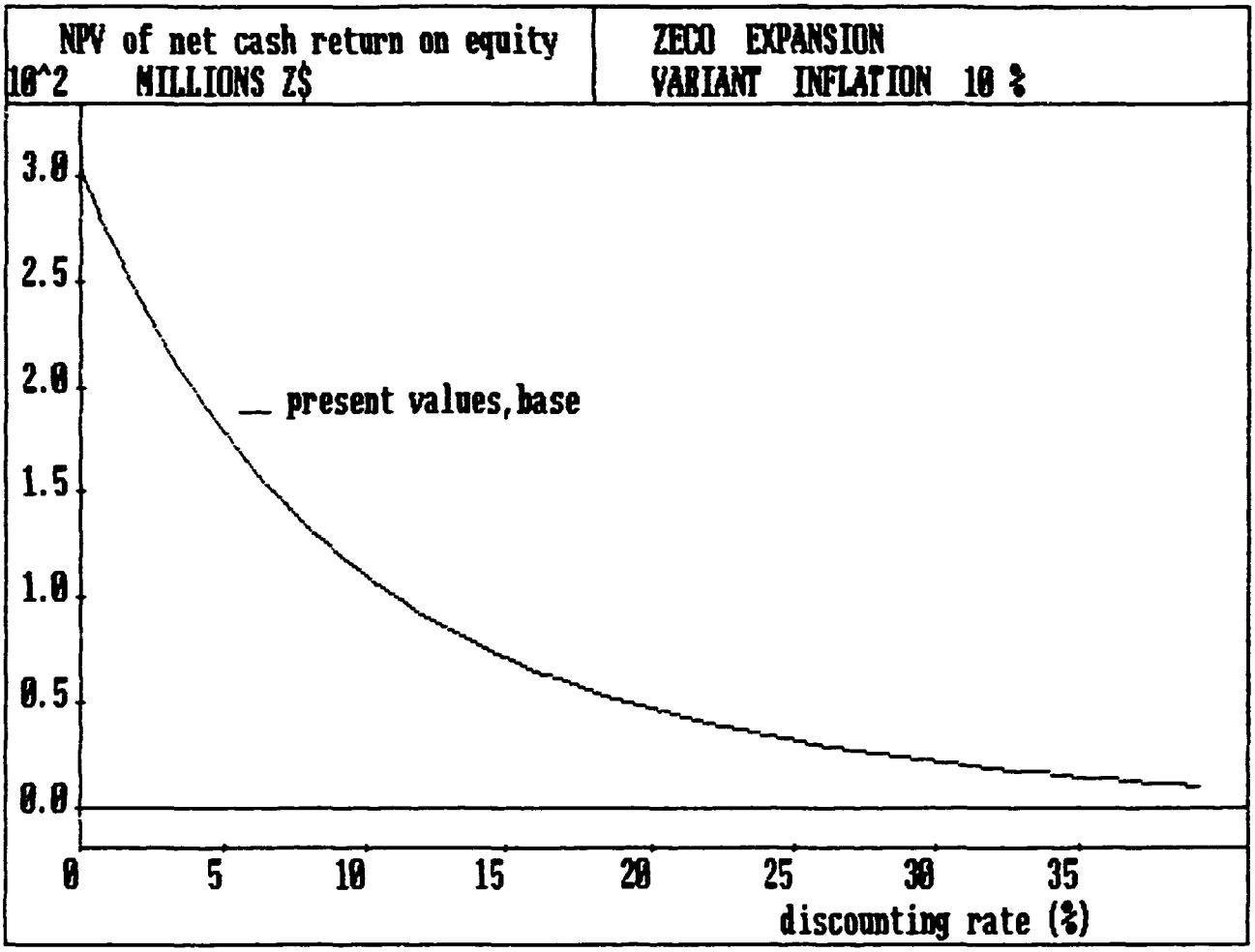
Net Present Value at: 40.00 % = 1.69
Internal Rate of Return: 41.73 %
Return on equity1: 72.34 %
Return on equity2: 55.99 %

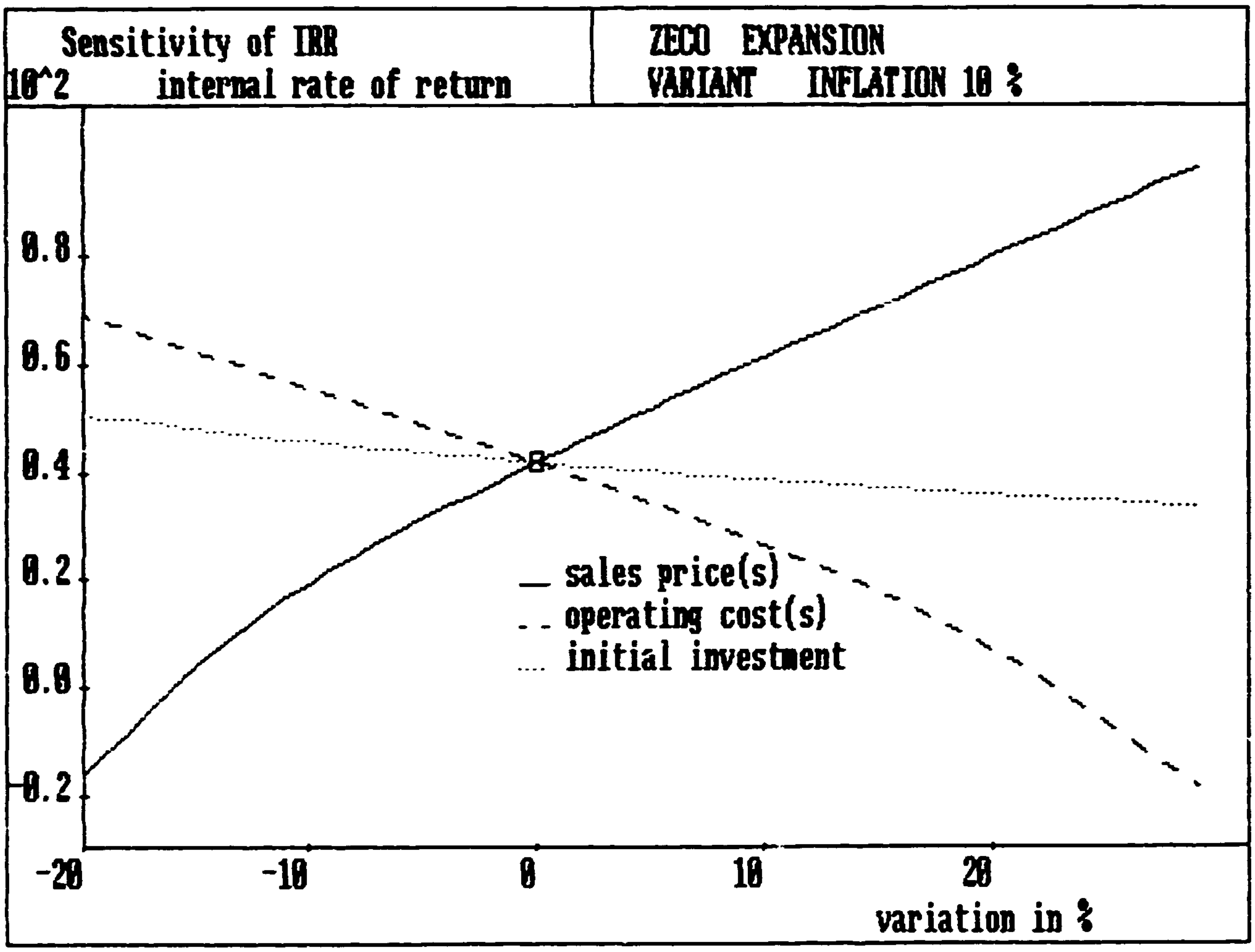
Index of Schedules produced by COMPAR

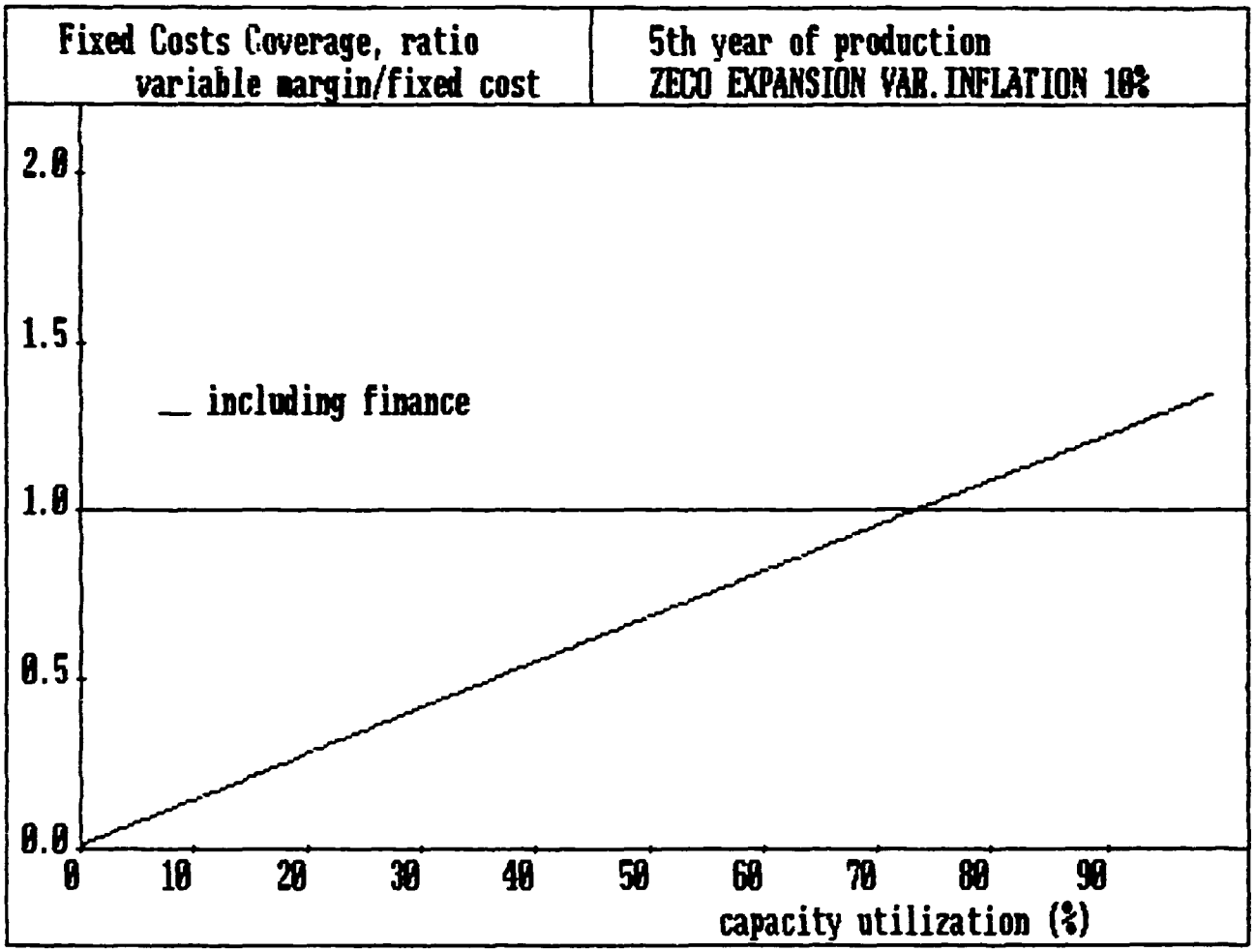

Annual CF, operation
10^2 MILLIONS Z$
ZECO EXPANSION
VARIANT INFLATION 10 %
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
local net cashflows
foreign net cashflows
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
year

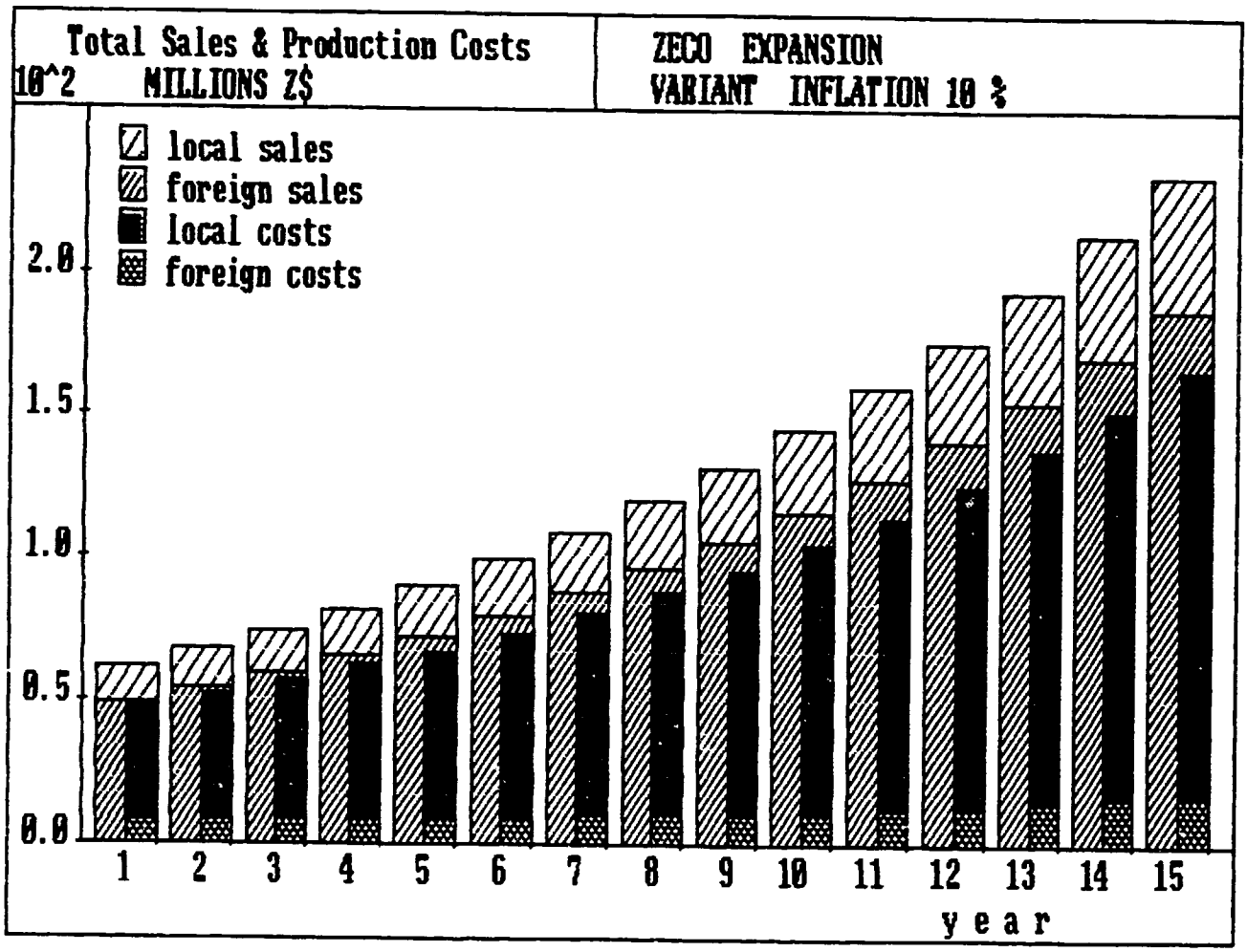

Accumulated cashflow, operations
10^3 MILLIONS Z$
ZECO EXPANSION
VARIANT INFLATION 10 %
local net cashflows
foreign net cashflows
1.0
0.5
0.0
-0.5
-1.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Démarrage
year


Debt Service Ratio, by year
net cashflow/debt service
ZECO EXPANSION
VARIANT INFLATION 10 %
8.0
7.0
6.0
5.0
4.0
3.0
2.0
base case
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Démarrage
year


NPV of net cash return on equity
10^2 MILLIONS Z$
ZECO EXPANSION
VARIANT INFLATION 10 %
3.0
2.5
2.0
1.5
1.0
0.5
0.0
present values,base
0
5
10
15
20
25
30
35
discounting rate (%)


Sensitivity of IRR
10^2 internal rate of return
ZECO EXPANSION
VARIANT INFLATION 10 %
0.8
0.6
0.4
0.2
0.0
-0.2
sales price(s)
operating cost(s)
initial investment
-20
-10
0
10
20
variation in %


Fixed Costs Coverage, ratio
variable margin/fixed cost
5th year of production
ZECO EXPANSION VAR. INFLATION 10%
2.0
1.5
1.0
0.5
0.0
including finance
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)


Total Sales & Production Costs
10^2 MILLIONS Z$
ZECO EXPANSION
VARIANT INFLATION 10 %
local sales
foreign sales
local costs
foreign costs
2.0
1.5
1.0
0.5
0.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
year