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PLANT FOR THE PRODUCTION OF TYLOSIN TARTRATE

FINAL REPORT

JOINT VENTURE BETWEEN:

UB PHARMACEUTICALS Ltd (Bangalore)
and
PHARMACHIM S.p.A. (Milano)

Una Società del Gruppo IMI

CONTRACT NO.91/104
between
THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
(UNIDO)
and
FIDIMI CONSULTING S.p.A.

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UNIDO PROJECT No.US/GLO/89/126
Activity Code: G01902

Roma, December 1991

In January 1991 UNIDO launched a tender for a pre-investment study of a plant for the production of tylosin tartrate in India.

Fidimi Consulting was selected and charged with the preparation of the requested study. The relevant Contract, No. 91/104, was signed, dated June 28th 1991.

The kick-off meeting took place in Milan, on May 23rd 1991, with UNIDO IPO Representative, the Italian Promoter and the Indian Promoter.

A field visit to India was made by Fidimi Consulting from June 22nd to July 5th, 1991. The relevant Interim Report is included in Annex 9.

The pre-investment study was developed on the basis of information provided by the Project Promoters and data collected during the field visit.

It should be pointed-out that the Italian Promoter provided information on the process technology at very preliminary design phase.

According to the Contract, Fidimi Consulting has carried-out the services and the Draft Report has been completed within the scheduled time and submitted to UNIDO on october 18th, 1991

UNIDO accepted the Draft Report on december 18th, 1991, without any comments or suggestions.

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SUMMARY OF BASIC DATA AND RESULTS

PROJECT NUMBER:	US/GLO/89/126
PROJECT TITLE:	**Plant for the production of Tylosin Tartrate**
COUNTRY:	India
EXCHANGE RATE:	**27 Rps/US $**
PROJECT SITE:	Taloja (Bombay)
PRODUCTION:	**108 Ton/y active tylosin** equivalent to 116 ton/y tylosin tartrate
TOTAL INVESTMENT:	**US$ 23.3 million**
DEBT/EQUITY:	2/1
REVENUES:	US$ 10.0 million
TYPE OF CO-OPERATION:	**Joint Venture**
INDIAN PROMOTER:	UB Group (Bangalore)
ITALIAN PROMOTER:	Pharmachim Engineering (Milan)
EQUITY COMPOSITION:	UB Group Shares: 50% Pharmachim Engineering Shares: 10% Indian Stock Market Shares: 40%
RESULTS:	BASE CASE: I.R.R. 18.04% I.R.R.E1 19.19% I.R.R.E2 21.09% N.P.V. (10%) 13.1 MUS$

1. EXECUTIVE SUMMARY

Project Outline

The Project is a **Joint Venture**, promoted by an Indian and an Italian firm, with the purpose to build-up and operate a factory for the production of Tylosin Tartrate in India.

The nominal capacity of the plant is **108 ton/y** of active Tylosin, equivalent to 116.5 ton/y of Tylosin Tartrate.

The major part of the production (103 ton/y) will be exported, through the Bombay port, while the remaining part will be commercialized on the local market (5 ton/y).

Promoters

The Promoters of the Project are:

UB Group
UB House One Vittal Mallya Road
Bangalore 560 001
India

Pharmachim Engineering S.r.l.
via Appiani 9
20121 Milano
Italy

The **UB Group** is an integrated body active since 1915 in various sectors: beverages (beer, liquor), polymers, food, electronics, engineering and pharmaceuticals.

Total revenues in the last fiscal year amounted to 14.445 million Rupees, of which 25% from the pharmaceutical division second only to the liquor division (29%). UB Group exports amounted to 840 million Rupees.

The UB Group with plants throughout India and employing over 50.000 persons is one of the leaders of the Indian economy and has established good working relations with many international firms (Hoechst, Farmitalia, ENI, Babcock, Dupont, Optrex, etc.).

The UB Group appears to be an important and well organized body with the international capacity of developing the proposed project.

Pharmachim Engineering S.r.l. was founded in 1980 by the present sole director Mr. Ennio Eusebio Pasquino who owns 98% of company shares, while the remaining 2% belong to his daughter Mrs. Fernanda.

The firm is an engineering company, specialized in pharmaceutical and biotechnology field.

The firm appears to be capable of providing the required know-how, engineering design and procurement services for the Tylosin project. The financial burden will be paid by the income deriving from said activities.

Market

Results of the market survey carried out can be summarized as follows:

- The **Western European market** appears to be too limited and steady to fully absorb the export output of the plant.
  The presence of consolidated producers, well known and active on the market with adequate distribution networks, limits the penetration of a new producer.
  For this reason the European market share that the promoters would like to acquire (30%) is considered quite optimistic.

- **Eastern Europe** represents a good potential market, but local productions, already existing in Bulgaria and under development in Poland, have to be taken into account.

- **Indian market** is potentially large: tylosin consumption growth is however conditioned by the modernization of poultry industry and by the enforcement of poultry farmer education, and limited by import restrictions.
  Moreover, a succesfull penetration of these markets requires the setting-up of an adequate distribution network or the establishment of commercial agreements with well-introduced distributers.

- **Price** is a key factor to stimulate the tylosin consumption and the penetration of a new producer into the different markets.

In conclusion the tylosin market perspectives do not appear to be very attractive for a new producer, expecially if the plant is located far from the main markets and not supported by a wide spread commercial network, as is the case of the Project under study.

However, the Indian Promoter, UB Group, claims to have started contacts with some European chemical groups, who have expressed their interest in purchasing the major part of the Project production, on the basis of a long term supply contract.

In particular, Hoechst Group, who has for many years established an industrial cooperation with UB Group, seems to be particularly willing to take over almost the total expected production (80 100 ton/y) and to market it through its own commercial channels.

Hoechst Group is a large chemical Company, with the Head Office based in Germany, but with production facilities in Germany and abroad and a world-wide commercial network.

Hence the final market should not be limited to the areas focused in the study, but should include those countries where Hoechst might find commercial opportunities. If the worldwide market is considered, Project production represents only 5 : therefore the envisaged goal does not appear to be impossible.

The commercial agreement with Hoechst is vital for the positive outcome of the Project, given that no other commercial agreement is underway.

Relevant to the Project revenues, the following prices have been considered in the study:

- In India, the assumed ex-factory price of **2538 Rps/Kg** active tylosin (equivalent to **94 $/Kg**), which would reduce the final product selling price up to 45 of the present one, should allow to increase the domestic consumptions from 1-1.5 ton/y (consumption level recorded in the last years) up to the 5 ton/y envisaged by the project Promoters, at least for the first years.

- As for the export, it has been assumed a F.O.B. price of **82 $/Kg** (active tylosin), which means a C.I.F. price of 85-86 $/Kg at the receiving port, almost equal to the minimum market price presently paid in Europe for the Bulgarian equivalent.
  According to the Indian regulation, an incentive equal to 12 of the F.O.B. value is granted by the Government, to promote its export: by considering said incentive the revenue of the Project per unit of exported production is **94 $/Kg**.

Materials and Input

Raw materials and other production inputs are available in India.

The process licensor, Pharmachim Engineering, will test the process performance with locally available raw materials.

The annual cost of raw material at full capacity operation of the plant is **54.7 M Rps**.

Other production input are Electric Power and Fuel Oil, which annual cost at full capacity operation is **17.4 M Rps**.

Location

Different alternative locations have been investigated by the Promoters in order to select the most suitable one for the Project.

As result of the investigation carried out the **Taloja Industrial Area**, about 50 Km from Bombay, in Maharashtra State, has been identified as the best solution for the Project.

Taloja Industrial Area offers the following positive points:

- fully developped industrial area;
- water treatment facilities available;
- well connected to Bombay Port with Highway (50 Km);
- near to raw material sources;
- two satellite townships (Vashi and Panval) within 30 minutes drive, where accomodation and educational facilities for the employed staff and their families are available.

Project Engineering

Within the battery limits of the factory all the facilities required for the production and operation will be installed, namely:

- Process Plant machineries and equipment
  Utilities production and distribution equipment
- Offices, laboratories and warehouses
- Other services facilities, such as canteen, roads and parking areas, entrance guard and fencing, etc.

The production process will be based on the technology developped by the Italian Promoter, Pharmachim Engineering, who will also supply the strain, carry out the basic design and provide procurement services for the imported equipment.

The Indian Promoter, UB Group, will supervise the implementation activities. Indian Firms will be charged with the detailed design, civil works, supply and construction of locally available equipment.

The total investment cost of the Project amounts to 23.2 M US$, of which 11.8 M US$ are in foreign currency (50.6%) and 11.5 M US$, corresponding to 317 M Rps, are in local currency (50.4%).

Plant Organization and Overhead Costs

Fixed factory costs foreseen during the production phase of the project to cover Maintenance and Repairs, Spare Parts, Factory Overheads, Administration and Marketing expenses, are estimated 1.39 M US$, at full capacity operation.

Manpower

The Project will employ **110 units** for the different activities of the Factory, for a total yearly cost of **269 T US$**.

Working Capital

The net working capital requirement for the financial operation of the Project amounts to **1.4 M US$**, at full operation of the plant.

Implementation

Project implementation will require an estimated period of **two and half years**, including plant commissioning and performance tests.

During said period all the initial investments will be realized and the required financial sources should be activated.

The implementation phase has been divided into five periods, each one lasting six months: the first four periods are devoted to land acquisition, civil works and plant construction, while the last one foresees start-up activities (plant commissioning, start-up and performance tests). The last period falls in the first year of the production phase.

The total initial investments have been distributed among the implementation periods, according to the expected plan of activities.

Financing scheme

- The Project financing will be based on an **Equity/Debt Ratio of 1:2**.

EQUITY

- The **Indian Promoter**, UB Group, will subscribe **50%** of the total equity, amounting to 117.2 M Rps (equivalent to 4.3 M US$).

  The **Italian Promoter** will partecipate to the Joint Venture with 905 T US$, which represents **10%** of total equity.

  The equity shares balance (**40%**) will be sold on the **Indian Stock Market**, amounting to 91.5 M Rps (equivalent to 3.4 M US$).

LOANS

Export Credit

Amount:	10.0 M US$
Interest rate:	8.5
Amortization:	Constant yearly rates, lasting for 7 years
Grace period:	1 year from the last installment

- **Commercial Loan**

Amount:	1.8 M US$
Interest rate:	16.5%
Amortization:	Constant yearly rates, lasting for 7 years
Grace period:	3 years from the last installment

- Loan from **Public Indian Financial Institution**

Amount:	122.6 M Rps equivalent to 4.5 M US$
Interest rate:	14%
Amortization:	Constant yearly rates, lasting for 5 years
Grace period:	3 years from the last installment

Tax

Income tax on company's profit are equal to **54%** on Gross Profits (Operating Margin, including Depreciation, less Cost of Finance).

Said rate has been applied to the portion of profits deriving from sales on local market.

Examined Cases

The following Cases have been analysed, utilizing the COMFAR Model.

	BASE CASE	CASE 1		
		A	B	C
- **Production**	108 ton/y	80 ton/y	90 ton/y	100 ton/y
- **Productivity**	100 %	74 %	83 %	93 %
- Sales (export)	103 ton/y	75 ton/y	80 ton/y	90 ton/y
- Sales (India)	5 ton/y	5 ton/y	5 ton/y	5 ton/y

The financial analysis performed on the BASE CASE also includes the Break Even Analysis, the Production Cost Structure and the Sensitivity Analysis on the main economic parameters (Sales Prices, Operating Costs and Initial Investment), worked out by utilizing the COMFAR GRAFIX Module.

Results

The main results of the financial analysis carried out on the proposed project are summarized in the following Table:

	I.R.R. (%)	I.R.R.E1 (%)	I.R.R.E2 (%)	N.P.V. @ 10% (M US$)
BASE CASE	18.04	19.19	21.09	13.1
CASE 1/A	10.87	6.84	9.93	1.3
CASE 1/B	13.59	11.44	13.65	5.5
CASE 1/C	16.07	15.71	17.70	9.6

where:

I.R.R. : Internal Rate of Return on total investment;
I.R.R.E1 : Internal Rate of Return on equity;
I.R.R.E2 : Internal Rate of Return on equity plus reserves.

The Project presents an acceptable profitability, in terms of Internal Rate of Return, on the basis of assumptions considered in the BASE CASE.

The break even analysis, carried out on the BASE CASE, shows a good performance of the project: the break even point excluding finance is settled at 50% of capacity utilization, while the one including finance is around 65%.

The sensitivity analysis shows that the Project profitability (I.R.R.) is not notably affected by the initial investment or by the operating costs, while is mainly affected by the sales prices. However, by applying a 15% reduction in sale prices, the I.R.R. remain still over 12%.

The sensitivity analysis carried out on the productivity of the plant (CASE 1, sub-Cases A, B and C), shows that the Project still presents acceptable values of I.R.R. even if the production is 83% of the nominal capacity (Case 1 B).

However, the financing scheme has to be re-considered, as the cashflow requires consistent bank overdraft to cover negative cumulate cash balances during the first years of production (in Case 1 B up to year 5, with maximum figure in year 3: 1.2 M US$).

Under CASE 1 A assumptions, the Project does not appear profitable.

These results point out the importance of:

- the process performance with locally available raw materials (to be tested by the Licensor);
- the training program and the technical assistance by the Licensor during the production phase;
- the commercial agreements to be signed with potential international clients (Hoechst or similar), in order to garantee the product marketing at adequate level.

2. PROJECT BACKGROUND AND HISTORY

The Project is a Joint Venture promoted by the following Indian and Italian Firms:

UB Group
UB House One Vittal Mallya Road
Bangalore 560 001
India

Pharmachim Engineering S.r.l.
via Appiani 9
20121 Milano
Italy

Purpose of the Joint Venture is to build-up a factory for the production of Tylosin Tartrate in India.

Tylosin Tartrate is a veterinary antibiotic mainly used in the poultry industry.

The Project is export oriented: less than 5% of the production will be marketed in India.

India welcomes foreign investment and technology transfer.

The strategy for the industrial sector is based upon (i) restructuring of industry; (ii) efficient use of capital; (iii) improving infrastructural facilities; (iv) modernization and upgrading of technology; (v) increase in productivity; and (vi) identification of thrust areas for export.

During the last years, the Government of India has reviewed the role of foreign investment in the economic development of the country, streamlining the procedures relating to foreign collaboration, investment, repartition of technology fees, with the major objective to promote larger flow of foreign investment to the country. A number of important policy measures have been taken to sustan foreign investment.

In addition Indian Governement supports export oriented projects with the following incentives:

- exemption of Custom Duty on imported machinery and equipment (not applied to Know How and Engineering services purchased abroad);
- exemption of Income Taxes on the profits deriving from product exports;
- export incentive equal to 15% of F.O.B. value of the exported production, in local currency.

UB is a large and diversified industrial Group, operating in India in different fields of activities. Recently UB Group entered into the pharmaceutical, biotechnology and agrochemicals fields, also in Joint Venture with foreign Firms.

As early a 1985 UB Group was interested in realising a tylosin tartrate plant and began searching for a technology licensor partner.

Different Tylosin Tartrate producers were approached, but without success results.

In 1986 UNIDO launched an enterprise level cooperation programme (US/INT/87/046) between Italy and selected developing countries among which India, with the support of the Indian Ministry of Industry and of the Italian Confederation of Small Enterprises (CONFAPI). The programme aimed at facilitating the contacts and the exchange of technology between Italian and Indian small enterprises.

During 1989 the IPO Milan developed an industrial and technological cooperation programme between Italy and India directed at setting up an institutional framework within which enterprises from India and Italy might develope joint-venture cooperation schemes.

The programme was launched during the 1989 Delhi Fair. Four sectorial seminars were held on 16, 17, 20 and 21 November in order to present Italian technology to Indian industrialists representing the specific sector. The sectors selected were: machinery and equipment, food processing, chemicals and essential oils and environmental protection in the order. A fifth seminar, covering all industrial sectors was held in Bangalore on 29 November 1989. Leading italian technologists participated in the seminars.

A series of workshops were held to present UNIDO's methodology with respect to identification and evaluation of projects and to introduce the software package PROPSPIN. The workshops were attended by officers from the Small Industries Service Institute of the Ministry of Industry and from the State Bank of India.

In this framework UB Group entered into contact with Pharmachim Engineering, who claims to have developped a biotechnology process for the production of Tylosin Tartrate and declared to be ready to partecipate in the Joint Venture.

To this extent a "Memorandum of Understanding" was signed by the parties, on July 28 1989, stating the basis of the cooperation.

Under the assistance of UNIDO, the Project was preliminarly examined applying UNIDO's PROSPIN methodology.

Due to a positive outcome of said preliminary analysis the partners requested UNIDO IPO to extend its assistance in order to carry out a pre investment study of the Project.

Fidimi Consulting S.p.A. was selected by UNIDO and charged with the preparation of the requested pre-investment study.

3. MARKET and PLANT CAPACITY

3.1 Tylosin: the Product, Uses and Market Trends

3.1.1 The Product

Tylosin is a macrolide antibiotic with a 16-membered lactone ring isolated in the Eli Lilly labs and described for the first time in 1961 (J.H. Mc Guire at al. Antibiot. Chemother 11:320.1961; R.L. Hamil et al. Antibiot. Chemiother. 11:328,1961).

Tylosin is produced by strains of Streptomyces Fradiae NRRL 2702 (ATCC 19609) and NRRL 2703 together with other related antibiotics desmycosin (tylosin B), macrocin (tylosin C) relomycin (tylosin D) and lactenocin. It had been reported that other strains of Streptomyces [S. rimosus, H.Pape and G.U. Brillinger, Arch. Microbiol. 88: 25, 1973); S.hygroscopicus (A.L.Jansen et al., Antimicrob. Agents and Chemother. 1964:49); S.species (N. Madry and H.Pape, Arch. Microbiol. 131:170, 1982] can also produce tylosin. However the industraial production of tylosin is currently performed using S.fradiae (likely suitable mutants of the original strains).

The structure and some physical chemical characteristics of tylosin and related compounds are reported in Annex 1 (from the Dictionary of antibiotics and Related Substances, Ed. B.W. Bycroft, Chapman and Hall, London, 1988).

3.1.2 The Commercial Product

The commercial product is a tylosin mixture containing predominantly tylosin, generally indicated as tylosin A. The content of tylosin A is not less than 80% and the total content of tylosins A, B, C, and D is not less than 95% in a commercial product. It is used as tylosin (base), but more currently as tylosin tartrate (where a molecule of tartaric acid salifies two molecules of tylosin base ((C46H77NO17)2.C4H6O6). It is used also the phosphate salt of tylosine.

The specifications reported by the British Veterinary Codex 1985 p. 42-44 (Annex 2 A) can be used for the identification, quality and quantitative analysis of the commercial product. The market value of a product is based, on its potency in Units per mg. Other specifications can be found on the Martindale Extra Pharmacopeia Annex 2 B.

Units: the International Standard Preparation contains 1.000 Units per mg tylosin base.

3.1.3 Uses of Tylosin and Market Trends

The use of antibiotics and some sulfonamides in animal husbandry has steadily increased since 1950 as has animal production. In developed countries probably more than 40% of all the antibiotics produced are used in the veteerinary field. Antibioties are administered in animal feed for improving the rate of growth and the feed efficiency in pigs, ruminants and poultry. Other large scale uses of antibiotics in veterinary pratice include disease prevention (especially chronic respiratory disease in poultry) and increase egg production in chickens. Obviously there is also a consistent market of antibiotics veterinary specilties for the treatment of acute infections in animals.

An indicatic of the total market of antibiotics in veterinary practice can be drawn from a report of the US International Trade Commission 1979, which evaluated that on a total of 11.660 tons of antibiotics used in 1978 in USA, about 5.580 tons (48%) had been used as additive to animal feed. Nowadays the world-wide production of antibiotics should be of the order of 150.000 tons per year of which probably 60.000 tons are used in veterinary pratice. Most of the antibiotics used in human medicine have found large application in veterinary practice. However there is an important difference in the policy for antibiotics as feed additive between the USA and the EEC. In fact, following the recommendation of the Swann Committee (1969), regulations development by the EEC to control the use of antimicrobials in animal feed came into force in 1974: they proscribed the addition of tetracyclines to feed as auxinic, with the consequence that in Europe there was an increase in the use of macrolide antibiotics (erythromycin, tylosin, spiramycin ecc.) and some othere antibiotics like virginiamycin, baritracin ecc. Tylosin, unlike to other macrolides to which is similar in many respects, had been already restricted to the veterinary area and for its favorable properties and specific antimicrobial profile became and is still well accepted among the farmers. The world market of Tylosin is probably of the order of 2.500 tons per year, of which about 1.000 tons are used in Europe (including East Europe).

The indications for use of tylosin are the following:

1) therapeutic: in the treatment of various specific and non-specific infections involving the respiratory tract, gastrointestinal tract, soft tissue, the eye and the mammary gland. Speific indications exist in therapy of Mycoplasma infections. For the therapeutic applications various pharmaceutical formulations, oral and i.m., containing either tylosin base or tatrate, are available.

2) disease prevention: tylosin is superior to most of the antibiotics in the control of chronic respiratory diseaded in chickens under a commercial production environment. Tylosin is recommended as both a preventive as well as a therapeutic agent for the mycoplasma infections in chicken and turkeys. It reduces the incidence of pneumonia in neonatal calves and reduces mortality by bacterial swine pneumonia.

3) feed additive. The effect of tylosin upon animal production is quite well established:

3a) in poultry, low level addition of tylosin to chicken rations increases feed efficiency (from 5 to 18%) and egg production and quality, in addition to the proved effectiveness in disease prevention

3b) in pigs, daily administration of tylosin improves average daily gain and improves both the rate of gain and feed efficiency.

In quantity, the largest use of tylosin is for disease prevention and as feed additive.

- Dosage of tylosin:

CHICKEN

- to prevent diseases: 80-1.000 g/ton feed
- to promote growth and increase feed efficiency: 4-50 g/ton feed.

SWINE

- to prevent diseases: 100 g/ton feed
  4-10 g/100 l drinking water
- to promote growth and increase feed efficiency: 10-100 g/ton feed.

Other products in development

As stated before, tylosin has important and well estabilished role in the veterinary medicine for the treatment and prevention of serious infections and for the improvement of growth among farm animals.

Macrolide antibiotics has been a field of continous research interest for finding new derivatives presenting some advantages over those already used. Various macrolides have been introduced in human therapeutic use in the recent years (miocamycin, roxithromycin, clarithromycin, ecc.) which have some advantages in comparison with erythromycin in some parameters (e.g. pharmacokinietics, activity on some specific pathogens, activitiy on erythromycin resistant pathogens etc.).

Also tylosin has been the subject of various studies (mainly in USA at the Eli Lilly Labs, and in Japan at the Institute of Microbial Chemistry, at the Sanraku Ocean Co. and at the Kitasato Institute). The researches have been focused on the chemical or biosynthetic modifications of the basic structure of tylosin with two main objectives: 1) to obtain a derivative for human use, active against erythromycin reystant pathogens, 2) to obtain a derivative superior to tylosin for veterinary use. In this second research area, Eli Lilly (USA) and Kitasato Institute (Japan) have prepared a series on derivatives by reductive amination of the aldeyde group of tylosin and desmycosin and have shown that some of these derivatives have an expanded antimicrobial spectrum against pathogens of veterinary interest (Pasturella). One of them (Tilmicosin EL 870) is now under evaluation foa efficacy against veterinary respiratory illness.

The patent of tylosin has expired some years ago and tylosin can be feely produced by other compainies. It is likely that Eli Lilly wants to develop a patetable second generation tylosin, in order to maintain also in future a strong market share in the field of veterinary antibiotics.

In any case, the derivatives under study are chemical modifications of the fermentation products and therefore only the companies having the know-how for the production of tylosin will be in condition to produce in the future also the derivatives. However, patents of the originators will seriously block other pruducers for some years. Among the products which compete with tylosin for their activity against Mycoplasma there are most of other macrolides (expecially erythromycin, spiramycin, kitasamycin) and thiamulin. The use of the latter is limited by the known incompatibility with some coccidiostatic agents (monensin) largely used in the treatment of poultry.

A new chemotherapeutic agent, Baytril, belongs to the family of guinolones and has been introduced recently by Bayer in the veterinary field with large promotional effort. Baytril has a broad spectrum of antibacterial activity which includes Mycoplasma. The scientific works and the promotional material aim to indicate the superiority of Baytril over tylosin. The present limit in its use is constituted by its price much higher than that of thylosin. A problem which could arise in the future for Baytril is the probable selection of resistant mutants (as in the human use of other guindoues.

In general it can be said that the veterinary market is rather conservative and the Farmer will stick to the established treatments unless really more efficacious and less expensive new products will be available.

A decrease of the use of antibiotics in animal husbandry is likely to result from: a) large scale vaccination; b) use fo pathogen-free animals used for reproduction; c) improved hygienic conditions of the animal farming.

3.1.4 Manufactures and Price of Tylosin

The technology for the manifacture of tylosin is not spread among the antibiotics producers in the world as is that of other antibiotics.

Few industrial companies are producing tylosin: the major producer is Eli Lilly, the American multinational that invented the antibiotic in the 60's and still retains the majority of the market supply. Since the patent on tylosin expired, other pharmaceutical companies started producing tylosin.

The price of tylosin bulk in the market depends from the requested quantities, the quality and type of salts and from agreements between the producing and the distributors. As an indication, tylosin tartrate has been quoted in Italy at a value of 85 120 $/kg activity and tylosin phosphate less than 84 $/kg activity.

It has to be remarked that in this quotation the price is related to the tylosin activity content not to the weight potency of the pruduct.

Tylosin bulk (base, tartrate or phosphate) is generally sold to the manufacturers of pharmaceutical formulations as specialties to be used for the treatment of acute infections in animals, but the major quantity is sold to manifacturers of premix formulations containing 20-200 g tylosin/kg to be mixed with the feed or dissolved in drinking water in order to reach the desired concentration of antibiotic for preventing disease and for promoting growth.

The premix formulations are prepared and distributed to the farmers by various companies. In the Annex 3 there is a partial list of premix formulations based on tylosin (with or without other antibiotics or chemotherapeutic agents) present in the Italian market (from "guida di Veterinaria e Zootecnia" - 8° Ed. 1991).

3.2 Tylosin Market Survey: Europe

3.2.1 Profile of End-users of Tylosin.

In Europe animal husbandry is concentrated in highly-intensive breeding centers where all the different phases of meat production are integrated.

In the case of poultry, for example, it is very common that the same company controls the full industrial cycle, from hatcheries to slaughter and meat commercialization.

Traditional farming based on small-scale centers was drastically reduced in the 60's when animal production entered the industrial stage with advanced breeding technics supported by new veterinary products. Since then animals were treated with increasing numbers of vaccines and antibiotics.

The latter are used for disease prevention and therapy and also as growth incentives. In particular Tylosin is used for treatment of Chronic Respiratory Diseases from Mycoplasma infections that may quickly spread in intensive breeding centers where density of animal population is high.

Poultry and pig farming in Europe increasingly relied on this advanced breeding technology through all the 70's and the beginning of the 80's in which the two main objectives of this sector were meat production increase and price reduction. The use of antibiotics has helped to prevent diseases to which animals are more vulnerable in such intensive farming.

In the last five years in Western Europe the development of bio-technologies and a new consumers' awareness of natural products coupled with a higher standard of living have become to shift the focus on meat quality.

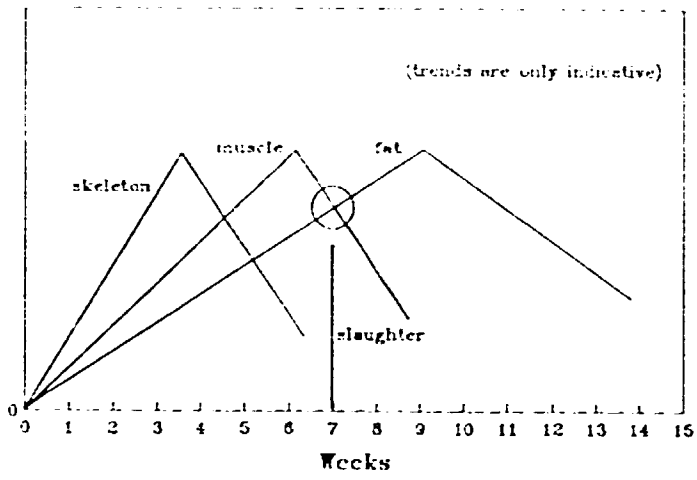
On one side bio-technologies favor the reproduction of pathogen free animals; on the other less intensive animal husbandry under better hygienic conditions requires less use of antibiotics as disease prevention. The meat produced is of the same quality and the water retention in the animal carcass, derived from antibiotic absorption, is inferior.

As shown in the following graph, in poultry farming a reduced use of antibiotics requires a longer breeding period (from 7 to 10 weeks on average) before slaughter. The animal turn over in one year is reduced but consumers' awareness of a more natural product allows the producers to increase prices at least in high standard-living Western Europe.

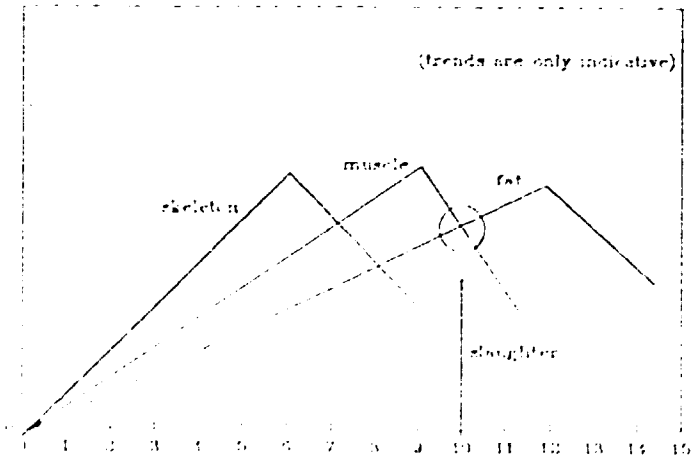
3.2.2 Poultry Farming in Europe: Data and Characteristics.

In the twelve countries of the European community, the yearly production of chicks in 1990 has been the following:

Growth Dynamic of Poultry
(with extensive use of antibiotics)



(without extensive use of antibiotics)



('000)	Broilers	Layers	Turkeys
Belgium	112,725	9,906	690
West Germany	240,362	34,080	14,359
France	785,108	55,027	90,269
Italy	420,112	35,764	25,902
Netherlands	339,896	31,285	3,218
Denmark	100,106	4,146	583
Ireland	44,235	1,558	3,975
United Kingdom	671,552	33,196	35,300
Greece	81,648	5,761	404
Spain	525,458	38,050	4,286
Portugal	150,200	5,084	3,552
12 EEC	3,471,401	253,855	182,539

Source: EEC Statistics

The breeding technology is similar in all countries with the only difference in the use of antibiotics that is considered higher in Italy, Spain, Portugal and Greece due to both worse hygienic conditions and bigger animals' weight.

The production of poultry meat in 1990 was 6,300,000 tons in the Community with an average meat consumption of 18 kg per EEC citizen. The EEC is self-sufficient in the poultry meat production. The production trend is still positive, considering that in the last five years there has been a yearly average growth rate of 4% .

For Eastern Europe estimated data for aggregated chick production in 1989 are as follows:

('000)	Birds
Poland	276,700
Romania	316,700
Yugoslavia	281,800
Bulgaria	175,000
Czechoslovakia	198,500
East Germany	132,500
Hungary	360,000
USSR	2,710,000
Total	4,451,200

Source: Italian Ministry Of Agriculture

The East European poultry farming is considered to have poor hygienic conditions and a significant potential use of antibiotics.

3.2.3 Pig Farming in Europe: Data and Characteristics.

In the twelve countries of the European Community the yearly production of pigs in 1990 has been the following:

	('000) Pigs	'90/'83
Belgium	7,357	- 6.8
West Germany	36,299	- 2.7
France	20,080	+ 5.5
Italy	9,953	- 3.4
Netherlands	24,218	+39.9
Denmark	16,341	+ 7.2
Ireland	2,384	+ 3.7
United Kingdom	14,268	-11.6
Greece	2.244	- 1.6
Spain	22,379	+24.4
Portugal	3,333	+16.3
Luxemburg	131	+ 9.2
12 EEC	159,077	+24.3

Source: EEC Statistics

The aggregated production trend in EEC is positive with a yearly average growth rate of 3.5% over the period 1983-90. Nevertheless by country the trend in the same period has been mixed, as shown in the above table.

For Easter Europe official statistics are not available but an estimate based on pork meat production gives the following numbers of pigs produced in 1990:

	('000) Pigs
Poland	21,036
Romania	11,040
Yugoslavia	9,600
Bulgaria	5,280
Czechoslovakia	11,424
Hungary	12,708
USSR	57,036
Total	128,124

Source: Italian Association of Pig Breeders.

In pig farming the use of antibiotics is still well established due to difficulties to sensibly improve hygienic conditions.

3.2.4 Demand for Tylosin in Animal Husbandry in Europe.

Poultry and pig breeders in Europe have made significant use of Tylosin since the 60's when Eli Lilly started commercializing the product as prophylaxis against Mycoplasma infections and as growth incentive besides the normal therapeutic use.

Tylosin is commercialized as premix in animal feed in two different formulations: Tylosin Tartrate, and Tylosin Phosphate. The first being much more orally absorbed than the letter. In poultry farming the Tartrate is the more used whereas pig breeders make an alternative use of the two formulations.

Poultry Sector

60% of the entire population of birds may be considered to have been treated each year with Tylosin. This large percentage of treatment is a consequence of intensive breeding technics where density of animal population is very high and an outbreak of Mycoplasma would easily infect all the birds.

Other antibiotics of the same group, i.e. Macrolide, have been in the market besides Tylosin Tartrate. The two most important are Erythromycin and Spiramycin.

In some case Mycoplasma has also proven to be resistant to Erythromycin.

Spiramycin is still considered an active antibiotics against Mycoplasma. It has a stable market share of about 20-30% in Italy and in France but its use is limited in other European countries.

Another antibiotic with similar to the macrolides (although of completely different chemical structure) is thiamulin, whose use is however impaired by the fact that is incompatible with some cocciostatic agents (particulary moneusin).

Baytril, a new antibiotic commercialized for the first time two years ago by Bayer, may represent in the next future a valid alternative to Tylosin. It has a wider range of action than Tylosin, including other pathogens that may be associated to Mycoplasma. Its recent market entry and its higher price have still limited its potential competition to Tylosin. Nevertheless if its capacity to substitute more than one antibiotics is well-proven, Baytril may gain a significant market share.

All the above-mentioned antibiotics may be considered to be alternative to Tylosin in the therapeutic use but it may be said that Tylosin is the most demanded antibiotic as prophylaxis against Mycoplasma. Being the latter use responsible for the bigger consumption of antibiotics, demand for Tylosin will remain substantially unmatched by other antibiotics.

Nevertheless, in the last five years demand of Tylosin has decreased in the frame-work of a generalized reduction of antibiotics usage in poultry farming. Parents of broilers tend to be more and more Mycoplasma free thanks to bio-technology. Thie block of transmission of Mycoplasma to offsprings, reduces the need of Tylosin prophylaxis. Better hygienic conditions and less intensive technics have also contributed to this declining trend.

As a consequence, the percentage of birds treated with Tylosin has diminished, especially for broilers, from the original estimated 60%. Only in countries where hygienic conditions have not sensibly improved, treatment has declined more slowly. All East-European countries and partially Italy, Spain, Portugal and Greece are among those. Heavier bird species in some of those countries also need bigger dosages.

Considering the animal population, the percentage of bird treated and the dosage per animal, an estimate of Tylosin consumption in poultry farming in Europe may be given as follows:

	Birds treated (in %)	Dose per animal (mg.)	Tylosin Consumption (tons)
EEC			
a. Broilers			
Italy, Spain Portugal, Greece	40	140-200	63- 90
Rest	30	140-200	96-137
b. Layers			
Italy, Spain Portugal, Greece	60	300	15- 15
Rest	40	300	20- 20
c. Turkeys			
Italy, Spain Portugal, Greece	20	500	3- 3
Rest	20	500	15- 15
EEC total			212-280
East Europe			
All Birds	60	140 200	374 534

The estimated consumption of Tylosin in EEC countries is based on informations directly obtained by breeders and veterinaries. On the contrary, for East Europe the estimate must be considered as potential consumption due to the fact that it is impossible to directly verify the regular practice in the use of antibiotics.

Of the total demand of Tylosin in poultry farming 90% may be considered to be Tartrate, the rest being Phosphate.

Pig Sector

Tylosin is used as prophilaxis and therapy against Mycoplasma in pig farming. This infection is less common in pigs than in poultry, resulting in less consumption of Tylosin. Tylosin is also active as growth incentive and against some cases of necrotic enteritis.

In estimating Tylosin consumption in pig farming a distinction in dosages has to be made. Prophilaxis is made during weaning when the animal has an average weight of 10-15 kilograms. Therefore, the dosage is inferior to that given to an adult animal for therapy. Considering this, it is possible to estimate the following quantities of Tylosin as follows:

	Pigs treated (in %)	Dose per animal (mg.)	Tylosin Consumption (tons)
- EEC			
a. prophylaxis	25	400-1,000	16- 40
b. therapy	15	1,000-1,500	24- 36
EEC Total			40- 76
- East-Europe			
a. prophylaxis	25	400-1,000	13- 32
b. therapy	15	1,000-1,500	19- 27
East-Europe Total			32- 59

As in the case of poultry, the estimated quantities of Tylosin use in East-Europe must be considered as estimates of potential and not effective consumption.

Of the total consumption, Tylosin in pig farming may be considered 40% Tartrate and 60% Phosphate.

In summary, by aggregating all the values and considering the two different formulations, the demand of Tylosin, 100% active principle, in Europe is estimated as follows:

(tons)	Effective EEC Demand	Potential East-Europe Demand
- Tartrate	216-286	350-510
- Phosphate	40- 70	56- 83
TOTAL	256-356	406-593

These quantities have to be evaluated in a frame-work of general reduction of Tylosin use in EEC countries. On the contrary, potential demand in East-Europe may continue to expand due to the need to increase meat production with intensive technics and their less hygienic conditions.

3.2.5 Suppliers of Tylosin in Europe.

In Europe Tylosin is produced in United Kingdom under Eli Lilly licence, in Bulgaria with their own formula and in Spain by a Firm of Montedison group.

Due to de facto oligopoly, the producers are reluctant to divulge information on their production volume. It is estimated that in Europe Eli Lilly controls 60% of Tylosin market, Bulgaria has a 25% share, the rest coming from Spain.

Prices of Tylosin Tartrate vary according to the "A factor" content, and efficiency of the distribution net-work. For bulk orders the indicative price range is:

- Tylosin Tartrate from Eli Lilly 120 US Dollars/kg
- Tylosin Tartrate from Bulgaria 85 US Dollars/kg.

Eli Lilly has the most expensive product due to its superior efficacy and a well developed net-work with local distributors in almost all European countries. On the contrary, a very competitive price has allowed the Bulgarian Tylosin to gain a consistent market share in Europe.

As far as other alternative antibiotics are concerned, their market shares in Europe seem to be not relevant with the only exception of Spiramycin produced by Rhone Poulenc, a French company. Spiramycin is produced mainly for the French and Italian markets where it has a 20-30% market share of the total antibiotics.

In Europe other alternative product are Erythromycin, produced under licence of American Abbott, and Baytril produced by Bayer.

Their indicative price for bulk orders of soluble formulations are:

Spiramycin	154 US Dollars/kg
Erythromycin	77 US Dollars/kg
Baytril	238 US Dollars/l (10% active principle)

As recommendations, any additional import of Tylosin Tartrate in EEC countries should have a price in line with that of the Bulgarian product to be competitive. In addition, a commercialization agreement with a big pharmaceutical company would further help to penetrate the European market of veterinary antibiotics that is dominated by few producers and characterized by a declining trend. On the contrary, the potential demand of Tylosin in East-Europe represents a market opportunity to be explored through direct contacts with local distributors.

3.3 Tylosin Market Survey: India

3.3.1 India: Present Consumption and Forecast

Tylosin consumption is very limited in India due to the high prices of formulated commercial products, which discourage the market penetration.

Poultry industry is mainly based on traditional small scale farmers, who are not made aware of the disease prevention possibilities and of the growth rate improvement and feed efficiency increase deriving from the use of antibiotics in feed pre-mix.

As a matter of fact Indian poultry farmers use antibiotics only for therapeutic pourposes, once an infection is recorded and is rapidly spreading among the chickens. When this occurs, farmers are ready to pay high prices in order to get therapeutic products able to stop the infection diffusion.

In this situation the suppliers of veterinary drugs are requested to have flexible formulation plant facilities, to mantain high stocks of different active therapeutic ingredients and to organize and manage a nation-wide information network, in order to have immediate knowledge of the incoming infections.

The main Indian firms producing goods for the poultry industry have their own information and distribution networks, especially in the areas of major poultry farmer concentration, as well as formulating plant facilities, sufficiently flexible and capable to promplty respond to market demand, but mantain limited stocks of active therapeutic ingredients, due to high import prices (overcharged by import duties). As soon as the local demand rises, they try to purchase the requested product on the international market, normally on spot selling contract basis, hence paying even higher prices.

In recent years the overall consumption of tylosin recorded in India does not exceed 1.5 ton/y, which represents a marginal consumption if compared with the bird population of the country.

In order to verify the potential Indian market of tylosin, estimated by the Project Promoters and included into the PROJECT BACKGROUND provided by UNIDO, a different approach has been followed.

The increase of tylosin consumption in India, by considering the framework outlined, appears more linked to the improvement of poultry farming than to the present bird population level and projected growth trend.

The concept of "prevention" and the knowledge of the positive effects of tylosin in improving poultry growth rate and egg production have to be introduced and diffused among the farmers.

This goal may be pursued through two development tools: an intensive information campaign and a reduction of current market prices to acceptable consumer level.

However, it should be stressed that such a goal can be achieved only over a long term period and with non-stop efforts and financial support.

The availability of tylosin, produced by a locally established plant, may stimulate the Indian firms active in the poultry field to undertake an information campaign among the farmers with the aim of introducing the use of tylosin as a feed additive in the poultry sector to improve the rate of growth and to increase feed efficiency, as well as to prevent diseases.

Contacts established during the field visit with Venkateshwara Hatcheries Ltd, a company belonging to one of the main Indian Industrial Groups active in the poultry industry with its own country-wide distribution network, confirmed the positive attitude of the Indian industry to partecipate in and to support the modernization of the local poultry sector, provided that the active ingredients are available at competitive prices.

Under the assumption that tylosin can be marketed at a price consistently lower than the present one, the potential local demand can be estimated by working on the following data and assumptions.

Presently the Indian poultry sector consumes around 4 million tons per year of feed.

By applying the average tylosin dosage, used in disease prevention and as feed additive to improve the poultry breeding performace, i.e. 50 g/ton of feed, the potential local demand could amount to 200 ton/y of active tylosin.

Assuming that only 10% of the present Indian poultry sector will use tylosin in improving the feed efficiency and in preventing diseases in the next years, the expected tylosin demand will be 20 ton/y. Taking into consideration the characteristics of the Indian poultry sector, said figure can slowly increase in the medium term.

3.3.2 India: Price

The present tylosin market price in India is consistently high if compared to the financial capabilities of the poultry farmers: this discourages its diffusion and the systematic use.

The structure of tylosin market price (per unit of active tylosin), according to the information collected during the field visit, is the following:

-	**F.O.B. purchasing price** (USA, spot contract)	**116 US$/Kg**	
-	Transport	4 "	
-	C. & F. import price (Bombay port)	120 US$/Kg	
-	Import Duty (115% of C. & F. price)	138 "	
-	Import price	258 US$/Kg	
-	Financial costs (interests on 3 months deposit of C&F import price)	7 "	
	Total	265 US$/Kg	= 7155 Rps/Kg
-	Formulation at 50%		3578 "
-	Formulation and distribution costs (including profits)		422 "
-	**Selling price**		**4000 Rps/Kg**

Starting from a selling price consistently lower than the present one, assumed 1800 Rps/Kg of active tylosin content in the final product, which represents 45% of actual selling price, the ex-factory price is the following:

-	**Selling price**	**1800 Rps/Kg**	
-	Active tylosin in formulated product (at 50%)	3600 "	
-	Formulation and distribution costs (including profits)	-422 "	
-	Market penetration campaign	-166 "	
	Total	3012 Rps/Kg	
-	Excise Tax (15.75%)	-474 "	
-	**Ex-Factory Price**	**2538 Rps/Kg**	**= 94 US$/Kg**

In the financial analysis of the Project the ex-factory price of 2538 Rps/Kg has been considered.

In addition, revenues from local market sales have been calculated assuming that at full capacity operation of the plant only 5 ton/y of tylosin are sold in India, which is considered to be cautious forecast for the Project.

3.4 Plant Capacity

The Promoters of the Project have preliminarly designed the process equipment of the plant, with a nominal production capacity of 108 ton/y (see Chapter 6. Project Engineering).

Almost 95% of the production is expected to be marketed abroad, mainly in Europe, and the remaining 5% (namely 5 ton/y) in India.

3.5 Conclusions

Results of the market survey carried out on tne considered geografic areas can be summarized as follows:

- The **Western European market** appears to be too limited and steady to fully absorb the export output of the plant (103 ton/y at full capacity).
  The presence of consolidated producers, well known and active on the market with adequate distribution networks, limits the penetration of a new producer.

- **Eastern Europe** represents a good potential market, but local productions, already existing in Bulgaria and under development in Poland, have to be taken into account.

- **Indian market** is potentially large in the long term: tylosin consumption growth is however conditioned by the modernization of poultry industry and by the enforcement of poultry farmer education, and limited by import restrictions.
  In the medium term the tylosin demand is expected in the order of 20 ton/y.
  Moreover, a succesfull penetration of these markets requires the setting-up of an adequate distribution network or the establishment of commercial agreements with well-introduced distributers.

- **Price** is a key factor to stimulate the tylosin consumption and the penetration of a new producer into the different markets.

In conclusion the tylosin market perspectives do not appear to be very attractive for a new producer, expecially if the plant is located far from the main markets and not supported by a wide-spread commercial network, as the Project under analysis is.

However, the Indian Promoter, UB Group, claims to have started contacts with some European chemical groups, who have expressed their interest in purchasing part of the Project production, on the basis of a long term supply contract.

In particular, Hoechst Group, who has for many years established an industrial cooperation with UB Group, seems to be particularly willing to take over almost all of expected production (80 100 ton/y) and to market it through its own commercial channels (see Annex 8).

5

Hoechst Group is a large chemical Company, with the Head Office based in Germany, but with production facilities in Germany and also abroad and a world-wide commercial network.

Hence the final market should not be limited to the areas focused in the study, but should include also those countries where Hoechst might find commercial opportunities.

Relevant to the Project revenues, the following prices have been considered in the study:

- In India, the assumed ex-factory price of **2538 Rps/Kg** active tylosin (equivalent to **94 $/Kg**), which would reduce the final product selling price up to 45% of the present one, should allow to increase the domestic consumptions from 1-1.5 ton/y (consumption level recorded in the last years) up to the 5 ton/y envisaged by the project Promoters.

- As for the export, it has been assumed a F.O.B. price of **82 $/Kg** (active tylosin), which means a C.I.F. price of 85-86 $/Kg at the receiving port, almost equal to the minimum market price presently paid in Europe for the Bulgarian equivalent.
  According to the Indian regulation, an incentive equal to 12% of the F.O.B. value is granted by the Government, to promote its export: by considering said incentive the revenue of the Project per unit of exported production is **94 $/Kg**.

4. MATERIALS AND INPUTS

4.1 Raw Materials and Chemicals

Tylosin Tartrate is obtained by a batch process divided into two Phases:

Phase 1- Fermentation of "Streptomycetes Fradiae" strain in sterilized broth, under temperature, pH and aeration controlled conditions. The inoculum strain is initially prepared in laboratory and then introduced in the pre-fermentators, where the strain reproduces and increases in volume. Once the required mass is reached, it is transferred into the fermentators where the Tylosin production is obtained.

Phase 2- Filtration of the fermented broth, Tylosin solvent recovery and cristallization, treatment with tartaric acid and, finally, Tylosin Tartrate recovery and purification.

The raw materials and chemicals required for the Tylosin production are available in India, but it is necessary to carry out laboratory tests with locally available inputs in order to assess the strain performances: these tests will be carried out by Pharmachim Engineering during the design phase of the plant and are included in the know how cost.

The importance of such tests should be stressed as the performances of the fermentation process are strictly related with the characteristics of the some raw materials (soya oil, soya meal, fish meal, corn meal, corn gluten), which may vary according to different sources.

According to what indicated by Pharmachim Engineering, the process licensor, the strain performances have been tested by utilizing raw materials available in Europe.

In the recovery Phase the process utilizes solvents, such as Methanol, Etoyl Acetate and Methyl Isobutyl Ketone, which can be partially recovered and re-utilized.

These solvents are available in India and the relevant characteristics do not affect process performances.

The raw material and chemical consumption per kg of tylosin activity, in the two Phases, according to the indications provided by Pharmachim Engineering, and the relevant unit prices in India (provided by the Indian Promoter) are shown in the following Table 4.1:

TABLE 4.1 - RAW MATERIALS AND CHEMICALS CONSUMPTION

Item	Unit Consumption Kg/Kg Tyl.activ.	Unit Price Rps/Kg	Unit Cost Rps/Kg Tyl.activ.
Phase 1 - Fermentation			
- Soya Oil and Meal	5.5	1.85	10.2
- Fish Meal	1.1	100.0	110.0
- Corn Meal	1.7	12.5	21.2
- Corn Gluten	1.0	1.9	1.9
- CaCO3	0.2	4.25	0.9
- Other chemicals			12.0
Total Cost for Fermentation Phase			156.2
Phase 2 - Recovery			
- Tartaric Acid	0.17	220.0	38.1
- Caustic Soda (20%)	0.41	2.15	0.9
- Methanol (1)	0.27	10.5	2.9
- EthylAcetate (1)	1.61	28.5	45.9
- Methy-Isobutyl--Ketone (1)	4.67	45.0	210.3
- Phosphoric Acid	0.09	49.0	4.4
- Other chemicals			48.1
Total Cost for Recovery Phase			350.6
TOTAL RAW MATERIAL AND CHEMICAL COST			**506.8**

The above consumptions, referred to the plant's full capacity operation (108 ton/y of active Tylosin), lead to an Annual Raw Material and Chemical Cost equal to:

54.73 million Rps.

This amount has been considered variable at 100% according to the production of the plant during the first years of operation.

(1) Total Net Consumption.

4.2 Utilities and Energy

The factory will purchase Electric Energy from the Electric Power Pubblic network, and Fuel Oil.

The water requirement will be obtained from public network available at The Project's site.

Electric Energy

Electric energy is required in Fermentation and Recovery Phases for process pumps, air compressors and agitators, as well as in Offices and Laboratory for lighting and instrument powering.

The total connected load is estimated at 2215 KW, according to the following requirements:

- Agitators	1000 kW
- Air compressors	900 "
- Extraction and recovery	230 "
- Offices and Labs.	85 "
Total connected load	2215 kW

The unit consumption per kg of active Tylosin is indicated in the following table:

- Agitators	25 kWh
- Air compressors	40 "
- Extraction and recovery	12 "
- Offices and Labs.	4 "
Total consumption	81 kWh

The present electric power fares at the plant location have been applied to estimate the total yearly cost for the Project.

This includes a fixed portion, on the basis of the connected load, and a variable one, according to the actual consumption.

The total cost amounts to:

7.56 million Rps/y.

80 % of said cost has been assumed variable, following the production schedule of the plant; the remaining 20 % has been considered fixed.

Fuel Oil

The Fuel Oil consumption derives from the steam requirements of the process: the biotechnological processes require large amounts of medium pressure steam to sterilize the broth and all the equipments (such as pre-fermentators, fermentators, tanks, pipes etc.) which are expected to be in contact with the active strain.

The sterilization should be carried out before each batch is inoculated with the strain and it will take approximatively 2.5 hours.

Taking into account the number of fermentators (4) and the fermentation cycle (180 hours), the sterilization should be carried out every 48 hours.

During this period the supply of large amount of steam is required (approx. 17 tons), while in the remaining hours the steam consumption (for other process requirements) is limited (approx 1.3 ton/h).

Different technical solutions can be envisaged to face this particular aspect of the process and the selection of the most convenient ones is expected to be studied during the project design phase.

For the purpose of the present study the installation of two boilers has been foreseen: the first one with a 15 ton/h steam production capacity, to be used during the sterilization phases; the second one, with a 1.65 ton/h capacity, for the running consumptions.

According to these assumptions, the yearly consumption of Fuel Oil has been estimated, taking into account the specific consumption of the proposed boilers and the expected load factors: 1505 Thousand Litres/y.

By utilizing the Fuel Oil price in India, 6.5 Rps/Litre, the cost for the Project amounts to:

9.8 million Rps/y.

The above cost, considered variable at 90%, has been accounted for under item "Utilities" of the "Standard Production Costs" COMFAR Table.

5. LOCATION AND SITE

5.1 Project Requirements

The main criteria taken into account by the Promoters in selecting the location of the proposed plant are based on the following Project Requirements:

Land Area: 10-12 hectares are considered necessary to cover current and future requirements for the process equipment installation and relevant off-site facilities.
In case effluent discharge facilities are available, land requirement can be reduced to 6-7 hectares (60.000 - 70.000 sq.m.)

Power: The process power load requirement is 3.000 kW.
The possibility of being connected to the National Electric Network will reduce the investment cost for power generation to the minimum stand-by capacity.

Water: The total fresh water consumption of the plant is estimated at 3.000 Kl/d. Taking into account the recycling, the net consumption is 1.000 Kl/d.

Climate: The ideal climatic conditions for the process would be a temperature not exceeding 25 °C for at least 10 months a year. As it is difficult to find sites in the central part of India which meet such conditions, according to the indication provided by the process licensor (Pharmachim), a higer temperature of 32 °C has been considered, taking into account the need to increase the capacity of the chilling facilities of the plant.

Effluent: The effluent treatment requirement of the plant is expected to be in the order of 450 Kl/d.
The possibility to utilise existing treatment facilities will reduce the investment cost of the project.

Transport: As the project is export-oriented, the proximity to major ports would be a plus advantage point for the plant, as well as easy access and good transport facilities.
In addition, suitable access facilities are necessary during the implementazion phase for the delivery of large sized imported equipment.

Housing: Well developed residential facilities are necessary in proximity to the plant site for the accomodation of employees and their families.
Public transport facilities are also necessary for the staff.

Different alternative locations had been investigated by the Project's Promoter, in order to identify the most suitable one.

In particular, three locations had been considered in the Karnataka State (where the UB Main Office is located) and other sites in Maharashtra State (where there is the main west coast Indian port of Bombay).

5.2 Locations in Karnataka State

The locations examined are the following (see map included in Annex 4):

A - Shivasamudram: 120 km from Bangalore

B - Between Madya and Srirangapatna: 80-100 km from Bangalore

C - Kushalnagar: 200 km from Bangalore

The locations in the Karnataka State have been considered for two main reasons:

1. The climatic conditions of the area are more suitable for process performances, especially with regards to the temperature requirement of a maximum 25 °C for the major portion of the year;

2. The UB Main Office is located in Bangalore and if Project is located in Karnataka State, this will facilitate the supervision activities of the Indian Promoter.

The results of the investigations carried out on the identified locations outlined the following disadvantages:

- The supply of Electric Power to the extent of 3 MW from the State Electricity Board is not available and therefore an appropirate Power Generation capacity should be included in the Project, with the relevant increasing effect on the investment cost.

- The availabilty of fresh water cannot be assured in the quantities foreseen by the Project and there are no effluent treatment facilities.

- All the locations are far from the ports and this will increase the trasportion cost of the exported product and of the imported equipment.

For the above reasons the locations in Karnataka State were considered not suitable for the Project.

5.3 Locations in Maharashtra State

In order to identify possible Project locations in Maharashtra State, UB Group approached the State Investment Corporation of Maharashtra (SICOM) which suggested different alternatives in the Pune as well as in the Bombay area.

The following have been investigated (see map included in Annex 4):

- Talegaon (within 20 km from Pune)
- Mulshi (30 km from Pune)
- Kurkum (70 km from Pune)
- Taloja (about 50 km from Bombay)

In all the proposed locations Electric Power and fresh water up to the extent required by the Project are available.

The main results of the investigations carried out for each location are summarized hereinafter:

- Taelagon:
  - climatic conditions are favourable;
  - the site is near the Bombay-Pune Highway and therefore access to Bombay Port is assured.
- Mulshi:
  - climatic conditions are favourable;
  - the site is along the new road, under construction, connecting Pune to Bombay-Goa Highway;
  - the nearest port is Navaseva Port;
  - 90% of raw materials can be available fron Konkan Belt.
- Kurkum:
  - climatic conditions are adverse;
  - no effluent treatment facilities are available;
  - considerably distant from Ports and from Raw Material Sources.
- Taloja:
  - fully developped industrial area;
  - water treatment facilities available;
  - well connected to Bombay Port with Highway (50 km);
  - near to raw material sources;
  - two satellite townships (Vashi and Panval) within 30 minutes drive, where accomodation and educational facilities for the employed staff and their families are available.

From the preliminary screening the Taloja location appeared to be the most favourable one. This was confirmed by the discussions with officials of the State Investment Corporation of Maharashtra (SICOM), of the Maharashtra Pollution Control Board and of the Maharashtra Industrial Development Corporation (MIDC).

Several industries are already in operation in the area, such as an Ammonia-urea plant, light mechanical industries, etc.

Two plots are available in the Taloja Industrial Area, suitable for the Project purposes (see map included in Annex 4): the first one (Preference 1) is about 13.6 hectars large, flat and clean; the second one is smaller (about 7 hectares), partially covered by shrubs and trees.

UB Group is evaluating in detail the two alternatives and a final decision is expected to be reached within the next months.

The lower cost for levelling and site development and the additional space for future expansion are considered in favour of Preference 1 with respect to Preference 2.

However, even if the total acquisition cost is substantially higher (the unit cost of land in Taloja industrial Area is 200 Rps/sq.m., considered high compared to the cost recorded in other locations) the Taloja location has been selected by the Indian Promoter, due to the infrastructure and industrial facilities available.

6. PROJECT ENGINEERING

6.1 Scope of the Project

Purpose of the Project is to build-up a factory for the production of Tylosin Tartrate in India.

The factory will be located in Taloja Industrial Area, about 50 km from Bombay, in Maharashtra State.

Within the battery limits of the factory all the facilities required for the production and operation will be installed, namely:

- Process Plant machineries and equipment
- Utilities production and distribution equipment
- Offices, laboratories and wharehouses
- Other services facilities, such as canteen, roads and parking areas, entrance guard and fencing, etc.

The production process will be based on the know-how developped by the Italian Promoter, Pharmachim Engineering, who will also supply the strain, carry out the basic design and provide procurement services for the imported equipment.

The nominal capacity of the plant is estimated 108 ton/y of active Tylosin, equivalent to 116.5 ton/y of Tylosin Tartrate.

The Indian Promoter, UB Group, will supervise the implementation activities. Indian Firms will be charged with the detailed design, civil works, supply and construction of locally available equipment.

Raw materials and other production inputs will be purchased in India: the Licensor, Pharmachim Engineering, will test the process performance with locally available raw material.

The major part of the production (103 ton/y) will exported to Europe, through the Bombay port, while the balance will be commercialized on the local market (5 ton/y).

Details on the Technology, Technology and Engineering Costs, Equipment Costs and Civil Engineering Works are included in the following paragraphs.

6.2 Technology

6.2.1 The Production Process

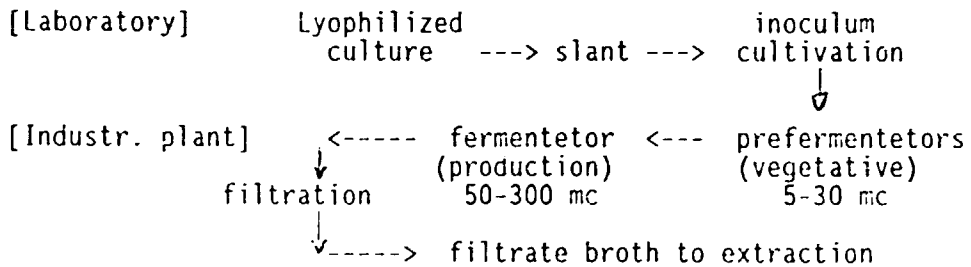
Tylosin, like many other antibiotics, is produced by a fermentantion process followed by extraction and purification.

The production process foreseen in the Project is based on the technology developed by the Italian Promoter, Pharmachim Engineering. Detailed description of the proposed process has not been provided by the Licensor, who was reluctant to disclose confidential data on the technology. However, on the basis of the preliminary information provided and discussed during several meetings, it is possible to conclude that the proposed process is viable and in line with the state of art of the technology.

There are no pubblications describing equipments or operating conditions currently used for production-scale tylosin fermentation, extraction and purification. Information on the production process can be drawn from the original patents and from several scientific papers, treating some specific aspects of the biosynthetic pathway or the influence of the components of the media.

6.2.2 Fermentation process

The fermentation process includes several steps, which are shown in the following scheme:



A. Inoculum preparation (from the lyophilized culture to the vegetative cultures).
All the operations described in this and in the following section B must be carried out employing aseptic techniques.
The tylosin-producing cultures are stored as lyophilized pellets, which are used to plant first-generation agar slants.
Several formulations for agar slant media have been described.
The slants are incubated at 28 °C for 10 days and then stored at 4 °C until used. Spore suspensions obtained from the agar slants are used to inoculate liquid vegetative medium. Several vegetative media have been described. Aerobic growth of the vegetative medium is carried out for 48 hr and the resulting suspension of vegetative mycelium is used to inoculate a vegetative prefermentor which after

growth is transferred to the production fermentator containing the pruduction medium. The volume of the vegetative inoculum is about 5-10% of the fermentation medium.

B. Fermentation media and fermentation conditions.
There have been relatively few descriptions of media suitable for production of tylosin and there have been no publicatiory describing detailed media optimization for complex media. From the limited information published it would seen that a complex medium needs a source of early assimilable carbohydrate, an insoluble protein source, mineral salts and a lipid source to supply energy and precursors during antibiotic sunthesis. It has been described that specific uptake rates of glucose and phosphate have a depressing effect on Tylosin biosynthesis. Information on the relationship between operating parameters and tylosin production is limited. Most studies appear to use operating temperatures of 28-30 °C and a pH near neutrality. The fermentation is highly aerobic and the volume of air used is of the order of one volume of air per minute per volume of culture medium. A series of parameters must be recorded and controlled during the fermentation: pH, temperature, agitation speed, air flow, pressure, dissolved O2, exhaust O2 and CO2, fermentator weight, foam level. Other parameters are checked in the laboratory on samples drawn from the fermentator: concentration of nutrilites (sugars, organic and inorganic nitrogen), microbial concentration, antibiotic concentration.

6.2.3 Product recovery

Upon completion of the fermentation, the mycelium and undissolved solids are removed from the fermentation broth by filtration, generally using vacuum rotatory filters. Filtration efficiency is improved by the use of filter-aids such as diatomaccous earth on the surface of the rotatory drum. Considering the physico chemical characteristics of tylosin, this product can be removed from the filtered broth employing either extraction or absorption techniques. For the recovery of tylosin by absorption techniques, ion-exchange resins of acidic character can be used. The most employed technique for separation of tylosin from the filtered broth is the extraction with water-immiscible solvents. The filtrate is adjusted to a weak alkaline value (pH 8.5-9.0) and is extracted in a countercurrent centrifugal extractor. The water-immiscible solvents most consumonly used are esters (e.g. ethil acetate, butyl acetate) or ketones (e.g. methylisobutylketone). If necessary a double extraction process can be used, transferring tylosin from the solvent into an aquerus phase at acidic pH and than again at alkaline pH to the solvent. In this way the final solution contains the antibiotic at high concentration. This solution is clarified by addition of charcoal followed by filtration. The antibiotic can be precipitated as tartrate adding tartaric acid to the solution. The crystals are removed by filtration, washed with a small amount of a solvent (e.g. methanol), and dried at room temperature under reduced pressure.

6.2.4 Tylosin assay

Chemical and biological assays have been described for the assay of Tylosine. These methods suffer from the problem that the presence of tylosin-like components also contribute to the assay results. A high-performance liquid chromatography method (HPLC) which will allow the quantification of tylosin and related components has been described and should be the assay of choice.

The process above described is drawn from data reported in patents and in the scientific literature. Obviously, industrial processes have been developed optimizing the operating conditions and represent the specifi know-hows, kept strictly confidential, of the producing companies.

The following comments can be added. The original N.S. Pat 3178341 (1965), assigned to Eli Lilly, indicates that strains of Streptomyces Fradiae NRRL 2702 and NRRL 2703 are the producers of Tylosin and of its degradation product desmycosin. A subsequent US Pat. 3326759 (Eli Lilly) claims the production from the same strains of macrocin and lactenocin. A patent for an improved process for the production of tylosin (US Pat. 3433711, Eli Lilly) claims that in presence of appropriate described precursors and in a defined medium the strain NRRL 2702 can produce from 4000 mcg/ml (without precursor) up to more than 6000 mcg/ml of tylosin.

These data indicate that the original wild strains are already quite good producers considering that generally for other antibiotics the initial yields have been much lower. It is general knowledge that the effors aimed at improving antibiotic production are carried out in three main ways:

1) strain random mutation and selection of the best antibiotic-producing mutants;

2) selection of nutrients;

3) optimization of operational conditions.

The result of repeated and combined applications of these techniques represents the know-how developed by an industrial laboratory for the production of a certain antibiotic. It is impossible to establish on paper the value of described process because the level of competitors is generally not known. Furthermore there is always the possibility that some competitors could reach much higher levels.

Raw materials for fermentation may consist in a large variety of carbon and protein sources, the suggested composition being the result of efforts of yields optimization with a selected strain. The effect of media composition on the tylosin yield obtained using the original strain NRRL 2702 is shown in the following table.

TABLE 6.2- EFFECT OF FERMENTATION MEDIUM COMPOSITION ON TYLOSIN YIELDS USING THE STRAIN NRRL-2702

Composition of ferm. medium g/l	1	2	3	4
Crude glucose syrup	20			
Beet molasses			20	20
Blackstrap molasses		20		
Starch		40		
Crude soybean oil			30	30
Baker's Nutrisoy Flour		20		
Soybean meal	15			
Fish meal			17.5	
CSL				5
Yeast extract				20
B. Yeast 500		10		
Casein	1			
(NH4)2HPO4			0.4	
NaNO3	3			
CaCO3	2.5	2	2	
NaCl			1	
Yields	250	1.000	4.360	3.395
(+ precursor)			6.000	3.830

1) US Pat. 3,178,341; 2) First publication: J.M.Mc Guire et al. 1961; 3 and 4 US Pat 3433711.

In the process offered by Pharmachim Engineering the main carbon souce is the crude soybean oil (which is consistent with scientific data showing the effect of oils on tylosin production) and the main protein source is fish meal plus corn meal and corn gluten. It is to be mentioned here that fish meal plus corn meal and corn gluten. It is to be mentioned that fish meal is often used in fermentation processes, but its effect in term of fermentation yields is quite variable, depending from the producer. In any case the raw materials for fermentation should be checked in laboratory fermentors (or better in pilot plant) in order to establish if they are suitable for tylosin production with a given strain.

6.2.5 Productivity of the Plant

According to the technical data provided by Pharmachim Engineering S.r.l. the production capacity of the proposed plant can be calculated as follows:

Fermentation cycle: 180 hr
Fermentation volume: 90 mc
Fermentation yield (harvest): 10.000 g/ml ± 3%

Recovery yields: 73%

Production of one fermentation batch: 657 kg (activity)

Yearly production of one fermentator
(41 cycle, 11 months): 26.94 ton (activity)

Yearly production of four fermentators: 107.7 ton (activity)

As far as the fermentation yield is concerned (10.000 g/ml) the figure has to be considered much higher than the usual ones, but not irrealistic.

Considering the transformation into tylosin tartrate, the weight of the final product can be calculated as follows 107.7x991:916= 116.5 ton. (or more, according to the purity of the final product). The potential productivity of the plant has been here calculated assuming that the plant will operate pratically all over the year (11 months plus 2-3 weeks before starting the yearly compain and 1 week for the extraction of the last batch). An evalutation of the possible lesses due to contaminated batchs, mechanical and electrical troubles and to other problems (e.g. possible shortage of some raw material) should be made for an assessment of the realistic productivity of the plant.

6.3 Technology and Engineering Costs

Tylosin production technology will be provided by the Italian Promoter (Pharmachim Engineering) together with the strain selected, according to the yield characteristics indicated above.

In addition the Licensor will test the strain with locally available raw materials, in order to assess the actual productivity of the plant.

Pharmachim Engineering will also develop the basic engineering of the plant, which will be transferred to an Indian engineering firm, which will charged with the detailed design.

As far as the Investment Cost Estimate, know-how, strain, basic and detailed engineering costs have been considered in the Project evaluation.

According to the Indian law, expenses in foreign currency to purchase know-how and engineering services are charged with the following duties, to be paid in local currency:

Witholding Tax : 15% of Know How and Basic Engineering Fees
Research & Develop. Cess: 5% of Know How and Basic Engineering Fees

The Technology and Engineering cost estimate, provided by the Project Promoters are summarized in the following Table 6.3.

TABLE 6.3 - TECHNOLOGY AND ENGINEERING COSTS

Item description	Foreign T US $	Local M Rps. = T US $		Total T US $
Technology	1 850	9.99(*)		
Strain	950			
Basic Engineering	650	3.51(*)		
Detailed Engineering		21.00		
Contingencies		3.05		
Total Know how & Eng. Costs	3 450	37.55	1.390	4.840

(*) Tax and Duties

The above estimates are considered sound as far as the engineering services (basic and detailed), taking into account the Total Investment of the Project: basic engineering accounts for 4.2% of Plant Equipment cost, detailed engineering accounts for 4.6% of Plant Equipment and Civil Engineering Works cost.

Technology and strain costs seem to be consistently high, if compared with market prices applied to similar processes in the biotechnology field, taking also into account that the patent of tylosin is already expired.

However, it should be noted that the technology is actually in the hands of a very limited number of Licensors, the main one (Eli Lilly) controls the major share of the world market and seems not available to transfer the know-how.

The Promoters have already reached an agrement on the indicated figures for transferring the technological know-how and the strain.

6.4 Equipment

The Plant Machinery and Equipment required for the Project has been assessed on the basis of preliminary information provided by the Process Licensor (Pharmachim Engineering).

It should be stressed that technical data available are at a very initial design stage and that Pharmachim Engineering kept more detailed information strictly confidential, in order to avoid the disclosure of major process characteristics and performances.

The Main Equipment List and relevant general specifications are indicated hereinafter, for the different sections of the project:

PRODUCTION EQUIPMENT

- Quality Control and Laboratories

  . Microbiological Laboratory for strain maintenance and selected strain tests, to be utilised for the preparation of the inoculum for industrial production.
  Every two days the Laboratory shall provide 2-2.5 l of culture containing the Saccaromyces Fradiae.

  . Chemical Laboratory for process testing, raw materials testing and research activity.

  . One computerized Fermentation Pilot Plant: 1.000 l capacity.

- Fermentation Department

  . n.4 Pre-fermentators: 10 cu.m. geometrical capacity each, equivalent to 7-8 cu.m. working capacity each.

  . n.4 Fermentators: 115 cu.m. geometrical capacity each, equivalent to 90 cu.m. working capacity each.

  . n.2 Sterilization tanks: 10 cu.m. geometrical capacity each.

  . n.1 Tank for ammonia storage: 2 cu.m. geometrical capacity.

  . n.1 Set of teflon and glass lined valves for fermentation Dept.

- Recovery Department

  . n.2 Harvest Broth tanks: 90 cu.m. working capacity each, equipped with agitator and cooling system.

  . n.2 Rotary Vacuum Filters: 40 cu.m. area each, equipped with vacuum pumps and pre coating preparation.

  . n.2 Tanks for rich filtered broth storage: 75 cu.m. capacity each, equipped with agitator and pumping system.

  . n.2 Liquid/liquid Extractors: 10 cu.m. capacity.

. n.2 Reactors for salification: 5 cu.m. capacity each.

. n.2 Centrifuges (type Comicondor): 250-300 K capacity, diam 1500.

. n.2 Fluid bed dryers.

. n.2 Stand-by Tanks: 10 cu.m. capacity each.

. n.1 Semi-automatic weighing and packaging system for finished product.

. Solvent Recovery Equipment: 5 cu.m./d capacity, equipped with 6 storage tanks for fresh and recovered solvents, 25 cu.m. capacity each.

AUXILIARY EQUIPMENT

. Compressed air production and distribution system, equipped with n.3 Air Compressors.

. Steam generation and distribution system: 15 ton/h 10 bar steam capacity.

  According to the indications provided by Pharmachim Eng., the process requires about 1.5 ton/h of steam on a continuos basis; in addition, every 48 hours a sterilization procedure lasting 2.5 hours is foreseen, which requires about 16 tons of steam.

  Different engineering solutions can be envisaged to face the discontinuos steam consumption requirement:
  a. install n.2 15 ton/h boilers, one operating and one stand-by;
  b. install one big (15 ton/h) plus one small (1,7 ton/h) boilers;
  c. install one small boiler (about 5-6 ton/h) and a pressurized steam storage system.
  The most suitable solution can be selected during the detailed project design phase.

. Cooling plant for chilled water.

. Fire fighting equipment

. Water system, including raw water storage and distribution, fresh water treatment plant, treated water storage and distribution, drinking water storage and distribution.

. Fuel oil storage and distribution system.

. Electric Power distribution system, including HT Transformer, Distribution Boards, Cables and other installation required for the connection to the external network.

. Stand-by generation set: 1.000 kW capacity.
  The generator might be driven by a diesel engine or by steam, in case that solution a) is selected for steam generation.

. Effluent pre-treatment plant, including relevant civil works, mechanical equipment, piping and other required installations.

In the selected location a centralized Effluent Treatment Plant is available and each industry has to pre-treat the effluents (i.e. to adjust acidity) before discharging it to the collecting sewer system.

. Storage facilities for liquid and solid products and spare parts warehouse.

. Instruments for Process Control System, including:
  - sectional control system
  - general control system

SERVICE EQUIPMENT

. Cars: n.2 cars, n.1 light commercial vehicle, n.1 pick-up.

. Office equipment: typewriters, filling cabinets, telephones, computers, etc.

. Furniture and Fixtures for Offices and Laboratories.

In addition to the equipment list, the following costs have been considered in the Investment Cost Estimate Table:

- piping and instrumentation
- installation and commissioning
- spare parts and accessories
- contingencies

The origin of the machinery and the equipment has been preliminarly identified, divided into locally available and imported, according to the experience of the Indian Promoter and the results of the on-site visit.

To this extent, the team of experts during the field visit got the opportunity to meet several Indian Companies, specialized in different industrial activities (such as engineering and plant design, mechanical manufacture, equipment supply, civil works): the results of said contacts allowed to confirm the preliminary distribution of goods and services into locally available and imported.

The Estimate of Investment Cost for the equipment and services listed in this paraghaph is shown in the attached Table 6.4.

The figures have been compared with the current european market prices (as far as the imported items) and checked with Indian manufactorers (for the locally available items): the result of said analysis shows a certain over-estimation of the equipment cost, particularly for the imported items. However, taking into account that the estimate are based on a preliminary design, that the indicated figures include long distance transportation cost up to Bombay port and provision for two years spare parts and that the purchasing orders will have to be placed during the construction period (two years ahead) the indicated overall amount can be considered acceptable for budgettary purpose and for the financial analysis of the Project.

TABLE 6.4 - ESTIMATE OF INVESTMENT COST: EQUIPMENT

Item description	Foreign T US $	Local M Rps. = T US $	Total T US $
PRODUCTION EQUIPMENT			
1. **Quality Control and Labs.**			
1.1 Microbiological Lab.	335		
1.2 Chemical Lab.		3,15	
1.3 Pilot Plant	245		
2. **Fermentation Department**			
2.1 n.4 Pre-Fermentators		8,95	
2.2 n.4 Fermentators	3.330		
2.3 n.2 Sterilization tanks		1,25	
2.4 n.1 Ammonia storage tank		,20	
2.5 Set of valves	600		
2.6 Process Control System	510	7,75	
3. **Recovery Department**			
3.1 n.2 Harvest Broth Tanks		6,50	
3.2 n.2 Rotary Vacuum Filters	1.360		
3.3 n.2 Filtered Broth Tanks		1,60	
3.4 n.2 Liq./liq. Extractors	840		
3.5 n.3 Reactors for salif.		1,60	
3.6 n.2 Centrifuges		4,50	
3.7 n.2 Fluid bed dryers		2,85	
3.8 n.2 Stand-by Tanks		,65	
3.9 Packaging system		,60	
3.10 Solvent Recover. equip.		8,95	
Piping and Instrum.		17,75	
Install. and Commiss.		12,40	
Spare Parts (7.5%)	535	5,90	
Contingencies (7.5% imp.;10% loc.)	580	8,40	
TOTAL PRODUCTION EQUIPMENT COST	8.335	93,00 = 3.444	11.779
AUXILIARY EQUIPMENT			
4.1 Compressed Air System		10,60	
4.2 Steam generation		10,60	
4.3 Cooling Water System		8,95	
4.4 Fire fighting		3,55	
4.5 Water system		4,10	
4.6 Fuel oil System		3,55	
4.7 Electric Power System		14,80	
4.8 Stand-by generation		7,05	
4.9 Effluent pre-treatment		4,95	
4.10 Storage facilities		3,50	
Piping and Instrum.		7,05	
Spare Parts		3,00	
Contingencies		8,60	
TOTAL AUXILIARY EQUIPMENT COST		93,30 = 3.456	3.456
SERVICE EQUIPMENT			
5.1 Cars		1,00	
5.2 Office equip.		2,00	
5.3 Furniture and Fixtures		2,40	
Contingencies		,60	
TOTAL SERVICE EQUIPMENT COST		6,00 = 222	222
TOTAL EQUIPMENT COST	8.335	192,30 = 7.122	15.457

6.5 Civil Engineering Works

Buildings designated for Process Plant, Utilities, Auxiliary Facilities, Laboratories and Offices have to be erected on the Project site, according to the provisional plot plan provided by Pharmachim Engineering.

The suggestions of Pharmachim Engineering have been also taken into consideration to preliminary design the buildings, to provide general specifications for the engineering phase, and to obtain a budgetary investment cost estimate.

Local unit costruction costs have been obtained according to UB Group experience and cross-checked with the Indian Civil Construction Firms contacted during the field visit of the Consultant.

A summary of the required buildings, with the relevant main dimension and characteristics, is shown in the attcched Table 6.5 - INVESTMENT COST: CIVIL ENGINEERING WORKS, while the Building Specifications are included in Annex 5.

In addition to the buildings, civil works also include roads, Compound Walls and Gates inside the Project site, as well as Foundations for storage tanks and for electrical substation, and other auxiliary works.

All these items have been considered in the investment cost estimate, including a provision for contingencies during the implementation phase.

TABLE 6.5 - ESTIMATE OF INVESTMENT COST: CIVIL ENGINEERING WORKS

Item	description	Dimension		unit cost (Rps/sq.m.)	Total Cost (M Rps.)
1.	**LAND & DEVELOPMENT**				
1.1	Land acquisition	136.000	sq.m.	200	27,20
1.2	Site Preparation (incl. fencing)	70.000	sq.m.	25	1,75
	Contingencies (@2.5%)				,72
	TOTAL LAND ACQUISITION AND SITE DEVELOPMENT				**29,67**
2.	**CIVIL WORKS**				
	Buildings				
2.1	Fermentation	20*60*22h	m.	5.500	6,60
2.2	Process	20*70*12h	m.	3.200	4,55
2.3	Pilot Plant (2 Flo.)	20*50*10h	m.	4.500	4,50
2.4	Offices (2 Flo.)	20*50*7h	m.	3.500	3,50
2.5	Utilities (n.2 Blds)	30*30*5.2h	m.	2.750	4,95
2.6	Canteen	30*20*3.5h	m.	2.000	1,20
	Total Building Cost				25,30
2.7	Roads, Compound Walls etc.				2,50
2.8	Off site Foundations	3.600	sq.m.	1.000	3,60
	Contingencies (@10%)				3,10
	TOTAL CIVIL ENGINEERING WORKS				**34,50**

7. PLANT ORGANIZATION AND OVERHEAD COSTS

7.1 Implementation Phase

The Indian Promoter, UB Group, will be fully involved in the Project implementation phase, in order to follow the activities of the local Main Contractor and to finalize all the formalities and obtain permitts required to start the production.

Even if a final decision on "how to implement" the Project has not been reached yet, the most probable schedule is the following:

a. The Licensor will carry out the basic design and will provide the general specification required for civil works and detailed process engineering.

b. UB Group will select a local engineering and construction Firm to perform the detailed engineering and to act as Main Contractor for the implementation of the Project.

c. UB Group will supervise the activities of the Main Contractor during the Plant construction Phase and will follow the research carried out by the Licensor to test the strain with locally available raw materials.

d. The Licensor will follow the Commissioning and Start-up Activities up to the Performance Test of the Plant and will run the Plant for one month.

e. UB Group will run the Plant for three months under the supervision of the Licensor (Pharmachim Eng.).

f. The Licensor will manage the operations of the Plant for two years.

The construction and erection cost of machinery and equipment has been included in the Estimate of Investment Cost Tables, as well as the costruction costs of civil works.

The additional expenses to cover the UB supervision costs, as well as the other pre-production costs are estimated at 18 M Rp, according to the following break-down:

TABLE 7.1 PRE-PRODUCTION EXPENDITURES

	Local Currency (M Rps)
- Project Management	2.85
- Travels:	
Domestic	2.00
Abroad	3.50
- Office expenses	1.65
- Legal and Professional Fees	2.50
- Living and Lodging for Foreign Technicians (18 m*m @ 100 T Rps/m)	1.80
- Deposits for Power supply, Land and other site facilities	2.50
- Contingency (@7.5%)	1.20
TOTAL PRE-PRODUCTION EXPENSES	**18.00**
(equivalent to	666.7 T US $)

7.2 Production Phase

For the Production Phase of the Project the following expenses have been taken into account:

- Maintenance and Repairs
- Spare Parts
- Factory Overheads
- Administration (non Labour costs)
- Marketing (non Labour costs)

The relevant estimates, with particular reference to the first years of operation, have been carried out on the following basis:

. Maintenance and Repairs

Ordinary maintenance activities will be carried out by the Factory Labour, and therefore, the relevant yearly cost is computed in the Manpower Cost of the Project.
However, a provision has to be considered to cover the cost of specialized services, consumable goods and extraordinary maintenance requirements.
The maintenance and repair services can be purchased in local currency, by utilizing locally available expertise and facilities.
It has been assumed that, at full capacity operation of the Plant, these expenses are equal to 3% of the Total Investment Cost for Process and Utilities Equipment, whereas during the first years after the completion of the Plant the maintenance requirement is lower according to the following schedule (excluding spare spare):

Year of Production:	1	2	3	4	5-15
Percentage assumed:	1%	1%	2%	2.5%	3%
Main. & Rep.(M Rps)	**4.1**	**4.1**	**8.2**	**10.3**	**12.34**

. Spare Parts

The annual spare parts purchasing cost has been estimated equal to 2% of the Total Investment Cost for Process and Utilities Equipment.
Said percentage has been applied to the local and imported portion of the Investment Cost, in order to obtain the values in different currencies.
A provision for spare parts is included in the Initial Investment Estmate, therefore, lower percentage values have been applied to the first years of operation of the Plant, according to the following trend:

Year of Production:	1	2	3	4	5-15
Percentage assumed:	0	0.5%	1%	1.5%	2%
Spare Parts Cost:					
local curr. (M Rps)	0	0.93	1.86	2.79	3.73
fore. curr. (T US$)	0	41.7	83.5	125.2	167.1

. **Factory Overheads**

This item includes the expenses necessary to cover operating requirements of the Factory, not directly linked to Plant production (variable costs) or considered within the other fixed costs (Labour, Maintenance, Spare Parts, etc.).
In particular the following expenses have been considered under this item:
- Plant and Building Insurance
- Consumables (i.e. packaging materials)
- Factory Security costs
- Rents (cars, storage space, outdoor works and services, etc.)
- Housekeeping costs

The Factory Overheads, considered fixed and in local currency, have been estimate on the following basis: 0.5% of Total Fixed Assets + 1% of Sales at Full Capacity operation.

Factory Overheads Expenses: 6.0 M Rps/y

. **Administration (Non Labour)**

This heading voice includes the expenses required to cover Factory Administration costs during the Plant Production Phase, excluding the relevant Labour cost, which is included under Labour Cost.
Such expenses, considered fixed and in local currency, have been estimated equal to 2% of Sales at Full Capacity operation.

Administration Expenses: 5.5 M Rps/y

. **Marketing (Non Labour)**

This item covers the expected costs (excluding Labour) required to market the product, such as promotional costs, advertising, sales commissions and communications costs.
Almost 95% of the production is expected to be marketed abroad, probably through long term contracts signed with a restricted number of European chemical/pharmaceutical Firms. For this reason it has been assumed that Marketing non-Labour Costs will be limited to 2% of Sales at Full Capacity operation, in foreign currency.
However, during the first years of operation higher percentage values have been considered, taking into account the production programme and the necessity to spend more to penetrate the market:

Year of Production:	1	2	3	4	5-15
Percentage assumed:	5%	5%	3%	2%	2%
Marketing Cost:					
Foreign curr. (T US$)	216.2	371.3	284.8	201.2	203.0

The above Operating Costs at Full Capacity Operation of the Plant are summarized in the following Table 7.2 - FIXED PRODUCTION COSTS, divided into local and Foreign Currency.

TABLE 7.2 ANNUAL FIXED PRODUCTION COSTS
(YEAR 5)

	Foreign currency (T US$)	Local currency (M Rps)
- Maintenance and Repairs		12.3
- Spare Parts	167.1	3.7
- Factory Overheads		6.0
- Administration (non Labour)		5.5
- Marketing (non Labour)	203.0	
TOTAL ANNUAL EXPENSES	370.1	27.5

8. MANPOWER

The Project will employ 110 units for the different activities of the Factory, according to the following scheme:

	Number of employees
Administration and Marketing (regular staff)	
- Management	5
- Supervisors (non technical)	7
- Clerical staff	10
Total Indirect Labour	22
Production (on shift)	
- Supervisors (technical)	15
- Labour Skilled	35
- " Semi-Skilled	18
- " Unskilled	20
Total Direct Labour	88
Total Employees	**110**

The Factory management will be provided by UB Group, Pharmaceuticals Division, while the remaining manpower will be recruited directly by the Company.

In the area of the selected location there is availability of skilled labour as well as of clerical staff and graduates, who can be appropriately trained in the particular field of biotechnology production plants.

Training will be provided by the Licensor during the implementation phase for the personnell employed in the production process and on the job training will also be carried out under the supervision of Licensor's technicians at the start-up and during the first two years of operation.

The relevant cost is included in the know how Cost (for the expenses at the Licensor charge) and in the Pre-production Costs (for the expenses in local currency).

The Labour Cost has been calculated on the basis of the average yearly cost for the different categories, including gross salary, social costs, payroll taxes and other expenses to be paid by the Company.

The following Table 8.1 shows the Labour Cost for the Project, splitted into Administrative (Indirect Labour) and Production (Direct Labour).

TABLE 8.1 - LABOUR COST

	Employees (no.)	Unit cost (T Rps/y)	Total cost (T Rps/y)
Administration and Marketing (regular staff)			
- Management	5	150	750
- Supervisors (non technical)	7	100	700
- Clerical satff	10	50	500
Total Indirect Labour	22		1.950
Production (on shift)			
- Supervisors (technical)	15	120	1.800
- Labour Skilled	35	60	2.100
- " Semi-Skilled	18	45	810
- " Unskilled	20	30	600
Total Direct Labour	88		5.310
TOTAL LABOUR COST			7.260

9. IMPLEMENTATION SCHEDULING

9.1 Investment Schedule

Project implementation will require an estimated period of time of two and half years, including plant commissioning and performance tests.

During said period all the initial investments will be realized and the required financial sources should be activated.

The Total Investment Cost of the project is summarized in Table 9.1.

The implementation phase has been divided into five periods, each one lasting six months: the first four periods are devoted to land acquisition, civil works and plant construction, while the last one foresees start-up activities (plant commissioning, start-up and performance tests). The last period falls in the first year of the production phase.

The total initial investments have been distributed among the implementation periods, according to the expected plan of activities.

The following plan has been foreseen for scheduling the investments during the implementation phase.

INVESTMENT SCHEDULING

Activity	Period I	Period II	Period III	Period IV	Period V
Land acquisition	100 %				
Site preparation	100%				
Civil works		20%	50%	30%	
Know how	25%	25%		25%	25%
Strain			100%		
Basic Engin.	25%	25%	25%	25%	
Detailed Engin.	20	40%	25%	15%	
Process Equip. (F.C.)	10%		80%	10%	
Process Equip. (L.C.)		20%	50%	30%	
Auxiliary Equip.		20%	50%	30%	
Service Equip.		10%	40%	50%	
Pre-production Costs	15	20%	30%	35%	

In order to allocate the investment figures according to the COMFAR input tables, the following break down has been worked out.

INVESTMENT ITEMS vs COMFAR INPUT

Investment Item	Amount (T US $)	COMFAR Input	
		Heading Voice	Line no.
Land & Site Develop.	1.099	Land	13
Civil Works	1.278	Structures & civil	15
Prod. & Aux. Equip.	15.235	Plant Mach. & Equip.	8,20
Service Equipment	222	Incorp. Fixed Ass.	17
Know How & Engineering	4.841	Incorp. Fixed Ass.	6.18
Pre-production Costs	667	Pre-prod. Expendit.	23

Table 9.2. utilized in the COMFAR input table. shows the investment scheduling during the construction period.

TABLE 9.1 - SUMMARY OF THE INVESTMENT COST

Item description		Foreign T US $	Local M Rps.	= T US $	Total T US $
1.	**LAND AND SITE DEVELOPMENT**				
1.1	Land acquisition		27,20		
1.2	Site preparation		1,75		
1.3	Contingencies		,72		
	Total Land & Site Development	0	29,67	= 1.099	1.099
2.	**CIVIL WORKS**				
2.1	Buildings		25,30		
2.2	Off-site Works		6,10		
2.3	Contingencies		3,10		
	Total Civil Works	0	34,50	= 1.278	1.278
3.	**MACHINERY AND EQUIPMENT**				
3.1	Production Equipment	8.335	93,00		
3.2	Auxiliary Equipment		93,30		
3.3	Service Equipment		6,00		
	Total Machin. & Equip	8.335	192,30	= 7.122	15.457
4.	**KNOW HOW AND ENGINEERING**				
4.1	Process Know How	1.850			
4.2	Strain Cost	950			
4.3	Engineering	650	24,05		
4.4	Taxes on Know-how & Engin.		13,50		
	Total Know How & Engin.	3.450	37,55	= 1.391	4.841
5.	**PRE-PRODUCTION COSTS**				
5.1	Pre-production expenditures		16,80		
5.2	Contingencies		1,20		
	Total Pre-production Costs	0	18,00	= 667	667
	TOTAL INITIAL INVESTMENT	11.785	312,02	= 11.556	23.341

TABLE 9.2

[illegible] TYLIN4 : [illegible] Current Fixed Investme.. - foreign

COMFAR 2.1 - FIDIMI CONSULTING, ROME, I T A L Y

[illegible]	1	2	3	4	5	6	7	8	9
	Depreci-n %	Depreciati	Scrap - %	Depreciati	Amount- Y1	Amount- Y2	Amount- Y3	Amount- Y4	Amount- Y5
25 Land............................	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26 Site preparation and developme	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27 Structures and civil w a	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28 Structures and civil w b......	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29 Incorporated fixed assets,-(a	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30 Incorporated fixed assets,-(b	20.00	1.00	0.00	5.00	452.00	0.00	0.00	0.00	0.00
31 Incorporated fixed assets,-(c	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32 Plant machinery and equipm-(a	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33 Plant machinery and equipm-(b	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34 Auxiliary and service faciliti	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35 Pre-production expenditures...	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36 Inventory, working capital....	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[illegible] TYLIN4 : [illegible] Current Fixed Investment - local

COMFAR 2.1 - FIDIMI CONSULTING, ROME, I T A L Y

[illegible]	1	2	3	4	5	6	7	8	9
	Depreci-n %	Depreciati	Scrap - %	Depreciati	Amount- Y1	Amount- Y2	Amount- Y3	Amount- Y4	Amount- Y5
37 Land............................	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38 Site preparation and developme	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39 Structures and civil w a	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40 Structures and civil (b)......	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41 Incorporated fixed assets,-(a)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42 Incorporated fixed assets,-(b)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43 Incorporated fixed assets,-(c)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44 Plant machinery and equipm-(a)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45 Plant machinery and equipm-(b)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46 Auxiliary and service faciliti	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47 Pre-production expenditures...	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48 Inventory, working capital....	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

9.2 Financing Scheme

The Project financing scheme has been worked out based on the following assumptions:

- The Project financing will be based on an Equity/Debt Ratio of 1:2.

- The Shareholders (UB Group and Pharmachim Engineering) will subscribe approximatively 60% of the Total Equity; the remaining part will be obtained by public issue of shares on the Indian Stock Market.

- According to the Indian Stock Market regulations the public issue is allowed under condition that the equity shares subscribed by the Indian Promoter are at least equal to 17.5% of the Total Financial Requirement of the Project. Consequently the UB Group Equity Shares will amount to 117.2 M Rps (equivalent to 4.340,7 T US$), which represents the 17.5% of Total Financial Requirement (Total Assets plus Cost of Finance during construction).

- The Italian Promoter is willing to partecipate to the Joint Venture Equity with 905 T US$.

- 85% of Initial Investment in foreign currency will be financed with export credit.
  The relevant financial conditions assumed in the financial analysis are the following:

Interest rate:	8.5%
Amortization:	Constant yearly rates, lasting for 7 years
Grace period:	1 year from the last installment

- A Commercial Loan will be negotiated to finance the foreign currency balance, calculated according to the following formula:

$$IIfc - ECfc - EPfc + FCfc = CLfc$$

where:

IIfc = Initial Investment in foreign currency
ECfc = Export Credit in foreign currency
EPfc = Equity Partecipation of the Italian Shareholder
FCfc = Financial Costs during costruction in foreign currency (both for Export Credit and for Commercial Loan)
CLfc = Commercial Loan Financial Requirement in foreign currency

The Promoters have approached Italian Financial Institutions and Banks to obtain the loan: negotiations are in progress.
Even if a final decision has not yet reached on the matter, the following financial conditions have been assumed in the financial analysis:

Interest rate:	16.5%
Amortization:	Constant yearly rates, lasting for 7 years
Grace period:	3 years from the last installment

- A loan will be negotiated with a Public Indian Financial Institution to finance the local currency balance, calculated according to the following formula:

$$IIIc + CCBIc - EPIc - SMIc + FCIc = PLIc$$

where:

IIIc = Initial Investment in local currency
CCBIc= Cumulated Cash Balance during the construction phase to cover 25% of fund requirement in the first year of operation
EPIc = Equity Partecipation of the Indian Shareholder
SMIc = Equity shares sold on the Stock Market
FCIc = Financial Costs during costruction in local currency (for the Public Institution Loan)
CLIc = Public Loan Financial Requirement in local currency

The Indian Promoter has approached a Public Indian Financial Institution (The Industrial Credit & Investment Corporation of India) to obtain the loan: negotiations are in progress.
Even if a final decision has not yet reached on the matter, the following financial conditions have been assumed in the financial analysis, according to the UB Group experience in previous similar projects:

Interest rate:	14%
Amortization:	Constant yearly rates, lasting for 5 years
Grace period:	3 years from the last installment

- Bank Overdraft: additional requirement of funds, during operation phase, may be financed on short term basis by UB Corporate at 14% interest rate, provided that the Project has enough cash (Cumulated cash balance during construction + Cash in hand included in the working capital) to cover 25% of total additional requirements.

10. FINANCIAL EVALUATION

10.1 General Remarks

The financial analysis of the Project has been worked out by utilizing COMFAR software package, developed by UNIDO.

Data and values indicated in detail in the previous chapters have been utilized to compile COMFAR DATA ENTRY Module.

Said data are relevant to the following aspects:

- Plant Capacity and Production
- Product Price
- Initial Investment
- Raw Materials and Inputs
- Overhead Costs
- Manpower
- Sources of Finance

The above data have been elaborated to obtain the figures such as required by the COMFAR DATA ENTRY Module with particular reference to:

- Production Program and Sales during the first years of operation, taking into account provision for Working Capital;
- Initial Investment splitted into the construction periods;
- Raw Materials and Inputs values during the first years of operation;
- Overheads Costs values during the first years of operation;
- Equity and External Loans installments splitted into the construction periods, to cover the relevant financial requirements (including calculation of interests during construction).

All the schedules utilized in the Project financial analysis have been worked out at **constant values**, without applying financial contingencies (inflation) forecast to the inflow and outflow figures.

The exchange rate utilized to convert local figures into foreign currency is:

1 US $ = 27 Rps

Other points necessary to complete the financial aspects of the Project have to be analysed, such as:

- Working Capital
- Investment Depreciation and Replacement
- Taxes and Duties
- Cases
- Results

In the following paraghaphs said aspects are discussed and the assumptions made are detailed.

10.2 Working Capital

The working capital requirement for the financial operation of the Project has been calculated according to the following assumptions:

- Accounts Receivable	30 days
- Raw material Inventory	60 "
- Utilities Inventory	30 "
- Spare Parts Inventory	180 "
- Work-in-progress Inventory	15 "
- Finished Product Inventory	30 "
- Accounts Payable	10 "

These assumptions have been discussed in detail with the Indian Promoter and are considered viable and sound for the Project, taking into account the proposed location.

By utilizing the above assumptions the net working capital requirement in the first year of operation amounts to 630.8 T US$, and become 1 390.3 T US$ at full capacity operation of the Plant (5º years), according to the following break-down:

TABLE 10.2 - WORKING CAPITAL

	1º Year (T US$)	5º Year (T US$)
- Current Assets	681,2	1.492,7
- Current Liabilities	-50,4	- 102,4
Net Working Capital	**630,8**	**1.390,3**

The ratio between working capital and Sales Revenues (of full capacity operation) shows a turnover equal to 14, which is considered quite hig for an industrial project.

10.3 Investment Depreciation and Replacement

The Indian legislation allows the application of high depreciation rates on industrial investments, to support the industry by reducing the fiscal drag during the first years of operation and to stimulate the companies to invest profits in replacement and modernization of production facilities, hence keeping the Indian industry productive and competitive.

In the analysis of Project profitability, however, the use of official depreciation rates has not been considered correct because they introduce in the cash flow effects deriving from external economic policy factors not related to the Project itself.

In other words, high and attractive depreciation rates produce financial effects more appropriate in the analysis of revamping and/or modernization of existing production facilities, than in the evaluation of new investments.

In addition, considering that the Project, being export oriented, will benefict of fiscal tax exemptions on the major part of the profits (see subsequent paragraph), investment depreciation does not significantly affect the Project Cash Flow.

For these reasons technical depreciation rates, normally applied to industrial investments in the same field of activity, have been utilized in the financial analysis of the project.

The following Table 10.2 shows the depreciation rates currently in use in India and the values used in the Project evaluation.

TABLE 10.3 - DEPRECIATION RATES

	Official Values allowed in India for P & L Account		for Income Tax	Values used
	WDV (1)	SL (1)	WDV (1)	SL (1)
Structure & Civil	10%	3.34%	10%	5%
Inc. Fixed Assets	15%	5.15%	33.3%	10%
Plant, Mach. & Equip.	30%	11.3%	33.3%	10%
Technology	-	20% (2)	not depr.	10%
Pre-prod. Expend.	-	20% (2)	not depr.	(3)

(1) WDV Accelerated; percentage on Written Down Value
SL Straight Line.

(2) Depreciation in 5 years, after 2 years grace.

(3) Not depreciated by COMIAR.

The Indian Promoter, UB Group, has worked out a detailed re-investment plan with regards to investment replacement during the operation phase, considerning both technical plant requirements and the positive effects produced by applying the offical depreciation rates.

However, the re-investment of net profits in replacing initial investments is mainly a management instrument to improve the operating cash flow of the Project.

For the same reasons previously stated replacements have not been taken into account in the analysis of initial investment profitability.

10.4 Taxes and Duties

Custom duties are applied in India to imported machinery and equipment as well as to imported products, in order to reduce the Balance of Payments Deficit and to protect the local industry.

The applied rates vary for different categories of goods, according to the indications of the Government, and are generally over 100% of the C.I.F. value.

Income tax on company's profit are also high: 54% on Gross Profits (Operating Margin, including Depreciation, less Cost of Finance).

On the other hand, incentives and exemptions are allowed to the Companies, to reduce the fiscal weight and to stimulate the development of the industrial sector in India.

The high official depreciation rates allowed for the investments (discussed in the previous paragraph) have to be considered in this framework.

In addition, according to the existing regulation, project exporting at least 80% of the production are considered export-oriented and benefict of various tax incentives:

- exemption of Custom Duty on imported machinery and equipment (not applied to Know How and Engineering services purchased abroad);
- exemption of Income Taxes on the profits deriving from product export;
- export incentive equal to 15% of F.O.B. value, in local currency.

The exemption of Custom Duty has been considered in the Project investment cost estimate.

Income Tax incentive has been considered by applying variable tax rates, according to the share of revenues deriving from the exported and locally marketed product.

Export incentive has been included in the export price value. In correct terms this item represent an income of the Project in local currency, but it was impossible to account revenues in local currency to the exported product within the options foreseen by the COMFAR Model. On the other hand it must be considered that more than 95% of the Project revenues is produced in foreign currency, which has to be partially transferred into local currency to finance the operating costs.

10.5 Cases

The framework of data and assumptions described in the previous paragraphs represents the **Base Case** of the Project financial evaluation, which may be identified by the following main aspects:

BASE CASE

- **Currency Conversion Rate**: 1 US$ = 27 Rps;
- **Production = Plant Capacity**: 108 ton/y of active Tylosin;
- **Sales**: 103 ton/y export, 5 ton/y local market;
- **Prices**: 94 $/ton of active Tylosin both for local and export;
- **Location**: Taloja, 50 Km from Bombay (Maharashtra State);
- **Raw Materials and inputs**: locally available;
- **Labour**: 110 employees;
- **Project Economic Life**: 15 years of operation;
- **Construction Period**: 2.5 years (including Start-up and Test Run);
- **Initial Fixed Investment**: 23.3 M US$, 50.5% in foreign currency;
- **Total Equity**: 8.6 M US$, of which 5.3 M US$ by the Promoters;
- **Total External Funds**: 16.6 M US$.

The financial analysis performed on the BASE CASE also includes the Break Even Analysis, the Production Cost Structure and the Sensitivity Analysis on the main economic parameters (Sales Prices, Operating Costs and Initial Investment), worked out by utilizing the COMFAR GRAFIX Module.

In order to investigate how the Project profitability is affected by changes of parameters not managed by the Sensitivity Analysis included in the COMFAR Package, an additional case, CASE 1, has been analysed. In particular a Production Level lower than the Plant Capacity has been considered in CASE 1, taking into account that:

- difficulties may occur in penetrating the export market, with consequent necessity to reduce the production of the Plant;

- the expected process performance has not yet tested with the locally available raw materials;

- operating contingencies, such as failure in electric power supply, lack of raw materials, extraordinary maintenance required by the installed machineries, may reduce the expected production of the Plant;

- in biotechnology processes it may happen to have polluted batches, due to uncorrected sterilization of the equipment, and, therefore, the relevant production does not reach the expected yield.

The CASE 1 is identified by the following main aspects:

CASE 1

- **Currency Conversion Rate**: unchanged
- **Production** : 80 - 100 ton/y of active Tylosin
- **Sales**: 5 ton/y local market, balance exported;
- **Prices**: unchanged
- **Location**: unchanged
- **Raw Materials and inputs**: unchanged
- **Labour**: unchanged
- **Project Economic Life**: unchanged
- **Construction Period**: unchanged
- **Initial Fixed Investment**: unchanged
- **Total Equity**: unchanged
- **Total External Funds**: unchanged

A sensitivity analysis on the Plant production, within the indicated range, has been performed by running three sub-cases:

Sub-cases	Production (ton/y)	% of nominal capacity	Local market (ton/y)	Export (ton/y)
CASE 1/A	80	74%	5	75
CASE 1/B	90	83%	5	80
CASE 1/C	100	93%	5	95

10.6 Results

The complete SCHEDULE TABLES obtained by COMFAR relevant to BASE CASE are included in Annex 6, while selected SCHEDULE TABLES relevant to CASE 1 (Sub-Cases A, B and C) are included in Annex 7 A, B and C.

The main results of the financial analysis carried out on the proposed project are summarized in the following Table:

	I.R.R. (%)	I.R.R.E1 (%)	I.R.R.E2 (%)	N.P.V. @ 10% (M US$)
BASE CASE	18.04	19.19	21.09	13.1
CASE 1/A	10.87	6.84	9.93	1.3
CASE 1/B	13.59	11.44	13.65	5.5
CASE 1/C	16.07	15.71	17.70	9.6

where:

I.R.R. : Internal Rate of Return on total investment;
I.R.R.E1 : Internal Rate of Return on equity;
I.R.R.E2 : Internal Rate of Return on equity plus reserves.

The Project presents an acceptable profitability, in terms of Internal Rate of Return, on the basis of assumptions considered in the BASE CASE.

It should be pointed out that all the figures considered in the Equity Cash Flows (for I.R.R.E1 and I.R.R.E2 calculation) are in constant prices except for the interests on loans, which are in current values and, therefore, include the inflation estimate of the borrowing Banks.

By considering the real cost of money (without provision for inflation), interests on loans should be substantially lower (around 4-5%, against a 13% average cost of money for the Project), with additional positive effects on Equity Cash Flows and the consequent increase of I.R.R.E1 and I.R.R.E2.

Said effects are partially reduced by the interest rates on Export Credit and on the loan from Public Indian Financial Institution, which are subsidized loans and, therefore, have interest rates lower than the ones offered by the capital market.

As for as the salvage value of the investment is concerned, only land value and working capital have been taken into account, without any estimate of commercial goodwill of the joint venture at the end of the considered production period. This is a prudential assumption for the project.

Cashflow table during production shows a negative cash balance in the first year of operation (291.7 T US$), which requires to apply for bank overdraft. However, the figure is within the range foressen in the financial assumptions (see Chapter 9.2 Financing Scheme).

The break even analysis, carried out on the BASE CASE, shows a good performance of the project: the break even point excluding finance is settled at 50% of capacity utilization, while the one including finance is around 65%.

The sensitivity analysis shows that the Project profitability (I.R.R.) is not heavily affected by the initial investment or by the operating costs, while is mainly affected by the sales prices. However, by applying a 15% reduction in sale prices, the I.R.R remain still over 12%. Such a reduction may be figured as a withdraw from the revenues of the export incentive, presently granted by the Indian Government.

The sensitivity analysis carried out on the productivity of the plant (CASE 1, sub-Cases A, B and C), shows that the Project still presents acceptable values of I.R.R. even if the production is 83% of the nominal capacity (Case 1 B).

However, the financing scheme has to be re-considered, as the cashflow requires consistent bank overdraft to cover negative cumulate cash balances during the first years of production (in Case 1 B up to year 5, with maximum figure in year 3: 1.2 M US$).

These results point out the importance of:

- the process performance with locally available raw materials (to be tested by the Licensor);
- the training program and the technical assistance of the process Licensor during the production phase;
- the commercial agreements to be signed with potential international clients (Hoechst or similar), in order to garantee the product marketing at adequate level.

11. PROJECT PROMOTERS

11.1 The Indian Promoter: UB Group

Established in 1915, UB Limited, the holding Company of UB Group, has celebrated its Platinum Jubilee in 1990.

Historically, the Group started its industrial activity in the field of brewery production and distribution, but later it has managed a diversification program covering the following sectors:

- Liquor
- Polymers
- Foods
- Electronics and Energy Products
- Engineering
- Petrochemicals
- Pharmaceuticals
- Biotechnology
- Research and Development
- Paints
- Export Trade

Today, UB Group is a large conglomerate of more than 60 Companies, with approximately 50,000 people employed, well integrated and active in the Indian industry sector, with over 7 Billion Rps (approx. 260 M US$) of Consolidated Fixed Assets, and 14.9 Billion Rps (approx. 550 M US$) of annual Revenues.

In the last three years (1987 - 1990) the Group has consistently developped its economic activities, by increasing investments and revenues (see the following Table 11.1).

TABLE 11.1 - UB GROUP KEY FINANCIAL DATA
(million Rupees)

Fiscal year	1989-90	1988-89	1987-88
Revenues	14,944	10,135	8,614
Profits before Depr. & Tax	635	567	594
Cash Profits (after Tax)	529	496	438
Fixed Assets	7,124	4,260	3,307
Debt/Equity Ratio	1.04/1	0.60/1	0.40/1

The Group is well capitalized, with good Debt/Equity ratio, even if in the last year it is increased to affort the financial requirements of new investments.

Breweries and Liquors are still the major activity of the Group, accounting for 37% of the revenues, followed by pharmaceuticals and biotechnology (25%) and engineering (18%).

Profitability is, viceversa, slowly decreasing, as appears from the trend of the ratio between Cash Profits and Revenues.

The following Table 11.2 shows the sharing of revenues and fixed assets among the different activities.

TABLE 11.2 - REVENUES AND FIXED ASSETS SHARE AMONG THE UB GROUP ACTIVITIES (year 1989/90)

	Revenues (%)	Fixed Assets (%)
Breweries and Liquors	37.3	41.1
Pharmaceuticals and Biotechnology	24.8	16.8
Engineering	18.1	13.5
Petrochemicals	5.7	19.0
Paints	6.8	2.8
Others	7.3	6.8

Several Licence Agreements and production Joint Ventures have been established and are under negotiation with major foreign Firms, in particular in the pharmaceutical field (Hoechst, Roussel, Optrex Farmitalia), as well as in the petrochemical (Enichem).

In terms of ratio between Revenues and Fixed Assets, the activities of pharmaceutical division appear the most profitable.

Perspectives of the pharmaceutical sector in India are presently the most promising ones, as the Country production is only 1.6% of total world one (in terms of value), in comparison with the Indian population, which represents 15% of the world.

Ub Group has, therefore, concentrated its efforts in this field by diversifying the products range and increasing the production capacity, in order to satisfy the demand growth expected in the next years.

The main companies controlled by UB Group, Pharmaceuticals Division are:

- Hoechst India Ltd.
- Roussel India Ltd.
- Optrex India Ltd.
- Carews Pharmaceuticals Ltd.
- Dominion Chemical Industries Private Ltd.

In addition, UB Pharmaceuticals Division has recently inaugurated a new manufacturing facility for the production of bulk drugs, at Tumkur.

Even if UB Group has been operating for many years now in the biotechnology industry (beer production is in fact a biotechnological process), it is not familiar with modern processes and techniques applied to the pharmaceutical field. For this reason UB policy is based on establishing collaboration agreements and setting up joint ventures with international technology licensors.

The Tylosin Project is part of this strategy: it will allow UB to gain the necessary experience in operating a biotechnology industrial plant, by starting with a veterinary drug production which does not require the high qualitative operating standards imposed to producers of antibiotics for human health care.

11.2 The Italian Promoter: Pharmachim Engineering

Pharmachim Engineering Srl, with its head office in Milan Via Appiani 9/1, was founded in 1980 by the present sole director Mr. Ennio Eusebio Pasquino who owns 98% of company shares, while the remaining 2% belong to his daughter Mrs. Fernanda.

Mr. Pasquino graduated in Mechanical Engineering in Milan and boasts a wide experience. He began in the '60s as project engineer in the pharmaceutical division of OLASA Spa, a firm in Milan which sets up pharmaceutical plants.

Mr. Pasquino started up his business during the '70s by founding SICOR (Milan), a company specialized in producing fermentation plant equipment for the pharmaceutical industry. This company was involved in the bankrupty of the SIR Group (a large Italian private chemical group), suffering a huge financial loss, and was eventually wound up.

Mr. Pasquino also owns CIAF, a non-operational pharmaceutical company, and is shareholder of SOMET. The latter company, with head office in Montecarlo, produces pharmaceutical bulks and has a turnover of approximately 3/4.000 million liras.

Owing to Mr. Pasquino's deep knowledge of the South East Asian market, he personally manages the sale of small plants and equipment, as well as the establishment of joint-ventures.

During the last few years Mr. Pasquino has been promoting a series of initiatives, but up to now has encountered difficulty in finding the necessary financial sources to cover large investments of planned initiatives.

In 1990 Italian and Polish partners founded BDK S.r.l. at Isili (Nuoro) for the production of diagnostical kits for virlogy, hormonlogy and cancer.

The overall investment of said initiative amounts to almost 3.800 million liras: 760 million liras will be equity, while the remainder could be financed by the Italian Law for the Region of Sardegna (Law 64) and by grants from AGENI MINERARIA. Pharmachim will participate in this initiative with a 40% equity share.

Mr. Pasquino also owns a 10% share of T.I.S. (Sardegna), which produces mono-use rectractil syringes, with a patent extended to U.S.A.

In view of setting up a joint-venture in the Philippines for the production of syringes, a feasibility study financed by UNIDO (Wien) was carried out in September. The Italian Cooporation Development Directorate of the Ministry of Foreign Affairs will also participate in the financing of this initiative.

This initiative would allow Pharmachim to perform engineering design and construct plants for an estimated value of 3.000 million liras.

Mr. Bianchi, a pharmacology graduate with a wide commercial experience gained with Lepetit in South East Asia, works alongside Mr. Pasquino in the management of Pharmachim Engineering.

At present Pharmachim has only two employees who attend to general and administrative duties, calling upon free-lance consultants when necessary.

Balance Sheet

The reclassified balance sheet of Pharmachim Engineering at 31/12/1990 is reported hereafter:

(Millions of Lira)

ASSETS		LIABILITIES	
Current Assets	726	Short-term Debts[1]	432
Inventory[2]	28	Medium-Long term Debts	33
Fixed Assets[3]	125	Equity net	414
Total Assets	879	Total liabilities	879

FINANCIAL RATIOS

Equity/Fixed Assets	3,31
Equity/Debts	0,89
(Equity-Fixed Assets)/Working Capital	0,43
Current Assets/Short Term Debts	1,68

On the whole the firm's financial situation appears to be acceptable.

In the reclassification of the equity net we have taken into account loans totalling 543 million liras made by Mr. Pasquino to the firm, as well as negative reserves for 298 million liras referred to doubtful debts due to a contract supply to Indonesia in 1986.

However it does not consider the plus-value due to the real estate market value of the apartment, which can be estimated at approximately 1.500 million liras.

---

[1] of which 197 million Liras towards banks
[2] relevant to molds sold during 1991
[3] includes the apartment, head office of the company, with a declared value equivalent to 84 million liras, and 8 million liras worth of BDK shares. During 1991 BDK shares were increased to 304 million liras, equivalent to 40% of the company, and the rest financed by the shareholders.

Economic Trend

The data relevant to the profit and loss account of Pharmachim Engineering S.r.l. for the three-year period 1988-1990 is summerized hereafter.

(Millions of Lira)

	1988		1989		1990	
	ML	%	ML	%	ML	%
Turnover(*)	711	100	991	100	394	100
Cash-flow	33	4,64	25	2,52	13	3,30
Employees	2		2		2	
Consultants	1		1		1	

(*) divided as follows:

	1989	1990
spare parts		5
raw materials		158
syringe molds		94
design		83
equipment	946	
miscellaneous	45	54
Total	991	394

The economic trend of the firm fluctuates according to the international supply contracts acquired, while the net profits are substantially stable.

1989 represents a peak year, owing to the sales contract of two goods-lifts to China.

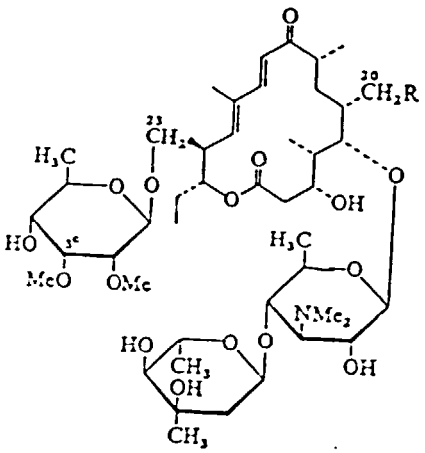
In conclusion, the firm appears to be capable of providing the required know-how, engineering design and procurement services for the Tylosin project. The financial burden will be paid by the income deriving from said activities.

ANNEX 1

CHEMICAL STRUCTURE AND PHISICAL CHARACTERISTICS OF TYLOSIN

Tylosin, 9Cl, 8Cl (Tylosin A)
[1401-69-0]

T-00216



R = CHO

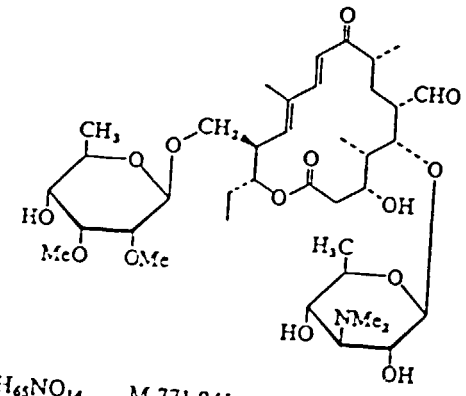
$C_{46}H_{77}NO_{17}$ M 916.111
Macrolide antibiotic. Isol. from *Streptomyces fradiae*. Antibacterial and used in treatment of mycoplasmas in poultry. Amorph. (Me_2CO/hexane). Mp 131°. $[\alpha]_D$ −55°.

3C-O-De-Me: [11049-15-3]. Tylosin C. *3C-O-Demethyltylosin, 9Cl. Macrocin.*
$C_{45}H_{75}NO_{17}$ M 902.084
Isol. from *S. fradiae*. Cryst. (Me_2CO aq.). Mp 134-136°. $[\alpha]_D^{25}$ −52.5° (c, 2 in MeOH). pK_a 7.0.

3C-O-De-Me, 4A-Demycarosyl: [11049-05-1]. *Lactenocin.*
$C_{38}H_{63}NO_{14}$ M 757.914
From *S. fradiae*. Mainly active against gram-positive bacteria.

Tylosin B
Desmycosin, 8Cl. Demycarosyltylosin
[11032-98-7]

T-00217



$C_{39}H_{65}NO_{14}$ M 771.941
Hydrolysis prod. of Tylosin and isol. from *Streptomyces fradiae*. Cryst. ($CHCl_3$). Mp 114-116°. $[\alpha]_D^{25}$ −14.8° (c, 2 in MeOH). pK_a 8.0.

Tylosin D
20-Deoxo-20-hydroxytylosin, 9Cl. Relomycin, 8Cl. LL-AM 684β. Antibiotic LL-AM 684β
[1404-48-4]

T-00218

As Tylosin, T-00216 with

R = $-CH_2OH$

$C_{46}H_{79}NO_{17}$ M 918.127
Macrolide antibiotic. Isol. from *Streptomyces hygroscopicus*. Active against gram-positive bacteria and exptl. infections in mice. Mp 172-175°. $[\alpha]_D^{25}$ −44°.

(From: Dictionary of Antibiotics and Related Substances, Ed. B.W. Bycroft, Chapman and Hall London, 1988).

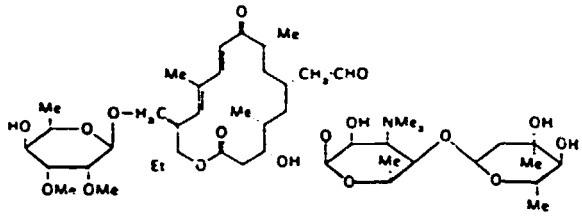
ANNEX 2

TYLOSIN SPECIFICATIONS

ANNEX 2 - A

BRITISH VETERINARY CODEX

Tylosin



$C_{46}H_{77}NO_{17}$ 916.1 *1401-69-0*

Tylosin is a mixture of antimicrobial macrolides produced by the growth of certain strains of *Streptomyces fradiae* or by any other means. It consists largely of tylosin A, which is (10*E*,12*E*)-(3*R*,4*S*,5*S*,6*R*,8*R*,14*S*,15*R*)-14-[(6-deoxy-2,3-di-*O*-methyl-β-D-allopyranosyl)oxymethyl]-5-{[3,6-dideoxy-4-*O*-(2,6-dideoxy-3-*C*-methyl-α-L-*ribo*-hexopyranosyl)-3-dimethylamino-β-D-glucopyranosyl]oxy}-6-formylmethyl-3-hydroxy-4,8,12-trimethyl-9-oxoheptadeca-10,12-dien-15-olide, but tylosins B (desmycosin), C (macrocin) and D (relomycin) may also be present.

Description An almost white to buff-coloured powder.

Solubility Slightly soluble in *water*; soluble in 15 parts of *ethanol (96 per cent)*, in 30 parts of *chloroform* and in 6 parts of *methanol*; soluble in dilute mineral acids.

Identification A. The *infra-red absorption spectrum*, Appendix II A, is concordant with the *reference spectrum* of tylosin.

B. The light absorption, in the range 230 to 350 nm, of a 0.004 per cent w/v solution in 0.1M *hydrochloric acid* exhibits a maximum only at 290 nm; *absorbance* at 290 nm, about 0.94, Appendix II B.

C. To 10 ml of a 0.004 per cent w/v solution in 0.1M *hydrochloric acid* add 1 ml of 2M *sodium hydroxide*, heat on a water-bath for twenty minutes and cool. The light absorption, in the range 250 to 430 nm, of the resulting solution exhibits a maximum at 332 nm.

Alkalinity pH of a 2.5 per cent w/v suspension in *carbon dioxide-free water*, 8.5 to 10.5, Appendix V L.

Heavy metals To the residue obtained in the test for Sulphated ash, add 2 ml of *hydrochloric acid* and evaporate slowly to dryness on a water-bath. Moisten the residue with 0.05 ml of *hydrochloric acid*, add 10 ml of boiling *water* and heat for ten minutes on a water-bath; cool and dilute to 25 ml with *water*. 12 ml of the resulting solution complies with *limit test A for heavy metals*, Appendix VII (30 ppm). Use *lead standard solution (2 ppm Pb)* for the preparation of the standard.

Composition Carry out the method for *high-pressure liquid chromatography*, Appendix III D, using freshly-prepared solutions in a mixture of equal volumes of *water* and *acetonitrile* containng (1) 0.02 per cent w/v of *tylosin BPCRS* and (2) 0.0 per cent w/v of the substance being examined. The chromatographic procedure may be carried out using (a) a stainless steel column 20 cm long and 5 mm in internal diameter packed with spherical particles of silica 5 μm in diameter the surface of which has been modified by chemically bonded octadecasilyl groups (Nucleosil ODS is suitable), (b) as the mobile phase with a flow rate of 1 ml per minute, 0.8% *sodium perchlorate* in a 40 per cent v/v solution of *acetonitrile* and adjusted to a final pH of 2.5 using 1M *hydrochloric acid* and (c) a detection wavelength of 290 nm.

The chromatogram obtained with solution (1) shows similar resolution to the sample chromatogram supplied with *tylosin BPCRS*. If necessary the molarity of the sodium perchlorate may be adjusted or the temperature of the column may be raised to a maximum of 50°. The order of elution of the major components of *tylosin BPCRS* in the chromatogram obtained with solution (1) is desmycinosyltylosin, tylosin C, tylosin B, tylosin D, an aldol impurity and tylosin A. The *column efficiency* should be determined using the peak due to tylosin A and should be not less than 22,000 theoretical plates per metre. Using *normalisation*, the content of tylosin A in the substance being examined is not less than 80 per cent and the total content of tylosins A, B, C and D is not less than 95 per cent.

Tyramine Dissolve 50 mg in 5 ml of *methanol* in a 25-ml graduated flask, add 2 ml of a 10 per cent v/v solution of *pyridine* and 2 ml of a 2 per cent w/v solution of *ninhydrin*. Close the flask by covering with a piece of aluminium foil and heat in a water-bath at 85° for exactly thirty minutes. Cool rapidly and add sufficient *water* to produce 25 ml. Use as the blank a solution prepared in a similar manner but omitting the substance being examined. The *absorbance* of the resulting solution, measured without delay, at 570 nm, Appendix II B, is not greater than that obtained by simultaneously carrying out the procedure using 5 ml of a solution in *methanol* containing 35 μg of *tyramine* per ml and beginning at the words 'add 2 ml . . .'.

For Tylosin intended for parenteral administration carry out the procedure described above but using 100 mg in 5 ml of *methanol*. The *absorbance* of the resulting solution, measured without delay, at 570 nm, Appendix II B, is not greater than that obtained by simultaneously carrying out the procedure using 5 ml of a solution in *methanol* containing 30 μg of *tyramine* per ml and beginning at the words 'add 2 ml . . .'.

Loss on drying When dried for three hours at 60° at a pressure not exceeding 0.7 kPa, loses not more than 5.0 per cent of its weight.

Sulphated ash Not more than 3.0 per cent, Appendix IX A; use 1.67 g.

Assay Carry out the *biological assay of antibiotics*, Appendix XIV A(Vet). The precision of the assay is such that the fiducial limits of error are not less than 95 per cent and not more than 105 per cent of the estimated potency. The upper fiducial limit of error is not less than 900 Units per mg, calculated with reference to the dried substance.

Tylosin intended for parenteral administration without further sterilisation complies with the following additional requirement.

Sterility Complies with the *test for sterility* Appendix XVI A.

Storage Tylosin should be kept in a well-closed container. If the contents are intended for parenteral administration without further sterilisation, the container should be sterile and sealed so as to exclude micro-organisms.

Tylosin Tartrate

$(C_{46}H_{77}NO_{17})_2,C_4H_6O_6$ 1982 *1405-54-5*

Tylosin Tartrate is the tartrate of tylosin, which a mixture of antimicrobial macrolides produced by the growth of certain strains of *Streptomyces fradiae* or by any other means.

Description A white to buff-coloured powder.

Solubility Soluble in 10 parts of *water*; slightly soluble in *ethanol (96 per cent)*; freely soluble in *chloroform*; practically insoluble in *ether*.

Identification A. The *infra-red absorption spectrum*, Appendix II A, is concordant with the *reference spectrum* of tylosin tartrate.

B. The light absorption, in the range 230 to 350 nm, of a 0.004 per cent w/v solution in 0.1M *hydrochloric acid* exhibits a maximum only at 290 nm; *absorbance* at 290 nm, about 0.88, Appendix II B.

C. To 10 ml of a 0.004 per cent w/v solution in 0.1M *hydrochloric acid* add 1 ml of 2M *sodium hydroxide*, heat on a water-bath for twenty minutes and cool. The light absorption, in the range 250 to 430 nm, of the resulting solution, exhibits a maximum at 332 nm.

D. Dissolve 30 mg in a mixture of 7.5 ml of *pyridine*, 2.5 ml of *acetic anhydride* and 0.15 ml of *water* and allow to stand; after about ten minutes an emerald green colour is produced.

Acidity or alkalinity pH of a 2.5 per cent w/v solution, 5.0 to 7.2, Appendix V L.

Composition Carry out the method for *high-pressure liquid chromatography*, Appendix III D, using freshly-prepared solutions in a mixture of equal volumes of *water* and *acetonitrile* containing (1) 0.02 per cent w/v of *tylosin BPCRS* and (2) 0.02 per cent w/v of the substance being examined. The chromatographic procedure may be carried out using (a) a stainless steel column 20 cm long and 5 mm in internal diameter packed with spherical particles of silica 5 µm in diameter the surface of which has been modified by chemically-bonded octadecasilyl groups (Nucleosil ODS is suitable), (b) as the mobile phase with a flow rate of 1 ml per minute, 0.85M *sodium perchlorate* in a 40 per cent v/v solution of *acetonitrile* and adjusted to a final pH of 2.5 using 1M *hydrochloric acid* and (c) a detection wavelength of 290 nm.

The chromatogram obtained with solution (1) shows similar resolution to the sample chromatogram supplied with the *tylosin BPCRS*. If necessary the molarity of the sodium perchlorate may be adjusted or the temperature of the column may be raised to a maximum of 50°. The order of elution of the six major components of *tylosin BPCRS* in the chromatogram obtained with solution (1) is desmycinosyltylosin, tylosin C, tylosin B, tylosin D, an aldol impurity and tylosin A. The *column efficiency* should be determined using the peak due to tylosin A and should be not less than 22,000 theoretical plates per metre. Using *normalisation*, the content of tylosin A in the substance being examined is not less than 80 per cent and the total content of tylosins A, B, C and D is not less than 95 per cent.

Tyramine Dissolve 50 mg in 5 ml of *methanol* in a 25-ml graduated flask, add 2 ml of a 10 per cent v/v solution of *pyridine* and 2 ml of a 2 per cent w/v solution of *ninhydrin*. Close the flask by covering with a piece of aluminium foil and heat in a water-bath at 85° for exactly thirty minutes. Cool rapidly and add sufficient *water* to produce 25 ml. Use as the blank a solution prepared in a similar manner but omitting the substance being examined. The *absorbance* of the resulting solution, measured without delay, at 570 nm, Appendix II B, is not greater than that obtained by simultaneously carrying out the procedure using 5 ml of a solution in *methanol* containing 35 µg of *tyramine* per ml and beginning at the words 'add 2 ml . . .'.

For Tylosin Tartrate intended for parenteral administration carry out the procedure described above but using 100 mg in 5 ml of *methanol*. The *absorbance* of the resulting solution, measured without delay, at 570 nm, Appendix II B, is not greater than that obtained by simultaneously carrying out the procedure using 5 ml of a solution in *methanol* containing 30 µg of *tyramine* per ml and beginning at the words 'add 2 ml . . .'.

Loss on drying When dried for three hours at 60° at a pressure not exceeding 0.7 kPa, loses not more than 4.5 per cent of its weight.

Sulphated ash Not more than 2.5 per cent, Appendix IX A.

Assay Carry out the *biological assay of antibiotics*, Appendix XIV A(Vet). The precision of the assay is such that the fiducial limits of error are not less than 95 per cent and not more than 105 per cent of the estimated potency. The upper fiducial limit of error is not less than 800 Units per mg calculated with reference to the dried substance.

Tylosin Tartate intended for parenteral administration without further sterilisation complies with the following additional requirement.

Sterility Complies with the *test for sterility*, Appendix XVI A.

Storage Tylosin Tartrate should be kept in a well-closed container.

(From British Veterinary Codex 1985, p. 42 - 44)

ANNEX 2 - B

MARTINDALE EXTRA PHARMACOPEIA

13388-t

Tylosin *(BAN, rINN)*

$C_{46}H_{77}NO_{17}$=916.1.

CAS — 1401-69-0.

Pharmacopoeias In *B.P. Vet.*

A mixture of antimicrobial macrolides, produced by the growth of certain strains of *Streptomyces fradiae* or by any other means. It consists largely of tylosin A, but tylosin B (desmycosin), tylosin C (macrocin), and tylosin D (relomycin) may also be present.

An almost white to buff-coloured powder. Slightly soluble in water; soluble 1 in 15 of alcohol, 1 in 30 of chloroform, and 1 in 6 of methyl alcohol; soluble in dilute mineral acids. A 2.5% suspension in carbon-dioxide-free water has a pH of 8.5 to 10.5. Store in well closed containers.

13389-f

Tylosin Tartrate *(BANM, rINNM).*

$(C_{46}H_{77}NO_{17})_2C_4H_6O_6$=1982.3

CAS — 1405-54-5.

Pharmacopoeias In *B.P. Vet.*

A white to buff-coloured powder. 1.1 g of monograph substance is approximately equivalent to 1 g of tylosin. Soluble 1 in 10 of water; slightly soluble in alcohol; freely soluble in chloroform; practically insoluble in ether. A 2.5% solution in water has a pH of 5.0 to 7.2. Store in well-closed containers.

Units

One unit of tylosin is contained in 0.001 mg of the first International Standard Preparation (1966) of tylosin base which contains 1000 units per mg.

Uses.

Tylosin is a macrolide antibiotic and has similar antimicrobial activity to erythromycin (p.222). Tylosin and its phosphate and tartrate salts are used in veterinary medicine in the prophylaxis and treatment of various infections caused by susceptible organisms.

Tylosin and tylosin phosphate are added to animal feeding stuffs as growth promoters for pigs.

A report of 2 cases of contact dermatitis due to tylosin contained in animal feed supplements. The second patient was also allergic to feed supplements containing nitrofurazone.— K. H. Neldner, *Archs Derm.*, 1972, *106*, 722.

A review of the use of tylosin in animal feeds and in veterinary medicine. J. D. Mackinnon, in *Ten Years on from Swann*, D.W. Jolly *et al* (Ed.), London, The Association of Veterinarians in Industries, 1981, p.51.

Susceptibility of *Legionella* spp. to macrolide antibiotics including tylosin.— P. H. Edelstein *et al.*, *Antimicrob. Ag. Chemother.*, 1982, *22*, 90.

Proprietary Veterinary Names and Manufacturers of Tylosin and its Salts

Tylamix (Elanco, UK); Tylan (Elanco, UK).

(Martindale, The Extra Pharmacopociax, 29th Ed. 1989, p. 331)

ANNEX 3

TYLOSIN PREMIX FORMULATION

GUIDA DI VETERINARIA E ZOOTECNIA

8ª Edizione

GUIDA ITALIANA DEI PRODOTTI E DELLE INDUSTRIE VETERINARIE E ZOOTECNICHE

ITALIAN DIRECTORY OF VETERINARY DRUGS, FEED ADDITIVES AND MANUFACTURERS

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Telefax (02) 67.505.202 - Telex 323598 OEMF MI I

ATITIL SULFA [LAB] ATI - 1426:
integratore medicato terapeutico

For: 1 kg = tilosina 100 g, sulfametazina 100 g.

Ind: volatili: M.C.R. da micoplasma gallisepticum e profilassi alle reazioni da vaccinazione e da altri stress, non usare nelle ovaiole produttrici di uova da consumo alimentare; tacchini: profilassi e cura della sinusite infettiva e della aerosacculite; vitelli da latte: prevenzione delle polmoniti da micoplasma e pasteurella multocida; suini: profilassi e cura dell'enterite necrotica e polmonite enzootica.

Pos: volatili: 250 g/100 litri di acqua da bere; vitelli da latte: 10-20 g/kg di latte in polvere da ricostituire pari a 2-4 g di tilosina per capo al dì; suini: 50 g/100 kg di mangime o 2 g/q.le di p.v.

confezione da 25 kg

ATI-TIL 100 PREMIX [LAB] ATI - 1426:
integratore medicato terapeutico

For: 1 kg = tilosina fosfato 100 g, supporto vegetale q.b.

Ind: volatili: malattia cronica respiratoria; suini: polmonite enzootica ed enterite necrotica.

Pos: mescolare accuratamente nel mangime, volatili: 800-1000 g/100 kg di mangime per 5 giorni, ripetere il trattamento per 2 giorni dopo 30 giorni; suini: 100 g/100 kg di mangime.

confezione da 20 kg

ATITIL 200 LIQUIDO [LAB] ATI - 1426:
integratore medicato terapeutico

For: 1 kg = tylosina 200 g, supporto q.b.

Ind: suini: enterite necrotica, polmonite enzootica; vitelli: polmonite da micoplasma e/o pasteurella multocida; volatili: malattia cronica respiratoria.

Pos: mescolare accuratamente nel mangime o nell'acqua da bere; suini: 50 g/q.le di mangime (2 g/100 kg di p.v.); vitelli: 1-2 kg/q.le di mangime (latte in polvere da ricostituire); volatili: 400-500 g/q.le di mangime oppure 250 g/100 litri di acqua (1,25 g/100 kg di p.v.).

Avv: da cedersi agli allevatori soltanto su presentazione di prescrizione veterinaria.

confezioni da 1 - 5 e 25 kg

ATITIL 200 PREMIX [LAB] ATI - 1426:
integratore medicato terapeutico

For: 1 kg = tilosina 200.000 mg, supporto q.b.

Ind: suini: enterite necrotica, polmonite enzootica; volatili: malattia cronica respiratoria.

Pos: suini: 50 g/100 kg di mangimi (2 g/100 kg di p.v.); volatili: 400-500 g/100 kg di mangime.

Avv: da cedersi agli allevatori soltanto su presentazione di prescrizione veterinaria.

confezione da 25 kg

ATITIL 200 SOLUBILE [LAB] ATI - 1426:
integratore medicato terapeutico

For: 1 kg = tilosina 200 g, supporto q.b.

Ind: volatili: M.C.R. da micoplasma gallisepticum e profilassi alle reazioni da vaccinazione e da altri stress, non usare nelle ovaiole produttrici di uova da consumo alimentare; tacchini: profilassi e cura della sinusite infettiva e della aerosacculite; vitelli da latte: prevenzione delle polmoniti da micoplasma e pasteurella multocida; suini: profilassi e cura dell'enterite necrotica e polmonite enzootica.

Pos: volatili: 250 g/100 litri di acqua da bere; vitelli da latte: 10-20 g/kg di latte in polvere da ricostituire pari a 2-4 g di tilosina per capo al dì; suini: 50 g/100 kg di mangime o 2 g/q.le di p.v.

confezioni da 1-5-25 kg
confezioni da 200-500 g

[redacted]

ATI-TIL 40 PREMIX [LAB] ATI - 142
integratore
auxinico per suini contenente tilosina fos

confezione da 25

BENATYLOSINA [LAB] Benaco - 8529
integratore medicato terapeutico

For: 1 kg = tylosina 100.000 mg.

Ind: suini: enterite necrotica e polmonite
malattia cronica respiratoria.

Pos: suini: 1 g/kg di mangime oppure 0,04 g/
1 g/suino di 25 kg); volatili: 5 g/litro
oppure 0,25 g/kg di peso vivo (es.
vivo).

solubile confezioni in k

BRONCOTYL [LAB] Pagnini - 5775:
integratore medicato terapeutico

For: 1 kg = tylosina 200 g, supporto glucidico q.b.

Ind: suini: enterite necrotica, polmonite enzootica; volatili: malattia cronica respiratoria; vitelli: polmonite da micoplasma e/o pasteurella multocida.

Pos: suini: 0,5 g/kg di mangime (0,2 g/10 kg di p.v.) per 8 giorni; volatili: 4-5 g/kg di mangime o 2,5 g per litro d'acqua (0,125 g/kg di p.v.) per 3-5 giorni; vitelli: 10-20 g/kg di mangime (latte in polvere da ricostituire) per 14 giorni.

solubile da 1-5-25 kg
solubile da 50 - 100 e 500 g

BRONCOTYL 100 [LAB] Pagnini - 5775:
integratore medicato terapeutico

For: 1 kg = tylosina 100 g, supporto glucidico q.b.

Ind: suini: enterite necrotica, polmon
malattia cronica respiratoria; vite
plasma e/o pasteurella multocida

Pos: suini: 1 g/kg di mangime (0,4 g/10
volatili: 8-10 g/kg di mangime per
g/kg di mangime (latte in polvere
gg.

TS: sospendere il trattamento 8 gg. p
ne.

Avv: da cedersi agli allevatori su presen
veterinaria.

confezioni da 500 g - 1 - 5

CHEZOOBOOSTER [LAB] Chezoo - 60:
integratore medicato terapeutico

For: 1 kg = ossitetracíclina 50 g, tilosina 10 g, supporto q.b.

Ind: per la cura della polmonite enzootica dei suini.

Pos: 1 kg/100 kg di mangime pari a 40 g/kg di peso vivo. Somministrare accuratamente miscelato nel mangime per 3-5 giorni.

TS: 10 gg.

confezione da 25 kg sacc.

CHEZOOTIL 40 [LAB] Chezoo - 60:
integratore
per mangimi per suini.

confezione da 2

COPAL TYLAN 100 [LAB] Copalfarm - 8517:
integratore medicato terapeutico

For: 1 kg = tylosina 100000 mg, supporto q.b.

Ind: volatili: malattia cronica respiratoria; suini: enterite necrotica, polmonite enzootica; vitelli: polmoniti da micoplasma.

Pos: volatili: 8-10 g/kg di mangime o 5 g/litro di acqua da bere; suini: 1 g/kg di mangime o 0,04 g/kg di p.v.; vitelli: 20-40 g/kg di mangime (latte in polvere da ricostituire). Somministrare nel mangime accuratamente miscelato o in acqua da bere perfettamente disciolto.

confezioni da 1 - 5 - 25 kg

ELANCO T-20 [LAB] Elanco - 4717:
integratore medicato terapeutico

For: 1 kg = tilosina 200 g, destrosio mon. q.b.

Ind: per il controllo della malattia cronica respiratoria del broiler e della sinusite infettiva dei tacchini e nella prevenzione e cura delle polmoniti dei vitelli.

Pos: broiler: sciogliere 2,5 g di prodotto per litro di acqua di bevanda.

confezioni da 0,5 kg - 1 e 5 kg flac.

ICC-O-TYLOMETA [LAB] Nuova ICC - 6006:
integratore medicato terapeutico

For: 1 kg = tilosina 40.000 mg, sulfametazina 200.000 mg, supporto q.b.

Ind: terapia della polmonite enzootica e della enterite necrotica dei suini, malattie batteriche.

Pos: 250 g ogni 100 kg di mangime; somministrare accuratamente miscelato nel mangime.

feed grade

LEVACOR [LAB] Copalfarm - 8517:
integratore medicato terapeutico

For: 1 kg = tylosina 40.000 mg, tetraciclina [illegible] porto solubile q.b.

Ind: volatili: malattie batteriche respiratorie, [illegible] e dell'apparato genitale, setticemie batte[illegible] cronica respiratoria.

Pos: 2 kg/100 kg di mangime oppure 12,5 g/[illegible] bere. Somministrare nel mangime accura[illegible] lato o nell'acqua di bevanda perfettamen[illegible]

confezioni da 10 - 100 g, 1 - 5 - 25 kg

OXITYL [LAB] Unione Commerc. Lombarda - 8715:
integratore medicato terapeutico

For: 1 kg = tylosina 150000 mg, ossitetraciclina 125000 mg, supporto idrosolubile q.b.

Ind: vitelli da latte: polmoniti da micoplasma e/o pasteurella multocida, pasteurellosi, affezioni complicanti le virosi degli apparati respiratorio e digerente, polmonite enzootica; volatili: malattia cronica respiratoria, malattie batteriche respiratorie, gastro-intestinali e dell'apparato genitale, setticemie batteriche.

Pos: vitelli da latte: 2-2,6 kg/100 kg di latte in polvere da ricostituire; volatili: 550-665 g/100 kg di mangime o 335 g/100 litri di acqua da bere.

confezione da 25 kg

TIELLE 20 [LAB] Chemifarma - 4449:
integratore medicato terapeutico

For: 1 kg = tilosina 200.000 mg, supporto q.b.

Ind: volatili: malattia cronica respiratoria; bovini (vitelli da latte): polmoniti da micoplasma e/o pasteurella multocida.

Pos: volatili: 2,5 g/litro di acqua da bere; bovini (vitelli da latte): 10-20 g/kg di mangime (latte in polvere da ricostituire).

Avv: da cedersi agli allevatori soltanto su presentazione di prescrizione veterinaria.

confezioni da 1 - 5 - 10 kg

TILCLOR [LAB] Centralvet-Vetem - 7044:
integratore medicato terapeutico

For: 1 kg = tilosina 150 g, clortetraciclina 125 g, supporto q.b.

Ind: vitelli da latte: per la terapia e controllo della polmonite da micopiasma e/o pasteurellosi, affezioni complicanti le virosi dell'apparato respiratorio e digerente, polmonite enzootica; volatili: malattie batteriche respiratorie con presa MCR, gastrointestinali e dell'apparato genitale, setticemie batteriche.

Pos: vitelli da latte: 2 kg/q.le di latte in polvere da ricostituire; volatili: 600 g/q.le di mangime.

confezioni da 5 - 25 kg

TIL-FUR [LAB] ATI - 1426:
integratore medicato terapeutico

For: 1 kg = tylosina 200 g, furaltadone cloridrato 60 g, supporto idrosolubile q.b.

Ind: volatili: enteriti batteriche; malattia cronica respiratoria.

Pos: mescolare accuratamente nel mangime; volatili: 400 g/q.le di mangime.

Avv: da cedersi agli allevatori soltanto su presentazione di prescrizione veterinaria.

confezioni da 1 - 5 e 25 kg

TILMIX SULFA PREMIX [LAB] Centralvet-Vetem - 7044:
integratore medicato terapeutico

For: 1 kg = tilosina 200 g, sulfametazina 100 g.

Ind: suini: terapia e controllo della polmonite enzootica da micoplasma e della polmonite causata anche da altri batteri.

Pos: 100 g/q.le di mangime.

confezione da 25 kg

TILMIX 100 [LAB] Centralvet-Vetem - 7044:
integratore medicato terapeutico

For: 1 kg = tilosina 100 g, supporto q.b.

Ind: suini: terapia e controllo della polmonite enzootica, enterite necrotica; volatili: terapia e controllo della malattia cronica respiratoria.

Pos: suini: 100 g/q.le di mangime; volatili: 800-1000 g/q.le di mangime.

confezione da 25 kg

TILMIX 200 LAB Centralvet-Vetem - 7044:
integratore medicato terapeutico

For: 1 kg = tilosina 200 g, supporto q.b.

Ind: suini: terapia e controllo della polmonite enzootica, enterite necrotica; volatili: per la terapia e controllo della malattia cronica respiratorie; bovini (vitelli da latte): per la terapia e controllo della polmonite da micoplasma e/o pasteurella multocida.

Pos: suini: 50 g/q.le di mangime; volatili: 400-500 g/q.le di mangime; bovini: 1-2 kg/q.le di mangime (latte in polvere da ricostituire).

confezioni da 5 e 25 kg

TILMIX 40 LAB Centralvet-Vetem - 7044:
integratore
per suinetti e suini.

confezione da 25 kg

TILOMICIN K LAB ATI - 1426:
specialità medicinale solo uso veterinario

For: «100 ml» flacone a tappo perforabile = tilosina tartrato 3,124 g («500 ml» 15,62 g),kanamicina base (come solfato) 2 g («500 ml» 10 g), N-trimetilglicina ascorbato 1 g («500 ml» 5g); flacone solvente = sodio citrato F.U. VII 4 g («500 ml» 20 g), acqua bidistillata q.b.

Ind: «100 ml»: trattamento delle micoplasmosi aviarie (MCR) dei polli e sinusite infettiva dei tacchini e delle loro complicazioni ed eziologia batterica; «500 ml»: trattamento della micoplasmosi aviare (MCR) dei polli e sinusite infettiva dei tacchini complicate da germi kanamicino-sensibili.

Pos: nei polli e nei tacchini si iniettano nella pelle libera del collo subito dietro la testa 1 ml/kg di peso vivo, senza superare i 2,5 ml per ogni singolo trattamento qualunque sia il peso del soggetto.

TS: tra l'ultimo trattamento e la mattazione degli animali deve trascorrere un periodo di tempo non inferiore a 15 gg.

506213002 S im 1 flac. polv. + flac. solv. 100 ml ast. 6800

506213305 S im 1 flac. polv. + flac. solv. 500 ml ast. 26000

GU B - ricetta medica
0 8795.00 tylosinum + kanamycinum + betainum
GPF 9601 chemioterapici

TILOSIN 200 PREMIX LAB Chemifarma - 4449:
integratore medicato terapeutico

For: 1 kg = tilosina 200.000 mg, supporto q.b.

Ind: volatili: malattia cronica respiratoria; suini: enterite necrotica, polmonite enzootica; bovini (vitelli): polmonite da micoplasma e/o pasteurella multocida.

Pos: volatili: 0,400-0,500 kg/100 kg di mangime accurat te miscelato; suini: 50 g/100 kg di mangime accurat te miscelato (20 mg/kg di p.v.); bovini (vitelli): 1-2 kg di mangime (latte in polvere da ricostituire).

Avv: da cedersi agli allevatori soltanto su presentazione scrizione veterinaria.

confezione da 25 kg

TILOXIN 40 PREMIX LAB Copalfarm - 8517:
integratore
per mangimi per suini.

confezione da 25 kg

TILSOL 200 LIQUIDO LAB Centralvet-Vetem 7044:
integratore medicato terapeutico

For: 1 kg = tilosina 200 g, supporto liquido q.b.

Ind: vitelli da latte: per la terapia e il controllo della po da micoplasmi e/o pasteurella multocida; volatili terapia e controllo della MCR causata da micopla lisepticum e/o sinoviae; tacchini: per la terapia e zione della sinusite infettiva ed aerosacculite; sui rite necrotica, polmonite enzootica.

Pos: vitelli da latte: 1-2 kg/q.le di latte in polvere da ric re; volatili e tacchini: 250 g/100 litri di acqua d suini: 50 g/q.le di mangime.

confezioni da 1 - 5 litri

TILSOL 200 SOLUBILE LAB Centralvet-Vete 7044:
integratore medicato terapeutico

For: 1 kg = tilosina 200 g.

Ind: vitelli da latte: per la terapia e controllo della po da micoplasma e/o pasteurella multocida; volatili terapia e controllo della MCR causata da micopla lisepticum e/o sinoviae; tacchini. per la terapia e zione della sinusite infettiva ed aerosacculite.

Pos: vitelli: 1-2 kg/q.le di latte in polvere da ricostitui tili: 250 g/100 litri di acqua da bere.

confezioni da 1 - 5 kg

TILVET-S LAB Vetitalia - 8718:
integratore medicato terapeutico

For: 1 kg = tilosina 100 g, sulfacloropiridazina 110 g, s solubile q.b.

Ind: vitelli da latte: polmoniti da micoplasmi e/o da pa la multocida; enteriti batteriche, malattie batteriche tili: malattia cronica respiratoria; malattie batteri

Pos: vitelli da latte: 35-40 g di mangime (latte in polv ricostituire), oppure 60-70 g/100 kg di p.v.; volatili di mangime.

TS: tempo di interruzione: 21 giorni.

confezione da 25 kg

TILVET-200 LAB Vetitalia - 8718:
integratore medicato terapeutico

For: 1 kg = tilosina 200 g, supporto solubile q.b.

Ind: vitelli da latte: polmoniti da micoplasmi e/o da pa la multocida; suini: enterite necrotica, polmonite tica; volatili: malattia cronica respiratoria.

Pos: vitelli da latte: 1-2 kg/q.le di mangime (latte in polv ricostituire); suini: 50 g/q.le di mangime; volatili: 4 g/q.le di mangime.

TS: tempo di interruzione: 8 giorni.

confezione da 25 kg

TYCLO 200 LAB Biosint L.F.B. - 3022:
integratore medicato terapeutico

For: 1 kg = tylosina tartrato 200.000 mg, supporto q.b.

Ind: suini: enterite necrotica, polmonite enzotica; volatili: malattia cronica respiratoria.

Pos: suini: 500 mg/l.g oppure 20 mg/kg di p.v. nel mangime; volatili (nel mangime) 4.000-5.000 mg/kg di mangime; volatili (in acqua da bere): 2.500 mg/litro di acqua oppure 125 mg/kg di p.v.

confezione da 0,5 e 10 kg

TYLADD PREMIX LAB Elanco - 4717:
integratore
contenente 40 g di tilosina fosfato per kg; per uso auxinico in suinicoltura.

confezione da 25 kg

TYLADIN 20 LAB Chemifarma - 4449:
integratore medicato terapeutico

For: 1 kg = tilosina tartrato 200 g, supporto q.b.
Ind: volatili: malattia cronica respiratoria; bovini (vitelli da latte): polmoniti da micoplasma e/o pasteurella multocida.
Pos: volatili: 250 g/100 litri di acqua da bere; bovini (vitelli da latte): 1.000-2.000 g/q.le di mangime (latte in polvere da ricostituire).

confezioni da 1 - 5 - 25 kg

TYLAN LAB Elanco - 4717:
specialità medicinale solo uso veterinario

For: tilosina base.
Ind: antibiotico per il trattamento delle polmoniti contagiose dei vitelli, pneumo-enteriti, pododermatiti, metriti, polmoniti batteriche e mastiti acute da germi gram-positivi nei bovini; nei suini per il trattamento del mal rossino, polmoniti, dissenteria emorragica, artriti da PPLO.

506474473	S	"50" iniett. 50 ml (50 mg/ml)	flac. 7000
506474509	S	"200" iniett. 50 ml (200 mg/ml)	flac. 13000
506474556	S	"200" iniett. 100 ml (200 mg/ml)	flac. 23800

cl B - ricetta medica
S 3793.00 tylosinum
QV 9533 antisettici

TYLAN MG 200 PREMIX LAB Elanco - 4717:
integratore medicato terapeutico

For: 1 kg = fosfato di tilosina 200 g.
Ind: affezioni respiratorie ed enterite necrotica o dissenteria emorragica dei suini.
Pos: somministrare 10 g di tilosina per q.le di mangime finito (pari a 0,500 kg di prodotto per q.le) per un periodo indicativo di 8 giorni.

confezione da 25 kg

TYLAN SOLUBILE LAB Elanco - 4717:
specialità medicinale solo uso veterinario

For: tilosina tartrato.
Ind: antibiotico per la prevenzione ed il trattamento della malattia cronica respiratoria dei polli e della sinusite infettiva dei tacchini.

506474903	S	100 g	flac. 44000

cl B - ricetta medica
S 3793.01 tylosinum (tartrato)
QV 9533 antisettici

TYLAN SULFA PREMIX LAB Elanco - 4717:
integratore medicato terapeutico

For: 1 kg = tilosina fosfato 100 g, sulfametazina 100 g.
Ind: per il controllo delle infezioni respiratorie (polmonite enzootica e batterica, riniti), delle enteriti e in casi di malattie da stress e delle linfoadeniti.
Pos: miscelare 100 g di prodotto ogni 100 kg di mangime finito.

confezione da 25 kg

TYLAN 100 PREMIX LAB Elanco - 4717:
integratore medicato terapeutico

For: 1 kg = fosfato di tilosina 100 g.
Ind: affezioni respiratorie ed enterite necrotica o dissenteria emorragica dei suini.
Pos: somministrare 10 g di tilosina per q.le di mangime finito (pari a 0,1 kg di prodotto per q.le) per un periodo indicativo di 8 giorni.

confezione da 25 kg

TYLFUR 125 LAB Virgiliano - 695:
integratore medicato terapeutico

For: 1 kg = tylosina 25.000 mg, furazolidone 100.000 mg, supporto q.b.
Ind: enterite necrotica, polmonite enzootica, enteriti batteriche dei suini.
Pos: suini: 400 g/100 kg di mangime.

confezione da 10 kg

TYLOBRON C LAB SIMB - 8674:
integratore medicato terapeutico

For: 1 kg = tylosina 100.000 mg, furaltadone tartrato 30.000 mg, vit. C (protetta) 10.000 mg, supporto solubile q.b.
Ind: è indicato nel trattamento delle malattie respiratorie ed enteriche dei volatili, soprattutto quando siano sostenute da germi «difficili», quali i mycoplasmi; la vit. C aumenta la resistenza degli animali agli agenti infettivi.
Pos: colombi da gara e uccelli da voliera: 5 g (1 misurino colmo) ogni litro di acqua da bere per 3 gg.
TS: tempo di interruzione: 8 gg.
Avv: da cedersi agli allevatori solo su presentazione di ricetta medico-veterinaria.

polvere solubile da 100 g con misurino da 4,5 g

TYLODIN LAB Biosint L.F.B. - 3022:
integratore medicato terapeutico

For: 1 kg = tylosina 50.000 mg, furaltadone tartrato 15.000 mg, supporto solubile q.b.
Ind: malattia cronica respiratoria ed enterite batterica nei volatili.
Pos: 10 g/litro di acqua da bere.

confezioni da 1-10-25 kg

TYLOSINA SIMB LAB SIMB - 8674:
integratore
per suini.

"40" confezioni da 5-10-25 kg

TYLOSINA 10% FG ASCOR LAB Ascor Chimici - 4129:
integratore medicato terapeutico

For: 1 kg = tylosina 100.000 mg.
Ind: vitelli: polmoniti da micoplasma e/o pasteurrella multocida; suini: enterite necrotica; volatili: malattia cronica respiratoria.
Pos: vitelli: 2000-4000 g/100 kg di latte in polvere da ricostituire; suini: 100 g/100 kg di mangime o 4 g/100 kg di peso vivo; volatili: 800-1000 g/100 kg di mangime.

polvere da 25 kg sacc.

TYLOSINA 100 LAB SIMB - 8674:
integratore medicato terapeutico

For: 1 kg = tylosina 100.000 mg.
Ind: suini: enterite necrotica, polmonite enzootica; volatili: malattia cronica respiratoria; vitelli: polmoniti da micoplasma e/o pasteurella multocida.
Pos: suini: 100 g/q.le di mangime, oppure 4 g ogni 100 kg di peso vivo; volatili: 0,8-1 kg/q.le di mangime, oppure 0,5 kg/q.le di acqua da bere, oppure 2,5 g ogni 10 kg di peso vivo; vitelli: 2-4 kg/q.le di mangime (latte in polvere da ricostituire).

confezioni da 1 - 5 - 10 e 25 kg

TYLOSINA 100/F-UCL LAB Unione Commerc. Lombarda - 8715:
integratore medicato terapeutico

For: 1 kg = tylosina 100.000 mg, supporto q.b.
Ind: vitelli da latte: polmoniti da micoplasma e/o paste multocida; suini: enterite necrotica, polmonite enz volatili: malattia cronica respiratoria.
Pos: vitelli da latte: 20-40 g/kg di latte in polvere da rico re; suini: 100 g/q.le di mangime o 4 g/q.le di p.v.; v 800-1000 g/q.le di mangime.
TS: la somministrazione deve essere sospesa 8 gg. prim macellazione.
Avv: da cedersi agli allevatori soltanto dietro presentazi prescrizione veterinaria.

confezioni da 5 - 25 kg

TYLOSIN 200 L LAB Ascor Chimici - 4129:
integratore medicato terapeutico

For: 1 kg = tilosina 200.000 mg.
Ind: volatili: malattia cronica respiratoria; suini: enter crotica, polmonite enzootica.
Pos: volatili: 250 g/q.le di acqua oppure 12,5 g/q.le d vivo; suini: 50 g/q.le di mangime oppure 2 g/q.le vivo.

liquido

TYLOSIN 200 POLVERE LAB Ascor Chimici -
integratore medicato terapeutico

For: 1 kg = tilosina 200.000 mg.
Ind: volatili: malattia cronica respiratoria; suini: ente crotica, polmonite enzootica.
Pos: volatili: 250 g/q.le di acqua oppure 12,5 g/q.le vivo; suini: 50 g/q.le di mangime oppure 2 g/q.le vivo.

idrosolubile confezioni da 1 - 5 - 10 - 25 kg

TYLOSULFA LAB Copalfarm - 8517:
integratore medicato terapeutico

For: 1 kg = tylosina 20.000 mg, sulfadimetossina 160.(supporto q.b.
Ind: suini: polmonite enzootica, enteriti batteriche, necrotica.
Pos: 500 g/100 kg di mangime. Somministrare nel m accuratamente miscelato.

confezioni da 1 - 5 - 25 kg

TYLOTETRA LAB Pagnini - 5775:
integratore medicato terapeutico

For: 1 kg = tylosina 200 g, ossitetraciclina 160 g, s glucidico q.b.
Ind: volatili: malattie batteriche respiratorie, gastro-int e dell'apparato genitale, malattia cronica respirato ticemie batteriche; vitelli: polmonite enzootica, p te da micoplasma e/o pasteurella multocida, paste affezioni complicanti le virosi dell'apparato dige
Pos: volatili: 4-5 g/kg di mangime o 2,5 g/litro d'acqua giorni; vitelli: 15-20 g/kg di mangime (latte in pol ricostituire) per 3-14 giorni.

solubile da 1 kg
solubile da 50 e 500 g

TYLOX 100 PREMIX LAB Tre I - 8705:
integratore medicato terapeutico

For: 1 kg = tylosina fosfato 109,75 g (pari a 100 g d

Ind: enterite necrotica e polmonite enzootica dei suini; malattia cronica respiratoria dei volatili.
Pos: suini: 100 g/q.le di mangime (oppure 4 g/q.le di peso vivo); volatili: 800-1000 g/q.le di mangime.

polvere da 10 kg sacc.

TYSULFA LAB Unione Commerc. Lombarda - 8715:
integratore medicato terapeutico

For: 1 kg = sulfametazina 200000 mg, tylosina 100000 mg, supporto idrosolubile q.b.
Ind: vitelli da latte: polmoniti da micoplasma e/o pasteurella multocida; polmoniti batteriche.
Pos: vitelli da latte: 3-4 kg/100 kg di latte in polvere da ricostituire.

confezione da 25 kg

TYTETRA LAB Chemicals Laif - 4439:
integratore medicato terapeutico

For: 1 kg = tylosina 50.000 mg, tetraciclina 50.000 mg, supporto (destrosio) q.b.
Ind: vitelli da latte: pasteurellosi, affezioni dell'apparato respiratorio e digerente, polmonite enzootica; vitelli: polmoniti da micoplasma e pasteurella multocida; volatili: malattie batteriche respiratorie, gastrointestinali e dell'apparato genitale, setticemie batteriche, malattia cronica respiratoria.
Pos: vitelli da latte e vitelli: 5.000 g/q.le di mangime; volatili: 1.600 g/q.le di mangime.

idrosolubile da 1-5-10-25 kg

VETIL LAB ATI - 1426:
specialità medicinale solo uso veterinario

For: 100 ml = tilosina base 20 g, alcool benzilico 4 g, glicol propilenico 50 ml, acqua bidistillata q.b.
Ind: indicato nel trattamento delle infezioni da microrganism sensibili ed in particolare nella terapia della broncopol monite enzootica dei suini, delle artriti da micoplasmi delle mastiti acute da microrganismi gram-positivi PPLO delle infezioni podali, del mal rossino e della lep tospirosi; terapia delle metriti, piodermiti e nella terap di supporto dell'enterite necrotica superficiale.
Pos: bovini e suini: 1 ml ogni 20 kg p.v.; cani: 0,5 ml ogni 10-2 kg p.v.

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Produzione e commercio materie prime e intermedi per l'industria chimico-farmaceutica

edi Diosynth

ANTIBIOTICOS S.p.A. - 20146 Milano - Via Romagnoli 6 - tel. (02) 6998.1 - Telex: 353480 ANTIB I - telefax 02-69983229 - 69983213

[Cod. Fisc.: 00818080152]

Growth promoters and antibiotics

Chlortetracycline feed grade, mycelium
Chlortetracycline feed grade, 10%
Chlortetracycline feed grade, 11%
Chlortetracycline hydrochloride
Tylosin phosphate
Tylosin tartrate

C.F.M. Co. Farmaceutica Milanese S.p.A. - 20151 Milano - Via Gallarate 37 - tel. (02) 308.54.41 - 308.42.87 - 308.64.02 - Telex 331204 COFAMI I - telefax 02-38001028

[Cod. Fisc.: 00724750153]

Antibiotici
Antimuffa
Aromatizzanti - Appetibilizzanti per mangimi
Carbadox puro e 10%
Olaquindox puro e 10%
Vitamine

CHEMI s.r.l.

CHEMI S.p.A. - 03010 Patrica (FR) - Via Vadisi 5 - tel. (0775) 20.20.41/2/3 - telex 612023 CHEMO I - telefax 0775-83687 - Uffici Comm.li: V.le Fulvio Testi 117, 20092 Cinisello Balsamo (MI) - tel. (02) 61.28.431 - telex 350852 CHEMI I - telefax 02-6128960

off. prod. n. 5518 del 22-6-76

associata Federchimica

[Cod. Fisc.: 00148870603]

acido oxolinico e sale sodico
acido pipemidico anidro e triidrato

COFARMA S.p.A. - 20148 Milano - Via Don Gnocchi 24 - tel. (02) 40.44.547 (4 linee) - telex 333425 I - telefax 02-4043785

[Cod. Fisc.: 03832110153]

Acido Folico
Amprolium
Biotina pura e al 2%
Diaveridina base
Levamisolo HCl
Mebendazolo
Teobromina
Tetramisolo
Tylosina fosfato
Tylosina Tartrato
Vitamina B2
e molti altri a richiesta

COSTANTINO A. & C. S.p.A. - 10083 Favria Canavese (To) - Via Francesco Romana 11 - tel. (0124) 34.002 - 34.225 - telex 210554 BIOCOS - telefax 0124-348823

[off. prod. opot. 6-12-51]

[Cod. Fisc.: 00480440015]

Materie prime

DEIMOS s.r.l.

DEIMOS S.r.l. - 20131 Milano - Via Capranica 14 - tel. (02) 23.66.125 (8 linee ric. aut.) - telex 332570 DEIMOS I - telefax 02-70635180

[Cod. Fisc.: 08301880152]

associata ASSICC-FNARC

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Edward Mendel Co. Inc. (Penwest Group - U.S.A.) - U.S.A.
Remy Industries N.V. - Belgio
Moehs S.A. - Spagna
Siegfried Ag - Svizzera
Foirmount Chemical Co. Inc. - U.S.A.
A.T.P. - Formosa
Tessenderlo Chemie - Belgio
Nippon Rika - Giappone
Poli Industria Chimica S.p.a. - Italia
Gennenau Capz. International - Francia
Orchimie - Francia
Giulini Chemie GmbH - Germania

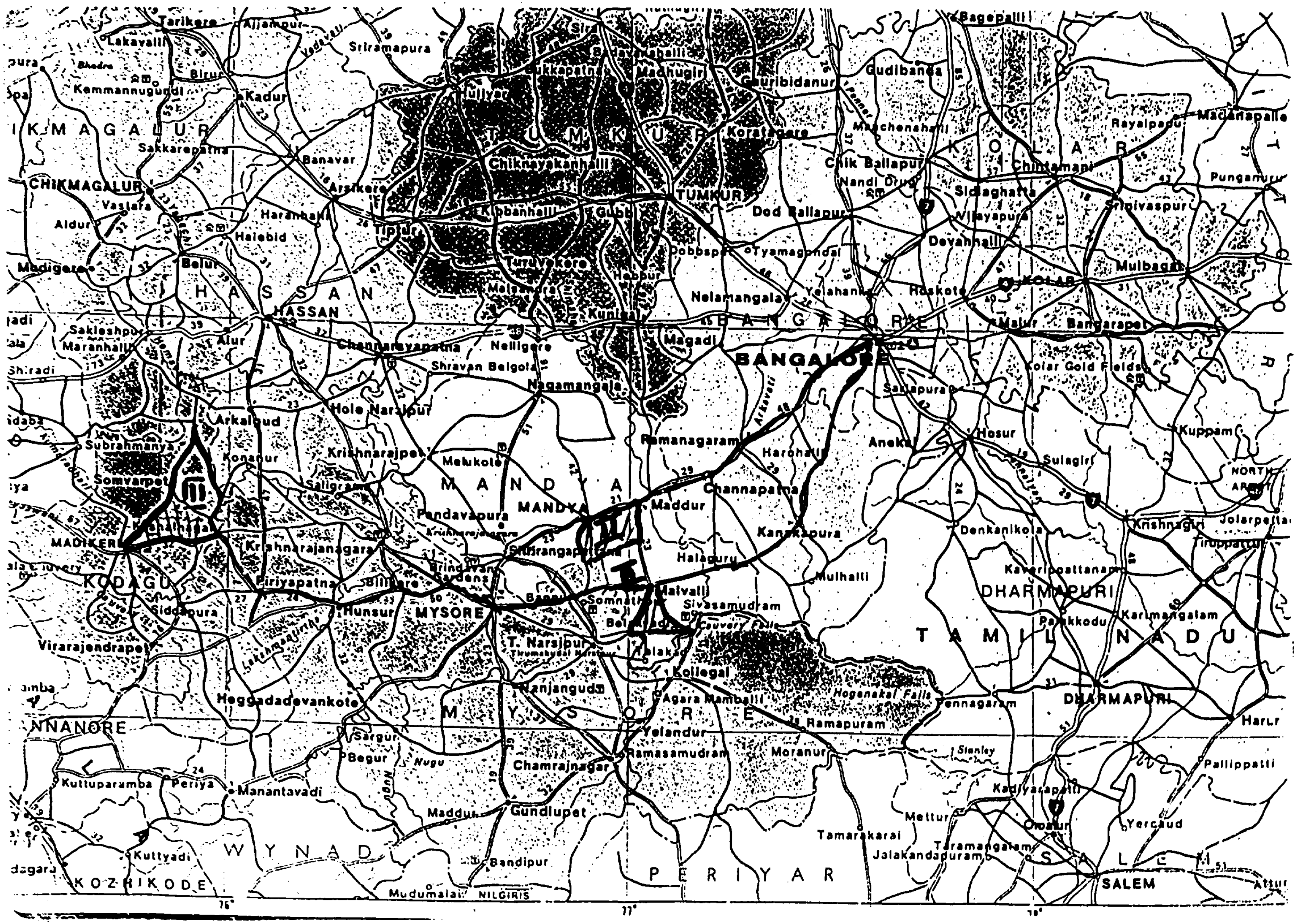
— Materie prime destinate all'industria farmaceutica, alimentare, zootecnica, cosmetica ed essenziera.

acido oxolinico e sale sodico

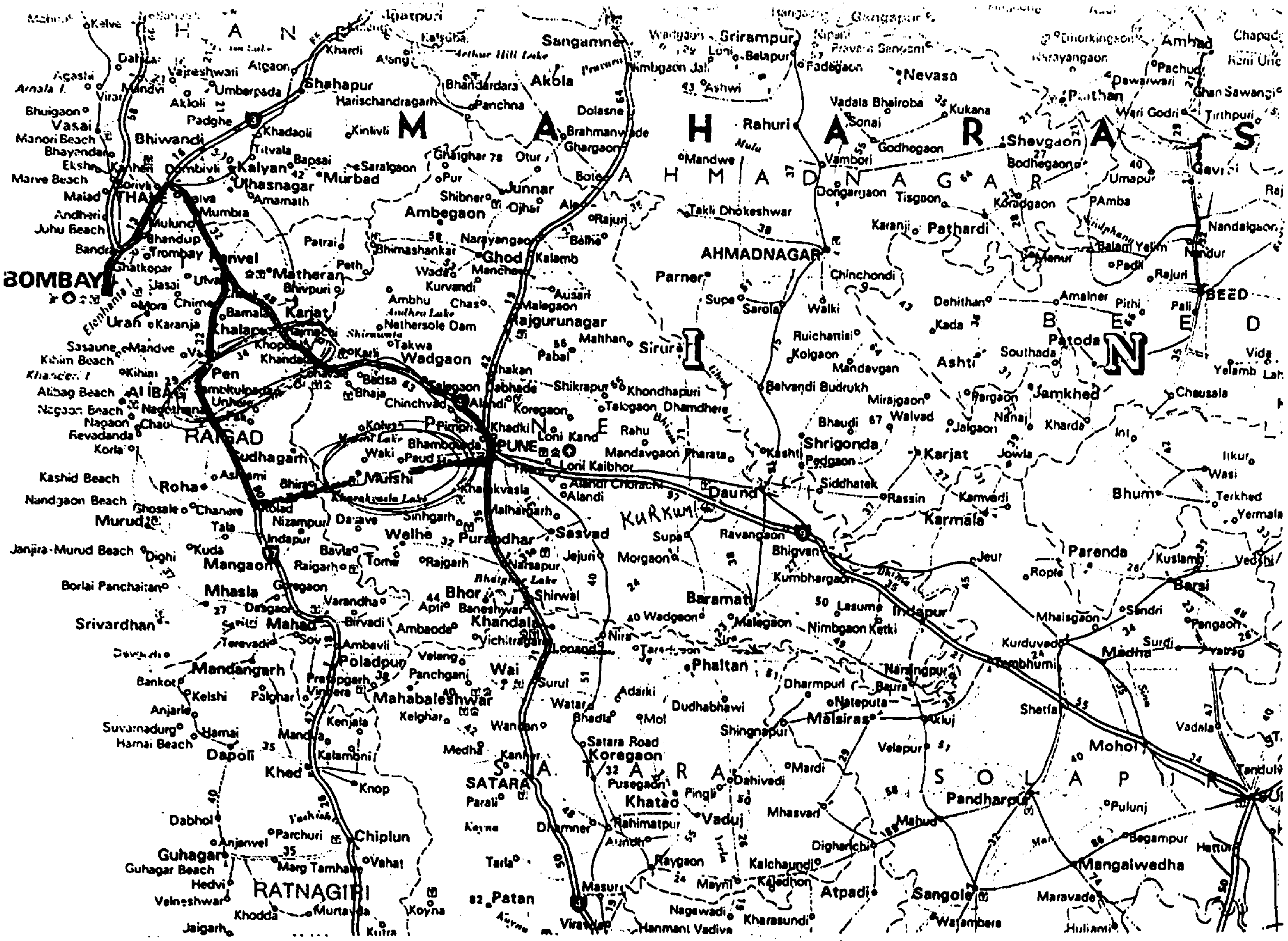
ANNEX 4

LOCATION AND SITE MAPS

MAP OF THE LOCATIONS IN KARNATAKA STATE

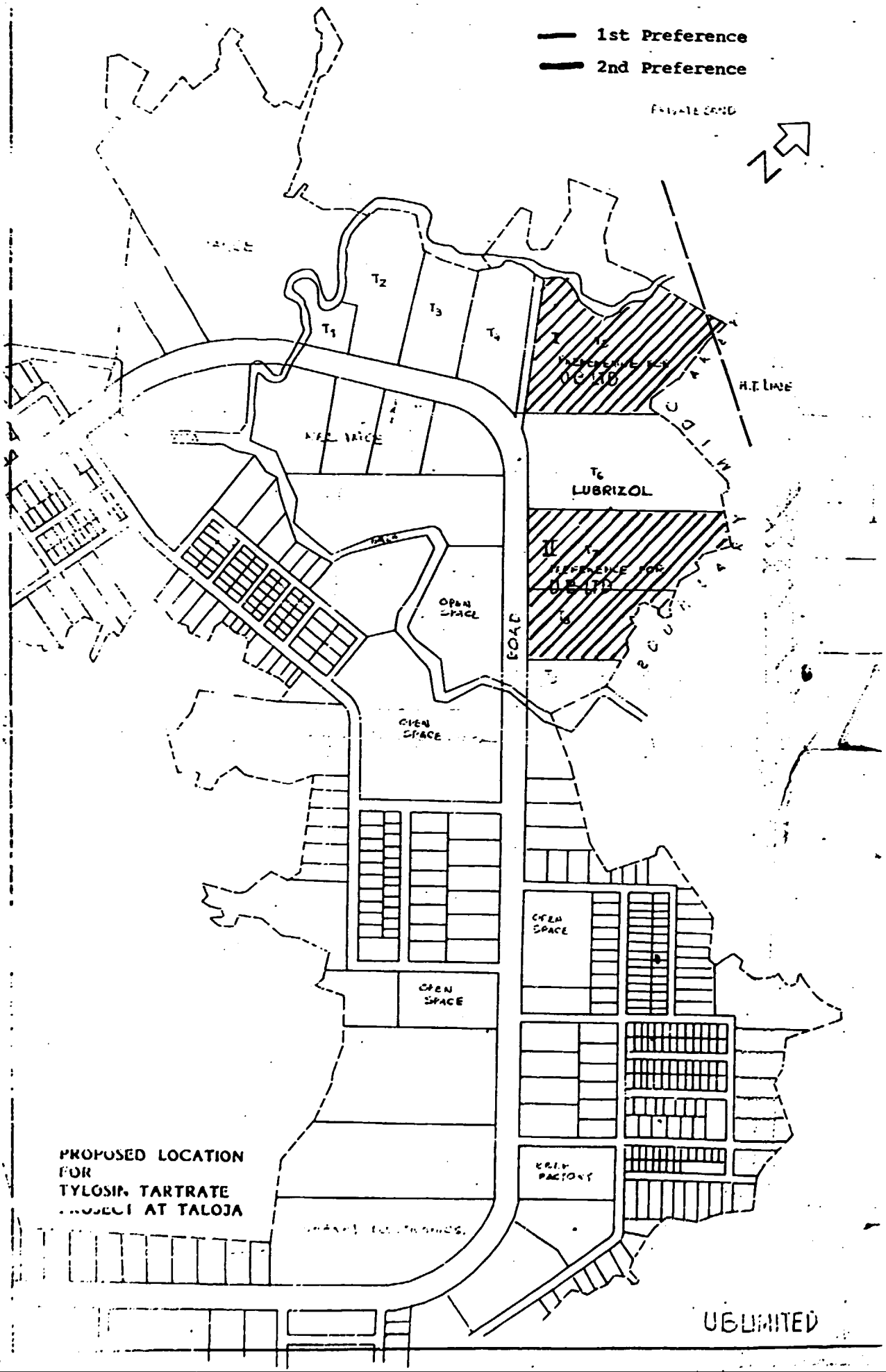

CHIKMAGALUR
HASSAN
TUMKUR
KOLAR
BANGALORE
MANDYA
MYSORE
KODAGU
DHARMAPURI
TAMIL NADU
SALEM
PERIYAR
WYNAD
KOZHIKODE
Tarikere
Aljampur
Lakavalli
Srirampura
Kemmannugundi
Kadur
Birur
Sakkarepatna
Banavar
Arsikere
Vastara
Aldur
Halebid
Haranhalli
Tiptur
Mudigere
Belur
Sakleshpur
Maranhalli
Alur
Channarayapatna
Nelligere
Shravan Belgola
Hole Narsipur
Arkalgud
Subrahmanya
Somvarpet
Konanur
Krishnarajpet
Melukote
Saligram
Pandavapura
Krishnarajanagara
Madikeri
Piriyapatna
Hunsur
Siddapura
Virarajendrapet
Heggadadevankote
Sargur
Begur
Nugu
Kuttuparamba
Periya
Manantavadi
Kuttyadi
Maddur
Gundlupet
Bandipur
Mudumalai
NILGIRIS
Chamrajnagar
Ramasamudram
Yelandur
Agara Mamballi
Kollegal
Ramapuram
Hogenakal Falls
Pennagaram
Moranur
Stanley
Mettur
Tamarakarai
Jalakandapuram
Taramangalam
Kadiyarapatti
Yercaud
Pallippatti
Harur
Dharmapuri
Palakkodu
Karimangalam
Kaveripattanam
Denkanikota
Krishnagiri
Jolarpettai
Tiruppattur
Hosur
Sulagiri
Kuppam
Anekal
Sarjapura
Kolar Gold Fields
Malur
Bangarapet
Kolar
Hoskote
Mulbagal
Srinivaspur
Devanhalli
Vijayapura
Sidlaghatta
Chintamani
Rayalpadu
Madanapalle
Pungamur
Bagepalli
Gudibanda
Gauribidanur
Chik Ballapur
Nandi Drug
Manchenahalli
Koratagere
Madhugiri
Dod Ballapur
Dobbspet
Tyamagondal
Nelamangala
Yelahanka
Magadi
Kunigal
Hebbur
Gubbi
Turuvekere
Chiknayakanhalli
Kibbanhalli
Huliyar
Ramanagaram
Channapatna
Harohalli
Kanakapura
Halaguru
Malvalli
Mulhalli
Sivasamudram
Cauvery Falls
Srirangapatna
Brindavan Gardens
Somnathpur
T. Narsipur
Nanjangud
Talakad
Mandya
Nagamangala
Bilikere
Arkavati
Hemavati
Pennar
Bhadra
Lakshmantirtha
NORTH ARCOT
NNANORE
76°
77°
78°

MAP OF THE LOCATIONS IN MAHARASHTRA STATE



M A H A R A S
A H M A D N A G A R
B E E D
P U N E
S A T A R A
S O L A P U R
BOMBAY
THANE
RAIGAD
RATNAGIRI
AHMADNAGAR
PUNE
SATARA
Kalyan
Ulhasnagar
Bhiwandi
Shahapur
Murbad
Vasai
Panvel
Uran
Pen
Alibag
Karjat
Khopoli
Khandala
Lonavla
Matheran
Roha
Murud
Mangaon
Mhasla
Srivardhan
Mahad
Poladpur
Dapoli
Khed
Chiplun
Guhagar
Mahabaleshwar
Wai
Bhor
Pachgani
Junnar
Ambegaon
Ghod
Rajgurunagar
Wadgaon
Talegaon Dabhade
Pimpri
Khadki
Mulshi
Sinhagarh
Saswad
Purandhar
Jejuri
Shirwal
Daund
Baramati
Indapur
Phaltan
Koregaon
Khatad
Vaduj
Patan
Karad
Sangamner
Akola
Rahuri
Srirampur
Nevasa
Shevgaon
Pathardi
Parner
Sirur
Shrigonda
Karjat
Jamkhed
Ashti
Patoda
Karmala
Madha
Kurduvadi
Tembhurni
Malsiras
Akluj
Pandharpur
Sangole
Mangalwedha
Mohol
Barsi
Paranda
Bhum
Kukana
Khandala
Kurkumb
Bhigvan
Bhimashankar
Sudhagarh
Janjira-Murud Beach
Kashid Beach
Juhu Beach
Alibag Beach
Harishchandragarh
Arthur Hill Lake
Khadakvasla Lake
Bhatghar Lake
Andhra Lake

MAP OF TALOJA INDUSTRIAL AREA


1st Preference
2nd Preference
T1
T2
T3
T4
T5
T6
LUBRIZOL
OPEN SPACE
OPEN SPACE
OPEN SPACE
OPEN SPACE
ROAD
H.T. LINE
PROPOSED LOCATION FOR TYLOSIN TARTRATE PROJECT AT TALOJA
UBLIMITED

ANNEX 5

BUILDING SPECIFICATIONS

BUILDING SPECIFICATIONS

- Fermentation Area	: Steel columns and Trusses 20 M x 60 m x 22 m high
	: Walling to 15 m high
	: Aluminium Sheet Cladding to 22 m high
	: Roofing with Aluminium Sheeting
	: Internal wall finishes by washable chemical resistance surfacing
	: Heavy Duty ironite flooring
- Process Area	: Steel Columns and Trusses 20 m x 70 m x 12 m High
	: Walling to 7 M high
	: Aluminium Sheet cladding to 12 m high
	: Roofing with Aluminium Structure
	: Internal wall finish as above
	: Heavy duty ironite flooring
- Pilot Plant Area	: R.C.C. Columns, Beams and Roofings 20 m x 50 m 5.5 m High
	: Air-conditioning for micro-processor Area
Ground Floor	: Walling to full height
	: Tiling on floor and walls upto 2 m high
	: Rest of wall, washable finish
- Micro-biology and Quality	: RCC Columns, beams, roofing Control Lab 20mx50 m x3.5 m: Walling to full height Second Floor
	: Fully air-conditioned
	: Tiling on floor and upto 2 m on wall
- Stores area	: RCC Columns, beams, roofing 20 m x 50 m x 5.5 m high
	: Ground Floor Walling to full high
	: Heavy Duty ironite flooring
	: Standard industrial finishing

- Office Area 20 m x 50 m x 3.5 m high Second Floor	: RCC Columns and roofings
	: Walling to full high
	: Fully air conditioned
	: Office interior finishing
- Utility Area 30 m x 30 m x 5.2 m high - 2 nos.	: Steel columns and Trusses
	: Walling to 3 m high
	: Cladding by Aluminium Sheeting upto 5.2 m
	: Aluminium Sheet roofing
	: Heavy Duty ironite flooring
- Canteen & Loker Room 30 m x 20 m x 3.5 m high	: Steel columns and Trusses
	: Walling to full high
	: Standard Shahabad flooring
	: Provision for internal Purlin & Crossing

ANNEX 6

BASE CASE

COMFAR OUTPUT TABLES

TYLOSIN TARTRATE PLANT
Sept.91
CASO BASE 108 ton/y - techn. deprec.

2 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 0.0370 units accounting currency
accounting currency: US Dollars, Thousands

Total initial investment during construction phase

fixed assets:	24421.81	50.085 % foreign
current assets:	0.00	0.000 % foreign
total assets:	24421.81	50.085 % foreign

Source of funds during construction phase

equity & grants:	8636.40	10.479 % foreign
foreign loans :	11327.10	
local loans :	4540.36	
total funds :	24503.86	49.919 % foreign

Cashflow from operations

Year:	1	3	5
operating costs:	2307.03	3984.35	4330.45
depreciation :	2047.56	2139.96	2139.96
interest :	1759.86	1657.86	1076.79
production costs	6114.45	7782.17	7547.20
thereof foreign	40.44 %	33.61 %	30.34 %

total sales	:	4324.00	9494.02	10152.04
gross income	:	-1790.45	1667.40	2530.76
net income	:	-1790.45	1640.66	2467.49
cash balance	:	-373.73	925.29	1940.91
net cashflow	:	924.13	5175.37	5609.93

Net Present Value at: 10.00 % = 13063.21
Internal Rate of Return: 18.04 %
Return on equity1: 19.19 %
Return on equity2: 21.09 %

Index of Schedules produced by COMFAR

Total Initial Investment in US Dollars, Thousands

Year	1992.1	1992.2	1993.1	1993.2
Fixed investment costs				
Land, site preparation, development	1098.977	0.000	0.000	0.000
Buildings and civil works	0.000	255.576	638.940	383.364
Auxiliary and service facilities	0.000	0.000	0.000	0.000
Incorporated fixed assets	902.300	1208.380	1551.924	937.988
Plant machinery and equipment	835.000	1381.592	10109.720	2909.240
Total fixed investment costs	2836.777	2845.548	12300.580	4230.592
Pre-production capital expenditures	142.461	323.441	705.276	1037.135
Net working capital	0.000	0.000	0.000	0.000
Total initial investment costs	2979.237	3168.989	13005.860	5267.727
Of it foreign, in %	50.287	22.671	61.942	37.187

Total Current Investment in US Dollars, Thousands

Year	1994	1995	1996	1997	1998
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	462.000	0.000	0.000	0.000	0.000
Plant, machinery and equipment	0.000	0.000	0.000	0.000	0.000
Total fixed investment costs	462.000	0.000	0.000	0.000	0.000
Preproduction capitals expenditures	0.000	0.000	0.000	0.000	0.000
Working capital	630.839	312.745	263.104	109.374	74.309
Total current investment costs	1092.839	312.745	263.104	109.374	74.309
Of it foreign, %	43.924	13.039	7.844	19.234	37.474

Total Production Costs in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
% of nom. capacity (single product).	46.296	75.000	95.370	100.000	100.000	100.000	100.000
Raw material 1	938.604	1520.538	1933.524	2027.384	2027.384	2027.384	2027.384
Other raw materials	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Utilities	187.546	281.319	347.867	362.992	362.992	362.992	362.992
Energy	159.716	224.018	269.651	280.022	280.022	280.022	280.022
Labour, direct	154.432	177.014	193.040	196.682	196.682	196.682	196.682
Repair, maintenance	152.346	152.346	304.728	380.882	457.074	457.074	457.074
Spares	0.000	76.283	152.556	228.838	305.111	305.111	305.111
Factory overheads	222.240	222.240	222.240	222.240	222.240	222.240	222.240
Factory costs	1814.884	2653.757	3423.606	3699.042	3851.505	3851.505	3851.505
Administrative overheads	275.948	275.948	275.948	275.948	275.948	275.948	275.948
Indir. costs, sales and distribution	216.200	371.300	284.800	203.000	203.000	203.000	203.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Depreciation	2047.558	2139.958	2139.958	2139.958	2139.958	2139.958	2047.558
Financial costs	1759.857	1779.492	1657.857	1367.321	1076.785	786.249	495.713
Total production costs	6114.447	7220.456	7782.170	7685.269	7547.197	7256.661	6873.725
Costs per unit (single product)	122.289	89.141	75.555	71.160	69.881	67.191	63.646
Of it foreign, %	40.440	38.524	33.606	31.383	30.345	29.309	27.219
Of it variable,%	20.116	27.596	32.559	34.570	35.202	36.611	38.651
Total labour	226.660	249.242	265.268	268.910	268.910	268.910	268.910

Total Production Costs in US Dollars, Thousands

Year	2001	2002	2003	2004- 8
% of nom. capacity (single product).	100.000	100.000	100.000	100.000
Raw material 1	2027.384	2027.384	2027.384	2027.384
Other raw materials	0.000	0.000	0.000	0.000
Utilities	362.992	362.992	362.992	362.992
Energy	280.022	280.022	280.022	280.022
Labour, direct	196.682	196.682	196.682	196.682
Repair, maintenance	457.074	457.074	457.074	457.074
Spares	305.111	305.111	305.111	305.111
Factory overheads	222.240	222.240	222.240	222.240
Factory costs	3851.505	3851.505	3851.505	3851.505
Administrative overheads	275.948	275.948	275.948	275.948
Indir. costs, sales and distribution	203.000	203.000	203.000	203.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000
Depreciation	2047.558	2047.558	2047.558	63.894
Financial costs	205.177	41.771	0.000	0.000
Total production costs	6583.188	6419.783	6378.012	4394.347
Costs per unit (single product)	60.955	59.442	59.056	40.688
Of it foreign, %	25.938	24.053	23.556	8.422
Of it variable,%	40.357	41.384	41.655	60.459
Total labour	268.910	268.910	268.910	268.910

Net Working Capital in US Dollars, Thousands

Year	adc	coto	1994	1995	1996	1997	1998	1999-2008
Coverage								
Current assets &								
Accounts receivable	30	12.0	192.253	276.318	335.733	354.339	367.044	367.044
Inventory and materials	55	6.5	172.063	276.866	351.243	368.147	368.147	368.147
Energy	0	---	0.000	0.000	0.000	0.000	0.000	0.000
Spares	180	2.0	0.000	38.141	76.278	114.419	152.556	152.556
Work in progress	15	24.0	75.620	108.832	139.169	148.905	153.517	153.517
Finished products	30	12.0	174.236	240.660	301.334	320.805	330.029	330.029
Cash in hand	30	12.0	67.080	75.319	95.709	108.716	121.421	121.421
Total current assets			681.252	1016.138	1299.466	1415.331	1492.714	1492.714
Current liabilities and								
Accounts payable	10	36.0	50.413	72.555	92.779	99.270	102.345	102.345
Net working capital			630.839	943.583	1206.687	1316.061	1390.370	1390.370
Increase in working capital			630.839	312.745	263.104	109.374	74.309	0.000
Net working capital, local			612.822	884.788	1127.254	1215.591	1262.053	1262.053
Net working capital, foreign			18.017	58.795	79.433	100.470	128.317	128.317

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

Source of Finance, production in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999-2000	2001	2002
Equity, ordinary ..	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Equity, preference.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subsidies, grants .	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, foreign .	462.000	-1431.000	-1431.000	-1431.000	-1431.000	-1431.000	-1431.000	0.000
Loan B, foreign..	0.000	0.000	-253.157	-253.157	-253.157	-253.157	-253.157	-253.157
Loan C, foreign .	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, local....	0.000	0.000	-908.073	-908.073	-908.073	-908.073	0.000	0.000
Loan B, local....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total loan	462.000	-1431.000	-2592.230	-2592.230	-2592.230	-2592.230	-1684.157	-253.157
Current liabilities	50.413	22.141	20.224	6.490	3.075	0.000	0.000	0.000
Bank overdraft	291.682	-291.682	0.000	0.000	0.000	0.000	0.000	0.000
Total funds	804.095	-1700.540	-2572.005	-2585.739	-2589.155	-2592.230	-1684.157	-253.157

Cashflow Tables, construction in US Dollars, Thousands

Year	1992.1	1992.2	1993.1	1993.2
Total cash inflow	2979.281	3169.166	13006.100	5349.308
Financial resources	2979.281	3169.166	13006.100	5349.308
Sales, net of tax	0.000	0.000	0.000	0.000
Total cash outflow	2979.237	3168.989	13005.860	5267.727
Total assets	2925.673	2997.412	12506.160	4450.979
Operating costs	0.000	0.000	0.000	0.000
Cost of finance	53.565	171.577	499.704	816.747
Repayment	0.000	0.000	0.000	0.000
Corporate tax	0.000	0.000	0.000	0.000
Dividends paid	0.000	0.000	0.000	0.000
Surplus (deficit)	0.044	0.177	0.243	81.581
Cumulated cash balance	0.044	0.221	0.464	82.045
Inflow, local	1481.081	2450.566	4949.803	3390.308
Outflow, local	1481.092	2450.535	4949.783	3308.805
Surplus (deficit)	-0.000	0.031	0.020	81.503
Inflow, foreign	1498.200	718.600	8056.300	1959.000
Outflow, foreign	1498.156	718.454	8056.077	1958.922
Surplus (deficit)	0.044	0.146	0.223	0.078
Net cashflow	-2925.673	-2997.412	-12506.160	-4450.979
Cumulated net cashflow	-2925.673	-5923.084	-18429.240	-22880.220

Cashflow tables, production in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
Total cash inflow	4836.414	7433.333	9469.799	9990.718	10081.030	10077.960	10077.960
Financial resources	512.413	22.141	20.224	6.490	3.075	0.000	0.000
Sales, net of tax	4324.000	7411.191	9449.574	9984.228	10077.960	10077.960	10077.960
Total cash outflow	5210.141	6847.687	8544.512	8311.416	8140.121	7779.464	7498.501
Total assets	1143.252	334.886	283.328	115.864	77.384	0.000	0.000
Operating costs	2307.032	3301.005	3984.353	4177.989	4330.453	4330.453	4330.453
Cost of finance	1759.857	1779.492	1657.857	1367.321	1076.785	786.249	495.713
Repayment	0.000	1431.000	2592.230	2592.230	2592.230	2592.230	2592.229
Corporate tax	0.000	1.304	26.743	58.012	63.269	70.532	80.106
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	-373.728	585.646	925.287	1679.302	1940.913	2298.494	2579.457
Cumulated cash balance	-291.683	293.963	1219.250	2898.552	4839.465	7137.959	9717.416
Inflow, local	50.413	101.333	257.799	402.448	399.032	395.958	395.958
Outflow, local	3389.718	3918.987	5449.160	5419.092	5362.623	5193.218	5075.662
Surplus (deficit)	-3339.304	-3717.654	-5191.361	-5016.644	-4963.590	-4797.261	-4679.704
Inflow, foreign	4786.000	7332.000	9212.000	9588.270	9682.000	9682.000	9682.000
Outflow, foreign	1820.423	3028.700	3095.352	2892.324	2777.498	2586.246	2422.840
Surplus (deficit)	2965.577	4303.300	6116.648	6695.945	6904.502	7095.754	7259.160
Net cashflow	924.130	3796.138	5175.374	5638.853	5609.927	5676.973	5667.399
Cumulated net cashflow	-21956.090	-18159.950	-12984.580	-7345.726	-1735.798	3941.175	9608.574

Cashflow tables, production in US Dollars, Thousands

Year	2001	2002	2003	2004	2005	2006	2007
Total cash inflow	10077.960	10077.960	10077.960	10077.960	10077.960	10077.960	10077.960
Financial resources	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	10077.960	10077.960	10077.960	10077.960	10077.960	10077.960	10077.960
Total cash outflow	6307.158	4716.835	4422.951	4472.543	4472.543	4472.543	4472.543
Total assets	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	4330.453	4330.453	4330.453	4330.453	4330.453	4330.453	4330.453
Cost of finance	205.177	41.771	0.000	0.000	0.000	0.000	0.000
Repayment	1684.157	253.157	0.000	0.000	0.000	0.000	0.000
Corporate tax	87.369	91.454	92.499	142.090	142.090	142.090	142.090
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	3770.802	5361.123	5655.007	5605.415	5605.415	5605.415	5605.415
Cumulated cash balance	13488.220	19849.340	24504.350	30109.760	35715.180	41320.590	46926.000
Inflow, local	395.958	395.958	395.958	395.958	395.958	395.958	395.958
Outflow, local	4047.722	4051.807	4052.852	4102.443	4102.443	4102.443	4102.443
Surplus (deficit)	-3651.765	-3655.850	-3656.894	-3706.486	-3706.486	-3706.486	-3706.486
Inflow, foreign	9682.000	9682.000	9682.000	9682.000	9682.000	9682.000	9682.000
Outflow, foreign	2259.434	665.028	370.100	370.100	370.100	370.100	370.100
Surplus (deficit)	7422.566	9016.973	9311.900	9311.900	9311.900	9311.900	9311.900
Net cashflow	5660.136	5656.051	5655.007	5605.415	5605.415	5605.415	5605.415
Cumulated net cashflow	15268.710	20924.760	26579.770	32185.180	37790.600	43396.010	49001.430

Cashflow tables, production in US Dollars, Thousands

Year	2008
Total cash inflow . .	10077.960
Financial resources .	0.000
Sales, net of tax . .	10077.960
Total cash outflow . .	4472.543
Total assets	0.000
Operating costs . . .	4330.453
Cost of finance . . .	0.000
Repayment	0.000
Corporate tax . . .	142.090
Dividends paid . . .	0.000
Surplus (deficit) .	5605.415
Cumulated cash balance	52531.420
Inflow, local	395.958
Outflow, local	4102.443
Surplus (deficit) .	-3706.486
Inflow, foreign . . .	9682.000
Outflow, foreign . . .	370.100
Surplus (deficit) .	9311.900
Net cashflow	5605.415
Cumulated net cashflow	54606.840

Cashflow Discounting:

a) Equity paid versus Net income flow:

Net present value	9001.14	at	10.00 %
Internal Rate of Return (IRRE1) ..	19.19 %		

b) Net Worth versus Net cash return:

Net present value	11185.00	at	10.00 %
Internal Rate of Return (IRRE2) ..	21.09 %		

c) Internal Rate of Return on total investment:

Net present value	13063.21	at	10.00 %
Internal Rate of Return (IRR) ..	18.04 %		

Net Worth = Equity paid plus reserves

Net Income Statement in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999
Total sales, incl. sales tax	4324.000	7426.007	9494.022	10058.310	10152.040	10152.040
Less: variable costs, incl. sales tax.	1229.985	2007.392	2578.218	2730.847	2730.847	2730.847
Variable margin	3094.015	5418.616	6915.805	7327.460	7421.190	7421.190
As % of total sales	71.554	72.968	72.844	72.850	73.101	73.101
Non-variable costs, incl. depreciation	3124.604	3448.388	3590.543	3661.179	3813.644	3813.644
Operational margin	-30.590	1970.228	3325.262	3666.281	3607.547	3607.547
As % of total sales	-0.707	26.531	35.025	36.450	35.535	35.535
Cost of finance	1759.857	1779.492	1657.857	1367.321	1076.785	786.249
Gross profit	-1790.447	190.735	1667.404	2298.959	2530.761	2821.298
Allowances	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	-1790.447	190.735	1667.404	2298.959	2530.761	2821.298
Tax	0.000	1.304	26.743	58.012	63.269	70.532
Net profit	-1790.447	189.432	1640.661	2240.948	2467.492	2750.765
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-1790.447	189.432	1640.661	2240.948	2467.492	2750.765
Accumulated undistributed profit	-1790.447	-1601.016	39.645	2280.593	4748.085	7498.851
Gross profit, % of total sales	-41.407	2.568	17.563	22.856	24.929	27.790
Net profit, % of total sales	-41.407	2.551	17.281	22.280	24.305	27.096
ROE, Net profit, % of equity	-20.731	2.193	18.997	25.948	28.571	31.851
ROI, Net profit+interest, % of invest.	-0.128	8.107	13.437	14.633	14.330	14.301

Net Income Statement in US Dollars, Thousands

Year	2000	2001	2002	2003	2004	2005
Total sales, incl. sales tax	10152.040	10152.040	10152.040	10152.040	10152.040	10152.040
Less: variable costs, incl. sales tax.	2730.847	2730.847	2730.847	2730.847	2730.847	2730.847
Variable margin	7421.190	7421.190	7421.190	7421.190	7421.190	7421.190
As % of total sales	73.101	73.101	73.101	73.101	73.101	73.101
Non-variable costs, incl. depreciation	3721.244	3721.244	3721.243	3721.243	1737.579	1737.579
Operational margin	3699.946	3699.947	3699.947	3699.947	5683.611	5683.611
As % of total sales	36.445	36.445	36.445	36.445	55.985	55.985
Cost of finance	495.713	205.177	41.771	0.000	0.000	0.000
Gross profit	3204.233	3494.770	3658.176	3699.947	5683.611	5683.611
Allowances	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	3204.233	3494.770	3658.176	3699.947	5683.611	5683.611
Tax	80.106	87.369	91.454	92.499	142.090	142.090
Net profit	3124.127	3407.400	3566.721	3607.448	5541.521	5541.521
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	3124.127	3407.400	3566.721	3607.448	5541.521	5541.521
Accumulated undistributed profit	10622.980	14030.380	17597.100	21204.550	26746.070	32287.590
Gross profit, % of total sales	31.562	34.424	36.034	36.445	55.985	55.985
Net profit, % of total sales	30.773	33.564	35.133	35.534	54.585	54.585
ROE, Net profit, % of equity	36.174	39.454	41.299	41.770	64.165	64.165
ROI, Net profit+interest, % of invest.	14.636	14.607	14.590	14.586	22.406	22.406

Net Income Statement in US Dollars, Thousands

Year	2006	2007	2008
Total sales, incl. sales tax	10152.040	10152.040	10152.040
Less: variable costs, incl. sales tax.	2730.847	2730.847	2730.847
Variable margin	7421.190	7421.190	7421.190
As % of total sales	73.101	73.101	73.101
Non-variable costs, incl. depreciation	1737.579	1737.579	1737.579
Operational margin	5683.611	5683.611	5683.611
As % of total sales	55.985	55.985	55.985
Cost of finance	0.000	0.000	0.000
Gross profit	5683.611	5683.611	5683.611
Allowances	0.000	0.000	0.000
Taxable profit	5683.611	5683.611	5683.611
Tax	142.090	142.090	142.090
Net profit	5541.521	5541.521	5541.521
Dividends paid	0.000	0.000	0.000
Undistributed profit	5541.521	5541.521	5541.521
Accumulated undistributed profit	37829.110	43370.630	48912.140
Gross profit, % of total sales	55.985	55.985	55.985
Net profit, % of total sales	54.585	54.585	54.585
ROE, Net profit, % of equity	64.165	64.165	64.165
ROI, Net profit+interest, % of invest.	22.406	22.406	22.406

Projected Balance Sheets, construction in US Dollars, Thousands

Year	1992.1	1992.2	1993.1	1993.2
Total assets	2979.281	6148.447	19154.550	24503.860
Fixed assets, net of depreciation	0.000	2979.237	6118.226	19154.090
Construction in progress	2979.237	3168.989	13005.860	5267.727
Current assets	0.000	0.000	0.000	0.000
Cash, bank	0.000	0.000	0.000	0.000
Cash surplus, finance available	0.044	0.221	0.465	82.047
Loss carried forward	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000
Total liabilities	2979.281	6148.447	19154.550	24503.860
Equity capital	1492.824	2591.801	5018.087	8636.396
Reserves, retained profit	0.000	0.000	0.000	0.000
Profit	0.000	0.000	0.000	0.000
Long and medium term debt	1486.457	3556.647	14136.460	15867.460
Current liabilities	0.000	0.000	0.000	0.000
Bank overdraft, finance required	0.000	0.000	0.000	0.000
Total debt	1486.457	3556.647	14136.460	15867.460
Equity, % of liabilities	50.107	42.154	26.198	35.245

Projected Balance Sheets, Production in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
Total assets	25307.950	23796.840	22676.070	20730.260	20608.600	20767.130	21299.030
Fixed assets, net of depreciation	22374.250	20696.290	18556.340	16416.380	14276.420	12136.460	10098.900
Construction in progress	462.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	814.172	940.819	1203.757	1306.615	1371.293	1371.293	1371.293
Cash, bank	87.080	75.319	95.709	108.716	121.421	121.421	121.421
Cash surplus, finance available	0.000	293.965	1219.250	2898.553	4839.466	7137.962	9717.417
Loss carried forward	0.000	1790.447	1601.016	0.000	0.000	0.000	0.000
Loss	1790.447	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	25307.950	23796.840	22676.070	20730.260	20608.600	20767.130	21299.030
Equity capital	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396
Reserves, retained profit	0.000	0.000	0.000	39.645	2280.593	4748.085	7498.851
Profit	0.000	189.432	1640.661	2240.948	2467.492	2750.765	3124.127
Long and medium term debt	16329.460	14898.460	12306.230	9714.004	7121.774	4529.544	1937.315
Current liabilities	50.413	72.555	92.779	99.270	102.345	102.345	102.345
Bank overdraft, finance required	291.680	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	16671.550	14971.020	12399.010	9813.273	7224.119	4631.889	2039.659
Equity, % of liabilities	34.125	36.292	38.086	41.661	41.907	41.587	40.548

Projected Balance Sheets, Production in US Dollars, Thousands

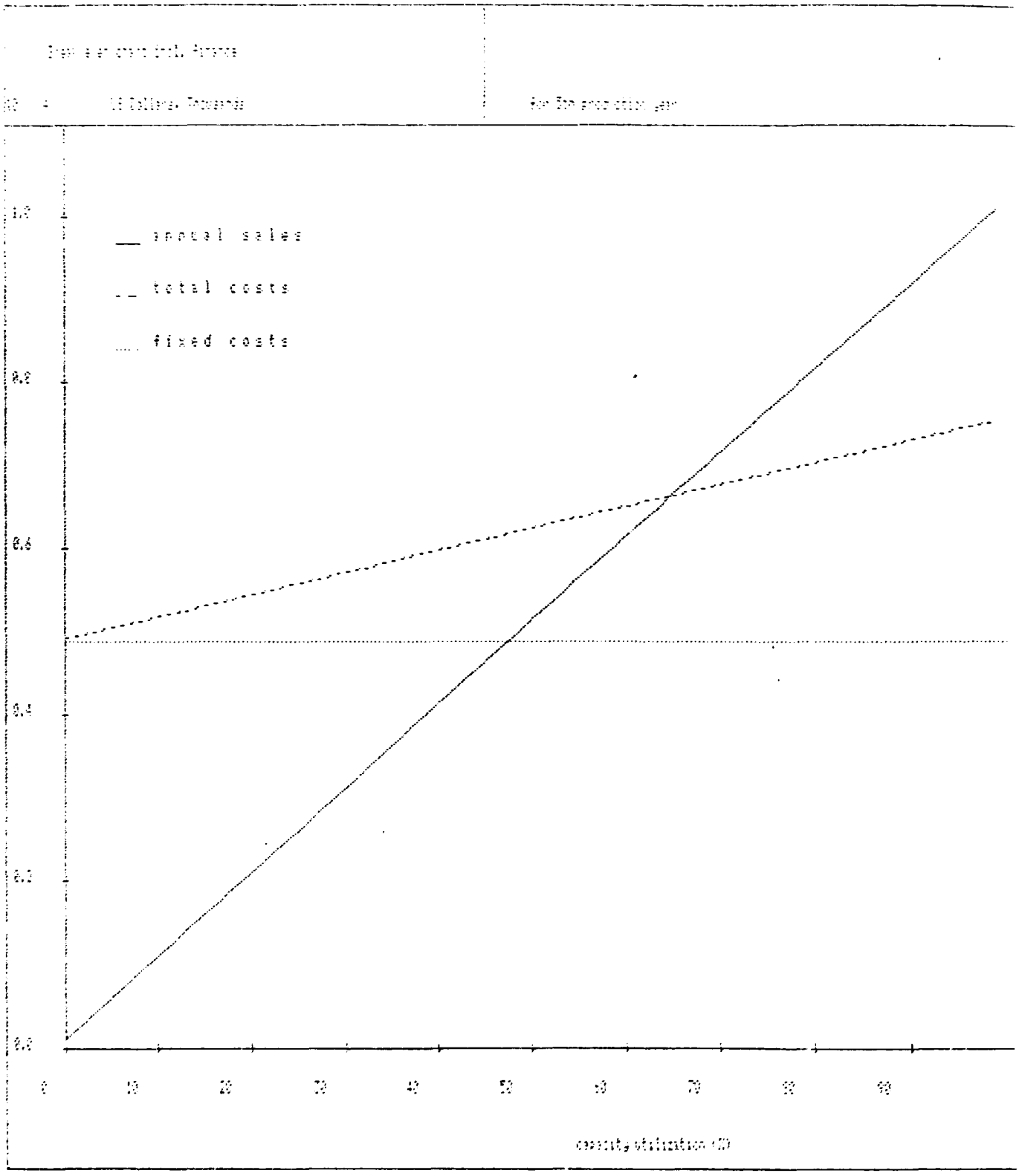
Year	2001	2002	2003	2004	2005	2006	2007
Total assets	23022.280	26335.840	29943.290	35484.800	41026.320	46567.840	52109.360
Fixed assets, net of depreciation	8041.342	5993.783	3946.225	3882.331	3818.437	3754.543	3690.649
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	1371.293	1371.293	1371.293	1371.293	1371.293	1371.293	1371.293
Cash, bank	121.421	121.421	121.421	121.421	121.421	121.421	121.421
Cash surplus, finance available	13488.220	18849.340	24504.350	30109.760	35715.170	41320.590	46926.000
Loss carried forward	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	23022.280	26335.840	29943.290	35484.800	41026.320	46567.840	52109.360
Equity capital	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396
Reserves, retained profit	10622.980	14030.380	17597.100	21204.550	26746.070	32287.590	37829.110
Profit	3407.400	3566.721	3607.448	5541.521	5541.521	5541.521	5541.521
Long and medium term debt	253.157	0.000	0.000	0.000	0.000	0.000	0.000
Current liabilities	102.345	102.345	102.345	102.345	102.345	102.345	102.345
Bank overdraft, finance required	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	355.502	102.345	102.345	102.345	102.345	102.345	102.345
Equity, % of liabilities	37.513	32.793	28.843	24.338	21.051	18.546	16.574

Projected Balance Sheets, Production in US Dollars, Thousands

Year	2003
Total assets	57650.880
Fixed assets, net of depreciation	3626.755
Construction in progress	0.000
Current assets	1371.293
Cash, bank	121.421
Cash surplus, finance available	52531.410
Loss carried forward	0.000
Loss	0.000
Total liabilities	57650.880
Equity capital	8638.396
Reserves, retained profit	43370.630
Profit	5541.521
Long and medium term debt	0.000
Current liabilities	102.345
Bank overdraft, finance required	0.000
Total debt	102.345
Equity, % of liabilities	14.981

BASE CASE

BREAK EVEN AND SENSITIVITY ANALYSES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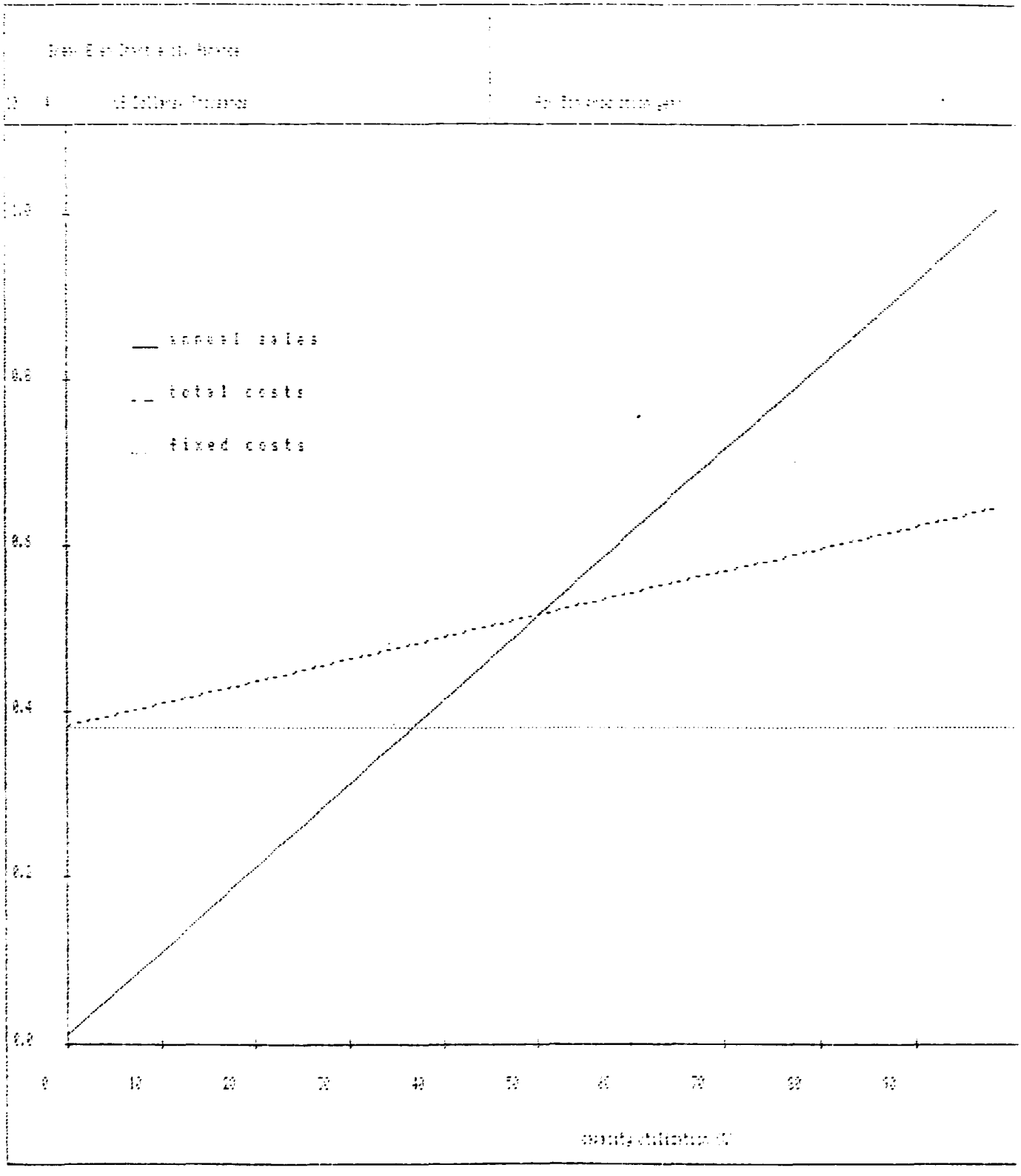
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total costs
fixed costs
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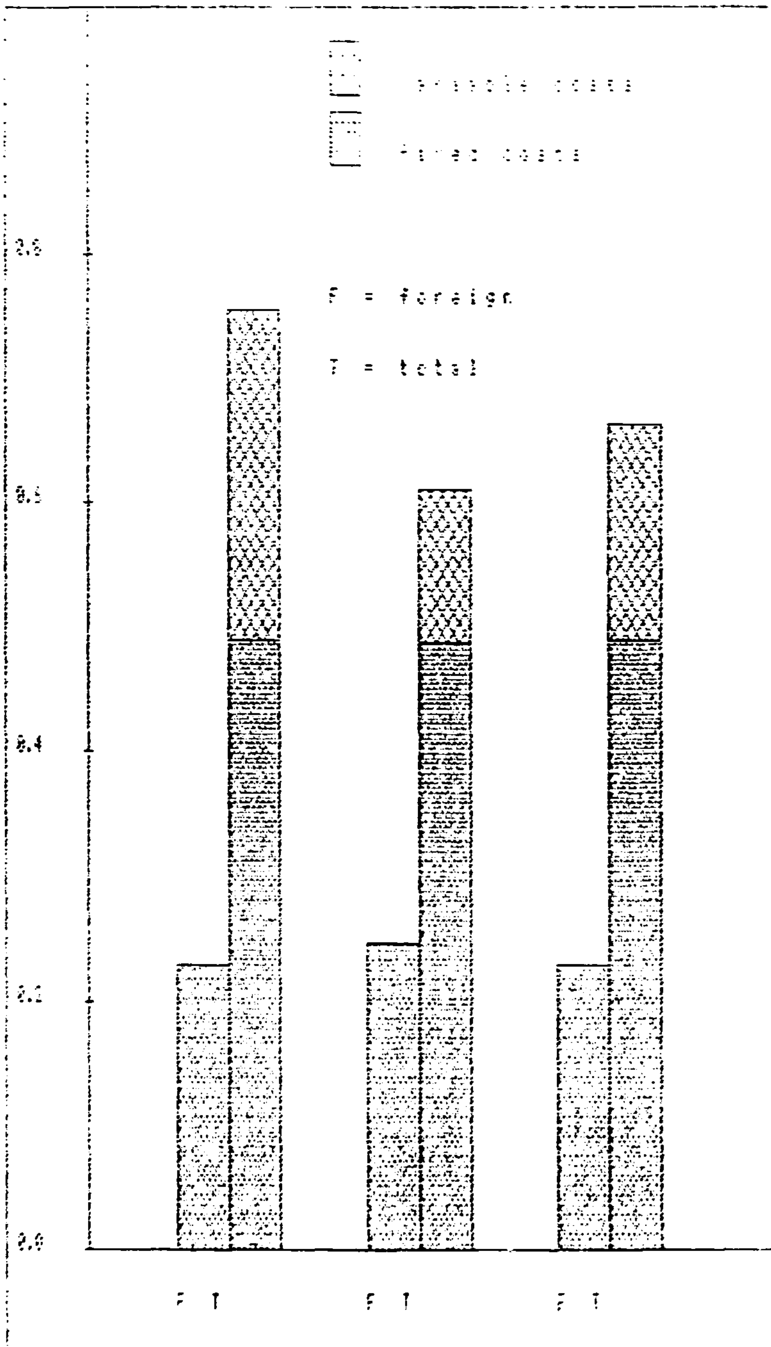
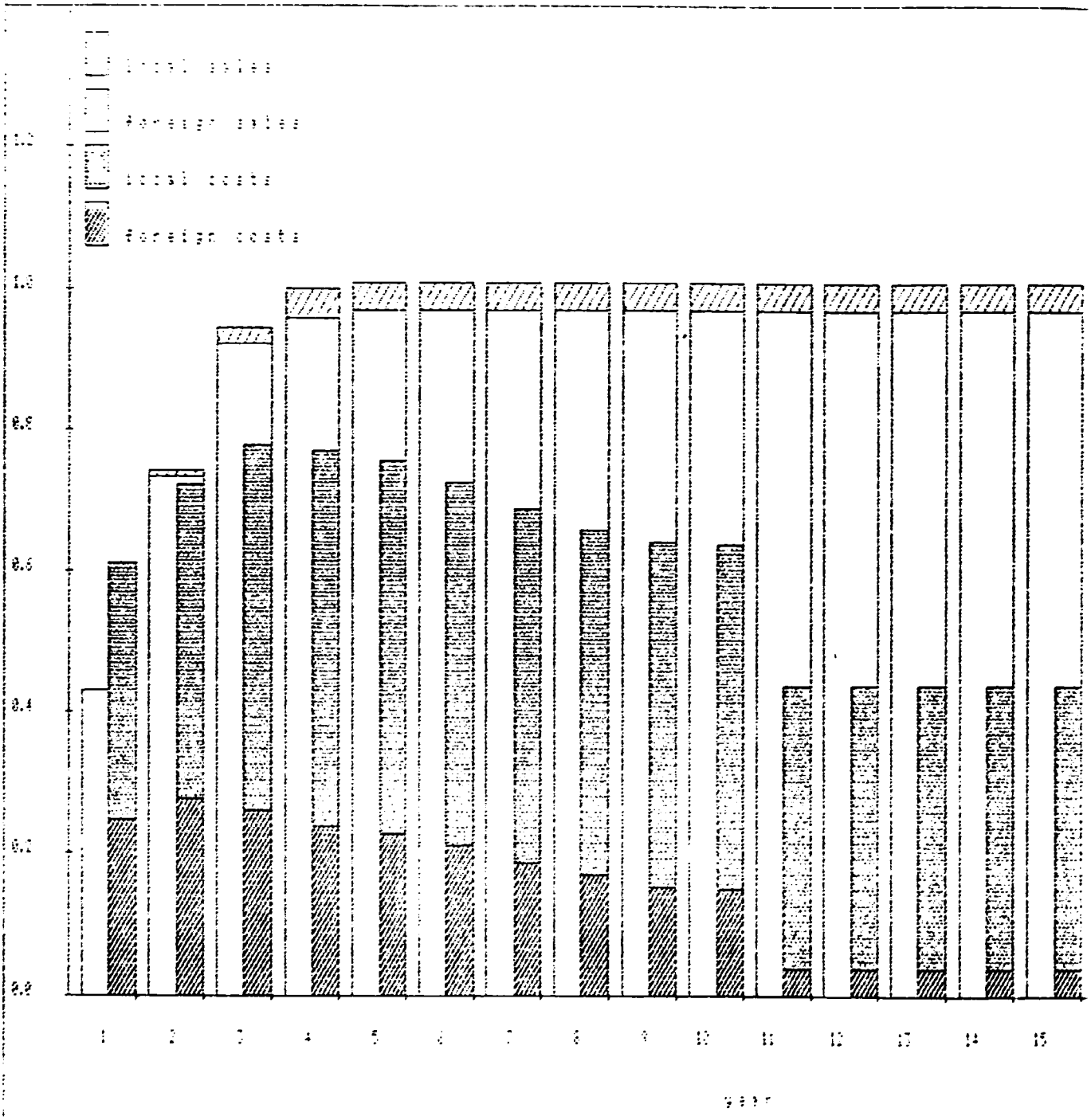
80
90

Structure of Production Costs

US Dollars Thousands — At 5th production year



Nominal	Start up	
26.55	15.35	raw material
0.00	0.00	other RM
4.81	3.07	utilities
3.71	2.61	energy
2.61	2.53	labour
5.86	2.49	maintenance
4.04	0.00	spares
9.29	11.59	overheads
25.35	33.49	depreciation
14.27	28.78	interest
100.00	100.00	Total Prod C.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total costs
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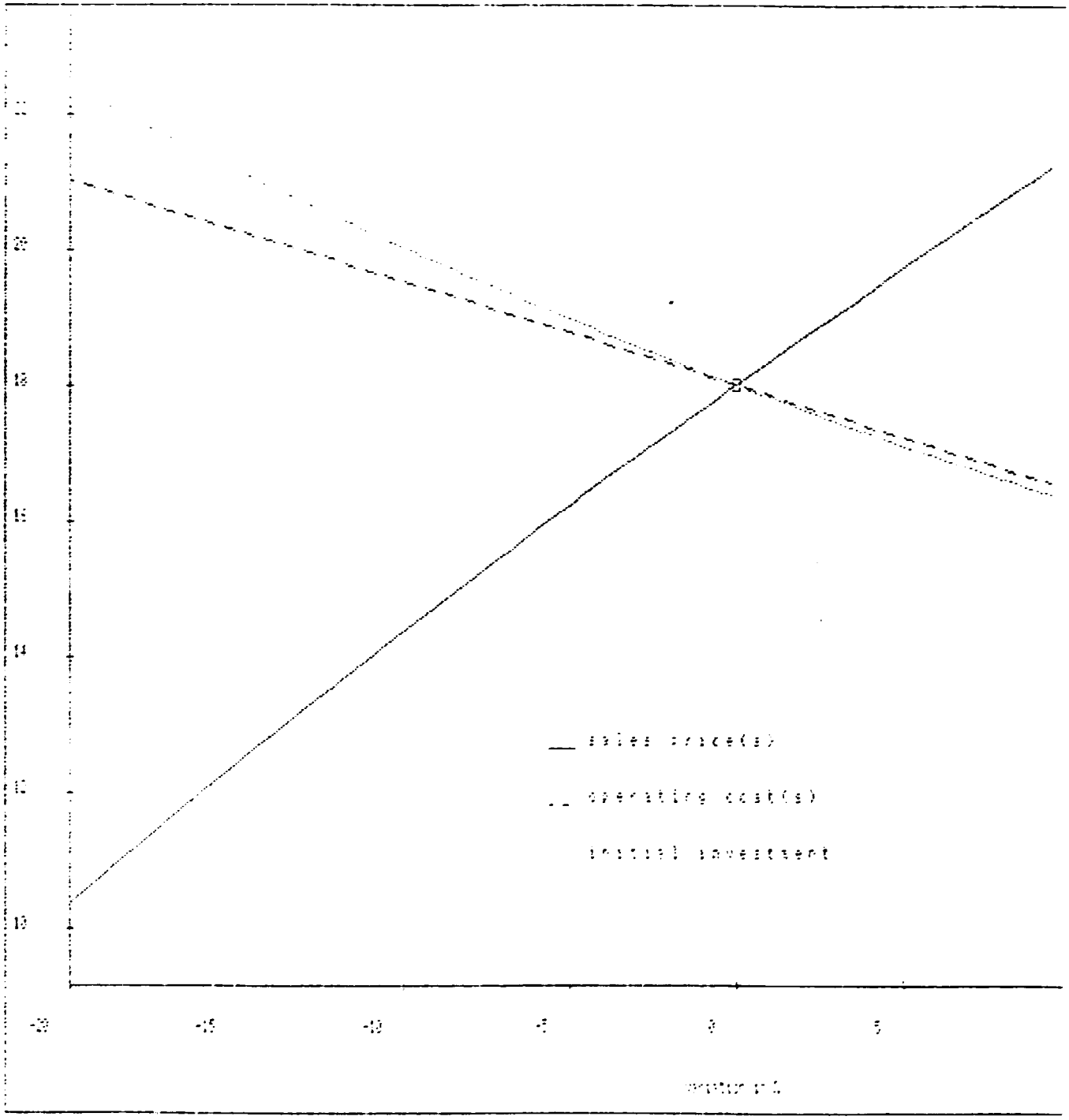
12
13
14
15
year


sales price(s)
operating cost(s)
initial investment

ANNEX 7

CASE 1

COMFAR OUTPUT TABLES

CASE 1/A

TYLOSIN TARTRATE PLANT
Sept.91
CASE 1/A - Production 80 ton/y

2 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 0.0370 units accounting currency
accounting currency: US Dollars, Thousands

Total initial investment during construction phase

fixed assets:	24421.81	50.085 % foreign
current assets:	0.00	0.000 % foreign
total assets:	24421.81	50.085 % foreign

Source of funds during construction phase

equity & grants:	8636.40	10.479 % foreign
foreign loans :	11327.10	
local loans :	4540.36	
total funds :	24503.86	49.919 % foreign

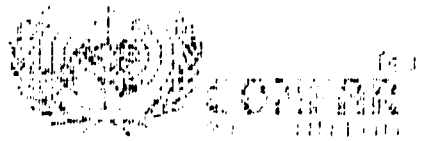
Cashflow from operations

Year:	1	3	5
operating costs:	1962.64	3320.16	3641.66
depreciation :	2047.56	2139.96	2139.96
interest :	1759.86	1657.86	1076.79
production costs	5770.05	7117.98	6858.41
thereof foreign	42.85 %	36.74 %	33.39 %
total sales :	3102.01	7050.00	7520.04

gross income	:	-2668.04	-112.43	587.55
net income	:	-2668.04	-112.43	567.69
cash balance	:	-1140.96	-780.50	41.11
net cashflow	:	156.90	3469.58	3710.13

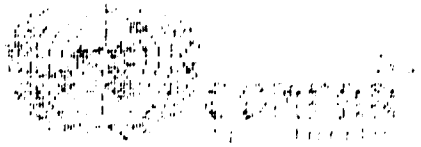
Net Present Value at: 10.00 % = 1280.80
Internal Rate of Return: 10.87 %
Return on equity1: 6.84 %
Return on equity2: 9.39 %

Index of Schedules produced by COMFAR



Total Production Costs in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
% of nom. capacity (single product).	33.333	55.556	70.370	74.074	74.074	74.074	74.074
Raw material 1	675.795	1126.325	1426.678	1501.766	1501.766	1501.766	1501.766
Other raw materials	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Utilities	145.197	217.795	266.194	278.294	278.294	278.294	278.294
Energy	130.677	180.459	213.647	221.944	221.944	221.944	221.944
Labour, direct	144.234	161.717	173.372	176.286	176.286	176.286	176.286
Repair, maintenance	152.346	152.346	304.728	380.882	457.074	457.074	457.074
Spares	0.000	76.283	152.556	228.838	305.111	305.111	305.111
Factory overheads	222.240	222.240	222.240	222.240	222.240	222.240	222.240
Factory costs	1470.488	2137.164	2759.414	3010.250	3162.714	3162.714	3162.714
Administrative overheads	275.948	275.948	275.948	275.948	275.948	275.948	275.948
Indir. costs, sales and distribution	216.200	371.300	284.800	203.000	203.000	203.000	203.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Depreciation	2047.558	2139.958	2139.958	2139.958	2139.958	2139.958	2047.558
Financial costs	1759.857	1779.492	1657.857	1367.321	1076.785	786.249	495.713
Total production costs	5770.052	6703.862	7117.978	6996.478	6858.405	6567.869	6184.933
Costs per unit (single product)	160.279	111.731	93.658	87.456	85.730	82.098	77.312
Of it foreign, %	42.854	41.493	36.742	34.472	33.393	32.382	30.251
Of it variable,%	15.348	22.017	26.266	28.128	28.694	29.964	31.819
Total labour	216.462	233.945	245.600	248.514	248.514	248.514	248.514



Total Production Costs in US Dollars, Thousands

Year	2001	2002	2003	2004- 8
% of nom. capacity (single product).	74.074	74.074	74.074	74.074
Raw material 1	1501.766	1501.766	1501.766	1501.766
Other raw materials	0.000	0.000	0.000	0.000
Utilities	278.294	278.294	278.294	278.294
Energy	221.944	221.944	221.944	221.944
Labour, direct	176.286	176.286	176.286	176.286
Repair, maintenance	457.074	457.074	457.074	457.074
Spares	305.111	305.111	305.111	305.111
Factory overheads	222.240	222.240	222.240	222.240
Factory costs	3162.714	3162.714	3162.714	3162.714
Administrative overheads	275.948	275.948	275.948	275.948
Indir. costs, sales and distribution	203.000	203.000	203.000	203.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000
Depreciation	2047.558	2047.558	2047.558	63.894
Financial costs	205.177	41.771	0.000	0.000
Total production costs	5894.397	5730.991	5689.220	3705.556
Costs per unit (single product)	73.680	71.637	71.115	46.319
Of it foreign, %	28.969	26.944	26.408	9.988
Of it variable,%	33.387	34.339	34.591	53.109
Total labour	248.514	248.514	248.514	248.514

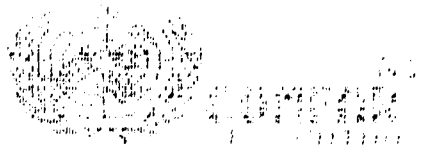
Net Working Capital in US Dollars, Thousands

Year	adc	coto	1994	1995	1996	1997	1998	1999-2008
Coverage								
Current assets &								
Accounts receivable	30	12.0	163.553	233.269	280.384	296.940	309.645	309.645
Inventory and materials	55	6.5	124.732	205.870	259.962	273.485	273.485	273.485
Energy	0	---	0.000	0.000	0.000	0.000	0.000	0.000
Spares	180	2.0	0.000	38.141	76.278	114.419	152.556	152.556
Work in progress	15	24.0	61.270	87.308	111.494	120.205	124.817	124.817
Finished products	30	12.0	145.536	197.611	245.984	263.406	272.630	272.630
Cash in hand	30	12.0	66.231	74.044	94.070	107.016	119.722	119.722
Total current assets			561.322	836.244	1068.173	1175.471	1252.855	1252.855
Current liabilities and								
Accounts payable	10	36.0	40.847	58.205	74.330	80.137	83.211	83.211
Net working capital			520.476	778.039	993.844	1095.335	1169.644	1169.644
Increase in working capital			520.476	257.563	215.805	101.491	74.309	0.000
Net working capital, local			502.459	719.244	914.410	994.865	1041.327	1041.327
Net working capital, foreign			18.017	58.795	79.433	100.470	128.317	128.317

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

Cashflow Tables, construction in US Dollars, Thousands

Year	1992.1	1992.2	1993.1	1993.2
Total cash inflow	2979.281	3169.166	13006.100	5349.308
Financial resources	2979.281	3169.166	13006.100	5349.308
Sales, net of tax	0.000	0.000	0.000	0.000
Total cash outflow	2979.237	3168.989	13005.860	5267.727
Total assets	2925.673	2997.412	12506.160	4450.979
Operating costs	0.000	0.000	0.000	0.000
Cost of finance	53.565	171.577	499.704	816.747
Repayment	0.000	0.000	0.000	0.000
Corporate tax	0.000	0.000	0.000	0.000
Dividends paid	0.000	0.000	0.000	0.000
Surplus (deficit)	0.044	0.177	0.243	81.581
Cumulated cash balance	0.044	0.221	0.464	82.045
Inflow, local	1481.081	2450.566	4949.803	3390.308
Outflow, local	1481.082	2450.535	4949.783	3308.805
Surplus (deficit)	-0.000	0.031	0.020	81.503
Inflow, foreign	1498.200	718.600	8056.300	1959.000
Outflow, foreign	1498.156	718.454	8056.077	1958.922
Surplus (deficit)	0.044	0.146	0.223	0.078
Net cashflow	-2925.673	-2997.412	-12506.160	-4450.979
Cumulated net cashflow	-2925.673	-5923.084	-18429.240	-22880.220

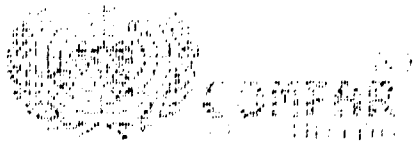


Cashflow tables, production in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
Total cash inflow	3604.859	5454.576	7021.675	7357.790	7449.032	7445.958	7445.958
Financial resources	502.847	17.358	16.124	5.807	3.075	0.000	0.000
Sales, net of tax	3102.012	5437.218	7005.551	7351.982	7445.958	7445.958	7445.958
Total cash outflow	4745.815	6269.825	7802.179	7568.205	7407.920	7049.820	6772.227
Total assets	1023.322	274.921	231.930	107.298	77.384	0.000	0.000
Operating costs	1962.636	2784.412	3320.162	3489.198	3641.662	3641.662	3641.662
Cost of finance	1759.857	1779.492	1657.857	1367.321	1076.785	786.249	495.713
Repayment	0.000	1431.000	2592.230	2592.230	2592.230	2592.230	2592.229
Corporate tax	0.000	0.000	0.000	12.158	19.859	29.679	42.623
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	-1140.957	-815.249	-780.503	-210.416	41.112	396.138	673.730
Cumulated cash balance	-1058.912	-1874.161	-2654.664	-2865.080	-2823.968	-2427.830	-1754.099
Inflow, local	40.847	96.550	253.699	401.765	399.032	395.958	395.958
Outflow, local	2925.393	3241.125	4706.827	4675.881	4630.421	4463.574	4349.387
Surplus (deficit)	-2884.546	-3144.575	-4453.127	-4274.116	-4231.389	-4067.616	-3953.429
Inflow, foreign	3564.012	5358.026	6767.976	6956.025	7050.000	7050.000	7050.000
Outflow, foreign	1820.423	3028.700	3095.352	2892.324	2777.499	2586.246	2422.840
Surplus (deficit)	1743.589	2329.326	3672.624	4063.701	4272.501	4463.754	4627.160
Net cashflow	156.900	2395.243	3469.583	3749.135	3710.127	3774.616	3761.673
Cumulated net cashflow	-22723.320	-20326.080	-16858.490	-13109.360	-9399.229	-5624.612	-1862.939

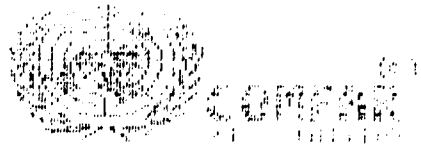
Cashflow tables, production in US Dollars, Thousands

Year	2001	2002	2003	2004	2005	2006	2007
Total cash inflow	7445.958	7445.958	7445.958	7445.958	7445.958	7445.958	7445.958
Financial resources	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	7445.958	7445.958	7445.958	7445.958	7445.958	7445.958	7445.958
Total cash outflow	5583.439	3994.556	3701.040	3768.087	3768.087	3768.087	3768.087
Total assets	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	3641.662	3641.662	3641.662	3641.662	3641.662	3641.662	3641.662
Cost of finance	205.177	41.771	0.000	0.000	0.000	0.000	0.000
Repayment	1684.157	253.157	0.000	0.000	0.000	0.000	0.000
Corporate tax	52.443	57.966	59.378	126.426	126.426	126.426	126.426
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	1862.519	3451.402	3744.918	3677.870	3677.870	3677.870	3677.870
Cumulated cash balance	108.419	3559.821	7304.739	10982.610	14660.480	18338.350	22016.220
Inflow, local	395.958	395.958	395.958	395.958	395.958	395.958	395.958
Outflow, local	3324.005	3329.528	3330.939	3397.987	3397.987	3397.987	3397.987
Surplus (deficit)	-2928.047	-2933.570	-2934.982	-3002.030	-3002.030	-3002.030	-3002.030
Inflow, foreign	7050.000	7050.000	7050.000	7050.000	7050.000	7050.000	7050.000
Outflow, foreign	2259.434	665.028	370.100	370.100	370.100	370.100	370.100
Surplus (deficit)	4790.566	6384.972	6679.900	6679.900	6679.900	6679.900	6679.900
Net cashflow	3751.853	3746.330	3744.918	3677.870	3677.870	3677.870	3677.870
Cumulated net cashflow	1888.914	5635.244	9380.162	13058.030	16735.900	20413.770	24091.640



Cashflow tables, production in US Dollars, Thousands

Year	2008
Total cash inflow	7445.958
Financial resources	0.000
Sales, net of tax	7445.958
Total cash outflow	3768.087
Total assets	0.000
Operating costs	3641.662
Cost of finance	0.000
Repayment	0.000
Corporate tax	126.426
Dividends paid	0.000
Surplus (deficit)	3677.870
Cumulated cash balance	25694.090
Inflow, local	395.958
Outflow, local	3397.987
Surplus (deficit)	-3002.030
Inflow, foreign	7050.000
Outflow, foreign	370.100
Surplus (deficit)	6679.900
Net cashflow	3677.870
Cumulated net cashflow	27769.520



Cashflow Discounting:

a) Equity paid versus Net income flow:

Net present value	-2907.46 at	10.00 %
Internal Rate of Return (IRRE1) ..	6.84 %	

b) Net Worth versus Net cash return:

Net present value	-597.41 at	10.00 %
Internal Rate of Return (IRRE2) ..	9.39 %	

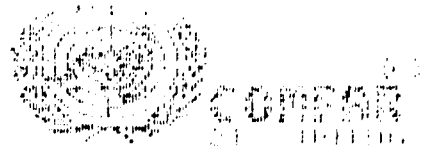
c) Internal Rate of Return on total investment:

Net present value	1280.80 at	10.00 %
Internal Rate of Return (IRR) ..	10.87 %	

Net Worth = Equity paid plus reserves

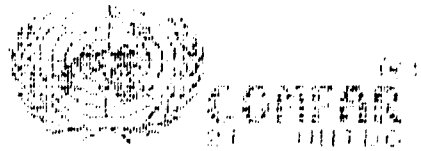
Net Income Statement in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999
Total sales, incl. sales tax	3102.012	5452.034	7049.999	7426.063	7520.038	7520.038
Less: variable costs, incl. sales tax.	885.589	1490.798	1914.025	2042.056	2042.056	2042.056
Variable margin	2216.423	3961.236	5135.974	5384.006	5477.981	5477.981
As % of total sales	71.451	72.656	72.851	72.501	72.845	72.845
Non-variable costs, incl. depreciation	3124.604	3448.388	3590.543	3661.180	3813.645	3813.644
Operational margin	-908.182	512.848	1545.431	1722.826	1664.337	1664.337
As % of total sales	-29.277	9.407	21.921	23.200	22.132	22.132
Cost of finance	1759.857	1779.492	1657.857	1367.321	1076.785	786.249
Gross profit	-2668.039	-1266.645	-112.427	355.505	587.552	878.088
Allowances	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	-2668.039	-1266.645	-112.427	355.505	587.552	878.088
Tax	0.000	0.000	0.000	12.158	19.859	29.679
Net profit	-2668.039	-1266.645	-112.427	343.347	567.693	848.409
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-2668.039	-1266.645	-112.427	343.347	567.693	848.409
Accumulated undistributed profit	-2668.039	-3934.684	-4047.111	-3703.764	-3136.071	-2287.662
Gross profit, % of total sales	-86.010	-23.233	-1.595	4.787	7.813	11.677
Net profit, % of total sales	-86.010	-23.233	-1.595	4.624	7.549	11.282
ROE, Net profit, % of equity	-30.893	-14.666	-1.302	3.976	6.573	9.824
ROI, Net profit+interest, % of invest.	-3.806	2.126	6.350	7.000	6.709	6.669



Net Income Statement in US Dollars, Thousands

Year	2000	2001	2002	2003	2004	2005
Total sales, incl. sales tax	7520.038	7520.038	7520.038	7520.038	7520.038	7520.038
Less: variable costs, incl. sales tax.	2042.056	2042.056	2042.056	2042.056	2042.056	2042.056
Variable margin	5477.981	5477.981	5477.981	5477.981	5477.981	5477.981
As % of total sales	72.845	72.845	72.845	72.845	72.845	72.845
Non-variable costs, incl. depreciation	3721.245	3721.245	3721.244	3721.244	1737.580	1737.580
Operational margin	1756.737	1756.737	1756.737	1756.737	3740.401	3740.401
As % of total sales	23.361	23.361	23.361	23.361	49.739	49.739
Cost of finance	495.713	205.177	41.771	0.000	0.000	0.000
Gross profit	1261.024	1551.560	1714.966	1756.737	3740.402	3740.402
Allowances	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	1261.024	1551.560	1714.966	1756.737	3740.402	3740.402
Tax	42.623	52.443	57.966	59.378	126.426	126.426
Net profit	1218.401	1499.117	1657.000	1697.360	3613.976	3613.976
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	1218.401	1499.117	1657.000	1697.360	3613.976	3613.976
Accumulated undistributed profit	-1069.261	429.856	2086.857	3784.217	7398.192	11012.170
Gross profit, % of total sales	16.769	20.632	22.805	23.361	49.739	49.739
Net profit, % of total sales	16.202	19.935	22.034	22.571	48.058	48.058
ROE, Net profit, % of equity	14.108	17.358	19.186	19.654	41.846	41.846
ROI, Net profit+interest, % of invest.	6.993	6.953	6.930	6.925	14.744	14.744

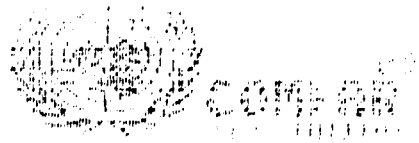


Net Income Statement in US Dollars, Thousands

Year	2006	2007	2008
Total sales, incl. sales tax	7520.038	7520.038	7520.038
Less: variable costs, incl. sales tax.	2042.056	2042.056	2042.056
Variable margin	5477.981	5477.981	5477.981
As % of total sales	72.845	72.845	72.845
Non-variable costs, incl. depreciation	1737.580	1737.580	1737.580
Operational margin	3740.401	3740.401	3740.401
As % of total sales	49.739	49.739	49.739
Cost of finance	0.000	0.000	0.000
Gross profit	3740.402	3740.402	3740.402
Allowances	0.000	0.000	0.000
Taxable profit	3740.402	3740.402	3740.402
Tax	126.426	126.426	126.426
Net profit	3613.976	3613.976	3613.976
Dividends paid	0.000	0.000	0.000
Undistributed profit	3613.976	3613.976	3613.976
Accumulated undistributed profit	14626.140	18240.120	21854.100
Gross profit, % of total sales	49.739	49.739	49.739
Net profit, % of total sales	48.058	48.058	48.058
ROE, Net profit, % of equity	41.846	41.846	41.846
ROI, Net profit+interest, % of invest.	14.744	14.744	14.744

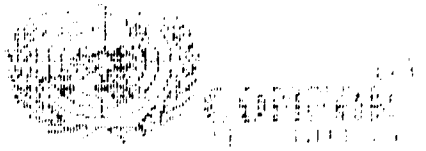
Projected Balance Sheets, construction in US Dollars, Thousands

Year	1992.1	1992.2	1993.1	1993.2
Total assets	2979.281	6148.447	19154.550	24503.860
Fixed assets, net of depreciation	0.000	2979.237	6148.226	19154.090
Construction in progress	2979.237	3168.989	13005.860	5267.727
Current assets	0.000	0.000	0.000	0.000
Cash, bank	0.000	0.000	0.000	0.000
Cash surplus, finance available	0.044	0.221	0.465	82.047
Loss carried forward	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000
Total liabilities	2979.281	6148.447	19154.550	24503.860
Equity capital	1492.824	2591.801	5018.087	8636.396
Reserves, retained profit	0.000	0.000	0.000	0.000
Profit	0.000	0.000	0.000	0.000
Long and medium term debt	1486.457	3556.647	14136.460	15867.460
Current liabilities	0.000	0.000	0.000	0.000
Bank overdraft, finance required.	0.000	0.000	0.000	0.000
Total debt	1486.457	3556.647	14136.460	15867.460
Equity, % of liabilities	50.107	42.154	26.198	35.245



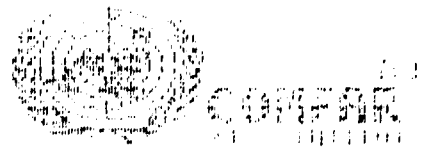
Projected Balance Sheets, Production in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
Total assets	26065.620	25467.220	23671.620	21638.960	19233.040	16525.390	13629.420
Fixed assets, net of depreciation	22374.250	20696.290	18556.340	16416.380	14276.420	12136.460	10088.900
Construction in progress	462.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	495.092	762.199	974.103	1068.455	1133.134	1133.134	1133.134
Cash, bank	66.231	74.044	94.070	107.016	119.722	119.722	119.722
Cash surplus, finance available	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loss carried forward	0.000	2668.039	3934.684	4047.111	3703.764	3136.071	2287.662
Loss	2668.039	1266.645	112.427	0.000	0.000	0.000	0.000
Total liabilities	26065.620	25467.220	23671.620	21638.960	19233.040	16525.390	13629.420
Equity capital	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396
Reserves, retained profit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Profit	0.000	0.000	0.000	343.347	567.693	848.409	1218.401
Long and medium term debt	16329.460	14898.460	12306.230	9714.004	7121.774	4529.544	1937.315
Current liabilities	40.847	58.205	74.330	80.137	83.211	83.211	83.211
Bank overdraft, finance required	1058.908	1874.158	2654.662	2865.076	2823.963	2427.825	1754.095
Total debt	17429.220	16830.830	15035.220	12659.220	10028.950	7040.581	3774.621
Equity, % of liabilities	33.133	33.912	36.484	39.911	44.904	52.261	63.366



Projected Balance Sheets, Production in US Dollars, Thousands

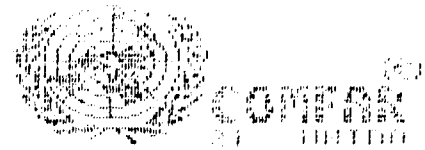
Year	2001	2002	2003	2004	2005	2006	2007
Total assets	10471.880	10806.460	12503.820	16117.800	19731.780	23345.750	26959.730
Fixed assets, net of depreciation	8041.342	5993.783	3946.225	3882.331	3818.437	3754.543	3690.649
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	1133.134	1133.134	1133.134	1133.134	1133.134	1133.134	1133.134
Cash, bank	119.722	119.722	119.722	119.722	119.722	119.722	119.722
Cash surplus, finance available	108.424	3559.825	7304.743	10982.610	14660.480	18338.350	22016.220
Loss carried forward	1069.261	0.000	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	10471.880	10806.460	12503.820	16117.800	19731.780	23345.750	26959.730
Equity capital	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396
Reserves, retained profit	0.000	429.856	2086.857	3784.217	7398.192	11012.170	14626.140
Profit	1499.117	1657.000	1697.360	3613.976	3613.976	3613.976	3613.976
Long and medium term debt	253.157	0.000	0.000	0.000	0.000	0.000	0.000
Current liabilities	83.211	83.211	83.211	83.211	83.211	83.211	83.211
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	336.369	83.212	83.212	83.212	83.212	83.212	83.212
Equity, % of liabilities	82.472	79.919	69.070	53.583	43.769	36.993	32.034



Projected Balance Sheets, Production in US Dollars, Thousands

Year	2008
Total assets	30573.700
Fixed assets, net of depreciation	3626.755
Construction in progress	0.000
Current assets	1133.134
Cash, bank	119.722
Cash surplus, finance available	25694.090
Loss carried forward	0.000
Loss	0.000
Total liabilities	30573.700
Equity capital	8636.396
Reserves, retained profit	18240.120
Profit	3613.976
Long and medium term debt	0.000
Current liabilities	83.211
Bank overdraft, finance required.	0.000
Total debt	83.212
Equity, % of liabilities	28.248

CASE 1/B



TYLOSIN TARTRATE PLANT
Sept.91
CASE 1/5 - Production 90 ton/y

2 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 0.0370 units accounting currency
accounting currency: US Dollars, Thousands

Total initial investment during construction phase

fixed assets:	24421.81	50.085 % foreign
current assets:	0.00	0.000 % foreign
total assets:	24421.81	50.085 % foreign

Source of funds during construction phase

equity & grants:	3636.40	10.479 % foreign
foreign loans :	11327.10	
local loans :	4540.36	
total funds :	24503.86	49.919 % foreign

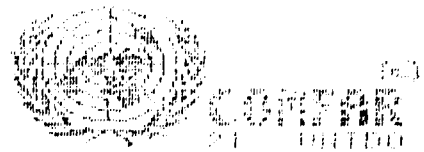
Cashflow from operations

Year:	1	3	5
operating costs:	2085.63	3566.16	3887.66
depreciation :	2047.56	2139.96	2139.96
interest :	1759.86	1657.86	1076.79
production costs	5893.05	7363.97	7104.40
thereof foreign	41.96 %	35.51 %	32.24 %

total sales	:	3572.00	7989.93	8456.04
gross income	:	-2321.05	531.56	1251.5:
net income	:	-2321.05	570.45	1243.11
cash balance	:	-633.38	-113.39	716.53
net cashflow	:	4e4.48	4136.79	4355.54

Net Present Value at: 10.00 % = 5500.01
Internal Rate of Return: 13.59 %
Return on equity1: 11.44 %
Return on equity2: 13.65 %

Index of Schedules produced by CONFAR



Total Production Costs in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
% of nom. capacit. (single product)	37.963	62.963	79.630	83.333	83.333	83.333	83.333
Raw material 1	769.655	1276.501	1614.398	1689.487	1689.487	1689.487	1689.487
Other raw materials	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Utilities	160.321	241.995	296.443	308.543	308.543	308.543	308.543
Energy	141.048	197.053	234.389	242.686	242.686	242.686	242.686
Labour, direct	147.876	167.544	180.656	183.570	183.570	183.570	183.570
Repair, maintenance	152.346	152.346	304.728	380.882	457.074	457.074	457.074
Stores	0.000	76.283	152.556	228.833	305.111	305.111	305.111
Factory overheads	222.240	222.240	222.240	222.240	222.240	222.240	222.240
Factor. costs	1593.486	2333.961	3005.411	3256.247	3408.711	3408.711	3408.711
Administrative overheads	275.948	275.948	275.948	275.948	275.948	275.948	275.948
Indir. costs, sales and distribution	216.200	371.300	284.800	203.000	203.000	203.000	203.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Depreciation	2047.553	2139.958	2139.958	2139.958	2139.958	2139.958	2047.553
Financial costs	1759.857	1779.492	1657.857	1367.321	1076.785	786.249	495.713
Total production costs	5893.050	6900.659	7363.975	7242.475	7104.402	6813.866	6430.930
Costs per unit (single product)	143.733	101.480	85.628	80.472	76.935	75.710	71.455
Of it foreign, %	41.960	40.310	35.514	33.301	32.236	31.213	29.694
Of it variable,%	17.115	24.241	28.729	30.569	31.163	32.492	34.427
Total labour	220.104	239.772	252.884	255.798	255.798	255.798	255.798

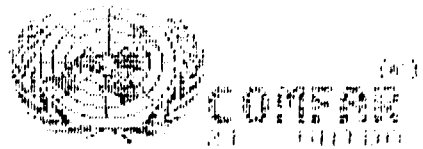
Total Production Costs in US Dollars, Thousands

Year	2001	2002	2003	2004- 8
% of nom. capacit. (single product)	83.333	83.333	83.333	83.333
Raw material 1	1689.487	1689.487	1689.487	1689.487
Other raw materials	0.000	0.000	0.000	0.000
Utilities	308.543	308.543	308.543	308.543
Energy	242.686	242.686	242.686	242.686
Labour, direct	183.570	183.570	183.570	183.570
Repair, maintenance	457.074	457.074	457.074	457.074
Salaries	305.111	305.111	305.111	305.111
Factory overheads	222.240	222.240	222.240	222.240
Factory costs	3408.711	3408.711	3408.711	3408.711
Administrative overheads	275.948	275.948	275.948	275.948
Indir. costs, sales and distribution	203.000	203.000	203.000	203.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000
Depreciation	2047.558	2047.558	2047.558	63.894
Financial costs	205.177	41.771	0.000	0.000
Total production costs	6140.394	5976.988	5935.217	3951.553
Costs per unit (single product)	68.227	66.411	65.947	43.906
Of it foreign, %	27.809	25.835	25.313	9.366
Of it variable,%	36.056	37.042	37.302	56.028
Total labour	255.793	255.798	255.798	255.798

Net Working Capital in US Dollars, Thousands

Year	mdc	coto	1994	1995	1996	1997	1998	1999-2008
Coverage								
Current assets								
Accounts receivable	30	12.0	173.803	249.669	300.884	317.449	336.145	336.145
Inventory and materials	55	6.5	141.636	232.916	293.770	307.293	307.293	307.293
Energy	0	---	0.000	0.000	0.000	0.000	0.000	0.000
Stores	180	2.0	0.000	38.141	76.278	114.419	152.556	152.556
Work in progress	15	24.0	86.395	95.508	121.744	130.455	135.067	135.067
Finished products	30	12.0	155.786	214.011	266.484	283.905	293.130	293.130
Cash in hand	30	12.0	66.534	74.530	94.677	107.623	120.329	120.329
Total current assets			604.154	904.775	1153.837	1261.135	1338.519	1338.519
Current liabilities and								
Accounts payable	10	36.0	44.264	63.672	81.163	86.970	90.045	90.045
Net working capital			559.891	841.103	1072.674	1174.165	1248.474	1248.474
Increase in working capital			559.891	281.212	231.571	101.491	74.309	0.000
Net working capital, local			541.874	782.308	993.241	1073.695	1120.158	1120.158
Net working capital, foreign			18.017	58.795	79.433	100.470	128.317	128.317

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



Cashflow Tables, construction in US Dollars, Thousands

Year	1992.1	1992.2	1993.1	1993.2
Total cash inflow . .	2979.281	3169.166	13006.100	5349.308
Financial resources .	2979.281	3169.166	13006.100	5349.308
Sales, net of tax . .	0.000	0.000	0.000	0.000
Total cash outflow . .	2979.237	3168.989	13005.860	5267.727
Total assets	2925.673	2997.412	12506.160	4450.979
Operating costs . . .	0.000	0.000	0.000	0.000
Cost of finance . . .	53.565	171.577	499.704	816.747
Repayment	0.000	0.000	0.000	0.000
Corporate tax . . .	0.000	0.000	0.000	0.000
Dividends paid . . .	0.000	0.000	0.000	0.000
Surplus (deficit) .	0.044	0.177	0.243	81.581
Cumulated cash balance	0.044	0.221	0.464	82.045
Inflow, local	1481.081	2450.566	4949.803	3390.308
Outflow, local	1481.082	2450.535	4949.783	3308.805
Surplus (deficit) .	-0.000	0.031	0.020	81.503
Inflow, foreign . . .	1498.200	718.600	8056.300	1959.000
Outflow, foreign . . .	1498.156	718.454	8056.077	1958.922
Surplus (deficit) .	0.044	0.146	0.223	0.078
Net cashflow	-2925.673	-2997.412	-12506.160	-4450.979
Cumulated net cashflow	-2925.673	-5923.084	-18429.240	-22880.220

Cashflow tables, production in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
Total cash inflow	4879.265	6114.597	7963.027	8297.754	8389.033	8385.958	8385.958
Financial resources	568.264	19.408	17.491	5.807	3.075	0.000	0.000
Sales, net of tax	3972.002	6095.189	7945.536	8291.947	8385.958	8385.958	8385.958
Total cash outflow	4811.648	5492.321	8076.417	7833.843	7672.504	7313.306	7034.252
Total assets	1056.154	300.620	249.062	107.298	77.384	0.000	0.000
Operating costs	2135.635	2931.209	3566.159	3735.195	3887.659	3887.659	3887.659
Cost of finance	1759.857	1779.492	1657.857	1367.321	1076.785	786.249	495.713
Repayment	0.000	1431.000	2592.230	2592.230	2592.230	2592.230	2592.229
Corporate tax	0.000	0.000	11.108	31.799	38.447	47.163	58.651
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	-833.381	-377.725	-113.390	463.911	716.529	1072.652	1351.706
Cumulated cash balance	-751.336	-1129.061	-1242.451	-778.540	-62.011	1010.647	2362.353
Inflow, local	44.264	98.600	255.066	401.765	399.032	395.958	395.958
Outflow, local	3091.223	3463.621	4981.064	4941.519	4895.006	4727.055	4611.417
Surplus (deficit)	-3046.960	-3365.022	-4725.999	-4539.754	-4495.974	-4331.097	-4215.455
Inflow, foreign	4834.002	6015.997	7707.961	7895.990	7990.000	7990.000	7990.000
Outflow, foreign	1820.423	3028.700	3095.352	2892.324	2777.498	2586.246	2422.840
Surplus (deficit)	3213.579	2987.297	4612.609	5003.666	5212.502	5403.754	5567.160
Net cashflow	464.477	2832.768	4136.698	4423.462	4385.543	4451.137	4439.648
Cumulated net cashflow	-22415.740	-19582.970	-15446.280	-11022.810	-6637.271	-2186.134	2253.514

Cashflow tables, production in US Dollars, Thousands

Year	2001	2002	2003	2004	2005	2006	2007
Total cash inflow	8385.958	8385.958	8385.958	8385.958	8385.958	8385.958	8385.958
Financial resources	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	8385.958	8385.958	8385.958	8385.958	8385.958	8385.958	8385.958
Total cash outflow	5844.359	4254.856	3961.181	4020.691	4020.691	4020.691	4020.691
Total assets	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	3887.659	3887.659	3887.659	3887.659	3887.659	3887.659	3887.659
Cost of finance	205.177	41.771	0.000	0.000	0.000	0.000	0.000
Repayment	1684.157	253.157	0.000	0.000	0.000	0.000	0.000
Corporate ta	67.367	72.269	73.522	133.032	133.032	133.032	133.032
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus / deficit	2541.599	4131.102	4424.777	4365.267	4365.267	4365.267	4365.267
Cumulated cash balance	4903.952	9035.054	13459.830	17825.100	22190.370	26555.630	30920.900
Inflow, local	395.958	395.958	395.958	395.958	395.958	395.958	395.958
Outflow, local	3584.926	3589.828	3591.081	3650.591	3650.591	3650.591	3650.591
Surplus / deficit	-3188.969	-3193.871	-3195.124	-3254.634	-3254.634	-3254.634	-3254.634
Inflow, foreign	7990.000	7990.000	7990.000	7990.000	7990.000	7990.000	7990.000
Outflow, foreign	2259.434	665.028	370.100	370.100	370.100	370.100	370.100
Surplus / deficit	5730.566	7324.972	7619.900	7619.900	7619.900	7619.900	7619.900
Net cashflow	4430.933	4426.030	4424.777	4365.267	4365.267	4365.267	4365.267
Cumulated net cashflow	8634.447	11110.480	15535.250	19900.520	24265.790	28631.060	32996.320

Cashflow tables, production in US Dollars, Thousands

Year	2003
Total cash inflow	8385.958
Financial resources	0.000
Sales, net of tax	8385.958
Total cash outflow	4020.691
Total assets	0.000
Operating costs	3687.659
Cost of finance	0.000
Repayment	0.000
Corporate tax	133.032
Dividends paid	0.000
Surplus / deficit	4365.267
Cumulated cash balance	35236.170
Inflow, local	395.958
Outflow, local	3650.591
Surplus / deficit	-3254.634
Inflow, foreign	7990.000
Outflow, foreign	370.100
Surplus / deficit	7619.900
Net cashflow	4365.267
Cumulated net cashflow	37361.590

Cashflow Discounting:

a) Equity paid versus Net income flow:

Net present value	1357.25	at	10.00 %
Internal Rate of Return (IRRE1) ..	11.44 %		

b) Net Worth versus Net cash return:

Net present value	3621.79	at	10.00 %
Internal Rate of Return (IRRE2) ..	13.65 %		

c) Internal Rate of Return on total investment:

Net present value	5500.01	at	10.00 %
Internal Rate of Return (IRR) ..	13.59 %		

Net Worth = Equity paid plus reserves

Net Income Statement in US Dollars, Thousands

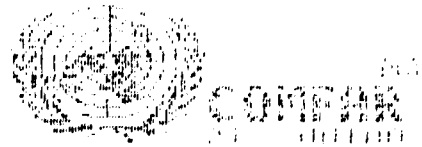
Year	1994	1995	1996	1997	1998	1999
Total sales, incl. sales tax	3572.002	6110.004	7989.983	8366.027	8460.037	8460.037
Less: variable costs, incl. sales tax	1008.588	1687.595	2160.022	2298.053	2288.052	2288.052
Variable margin	2563.414	4422.409	5829.961	6077.974	6171.985	6171.985
As % of total sales	71.764	72.380	72.966	72.651	72.955	72.955
Non-variable costs, incl. depreciation	3124.604	3448.388	3590.543	3661.180	3813.645	3813.644
Operational margin	-561.190	974.021	2239.418	2416.794	2358.340	2358.341
As % of total sales	-15.711	15.941	28.028	28.883	27.876	27.876
Cost of finance	1759.857	1779.492	1657.857	1367.321	1076.785	786.249
Gross profit	-2321.048	-805.471	581.561	1049.473	1281.555	1572.092
Allowances	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	-2321.048	-805.471	581.561	1049.473	1281.555	1572.092
Tax	0.000	0.000	11.108	31.799	38.447	47.163
Net profit	-2321.048	-805.471	570.453	1017.674	1243.109	1524.929
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-2321.048	-805.471	570.453	1017.674	1243.109	1524.929
Accumulated undistributed profit	-2321.048	-3126.519	-2556.065	-1538.391	-295.283	1229.646
Gross profit, % of total sales	-64.979	-13.183	7.279	12.544	15.148	18.583
Net profit, % of total sales	-64.979	-13.183	7.140	12.164	14.694	18.025
ROE. Net profit, % of equity	-25.875	-9.326	6.605	11.784	14.394	17.657
ROI. Net profit+interest, % of invest.	-2.348	4.028	9.127	9.723	9.434	9.399

Net Income Statement in US Dollars, Thousands

Year	2000	2001	2002	2003	2004	2005
Total sales, incl. sales tax	8460.037	8460.037	8460.037	8460.037	8460.037	8460.037
Less: variable costs, incl. sales tax	2288.052	2288.052	2288.052	2288.052	2288.052	2288.052
Variable margin	6171.985	6171.985	6171.985	6171.985	6171.985	6171.985
As % of total sales	72.955	72.955	72.955	72.955	72.955	72.955
Non-variable costs, incl. depreciation	3721.245	3721.245	3721.244	3721.244	1737.580	1737.580
Operational margin	2450.740	2450.740	2450.741	2450.741	4434.405	4434.405
As % of total sales	28.968	28.968	28.968	28.968	52.416	52.416
Cost of finance	495.713	205.177	41.771	0.000	0.000	0.000
Gross profit	1955.027	2245.563	2408.970	2450.741	4434.405	4434.405
Allowances	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	1955.027	2245.563	2408.970	2450.741	4434.405	4434.405
Tax	58.651	67.367	72.269	73.522	133.032	133.032
Net profit	1896.376	2178.197	2336.701	2377.219	4301.373	4301.373
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	1896.376	2178.197	2336.701	2377.219	4301.373	4301.373
Accumulated undistributed profit	3126.023	5304.219	7640.920	10018.140	14319.510	18620.880
Gross profit, % of total sales	23.109	26.543	28.475	28.968	52.416	52.416
Net profit, % of total sales	22.416	25.747	27.620	28.099	50.843	50.843
ROE, Net profit, % of equity	21.958	25.221	27.056	27.526	49.805	49.805
ROI, Net profit+interest, % of invest.	9.728	9.692	9.672	9.667	17.492	17.492

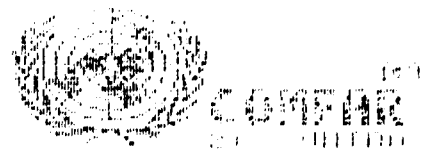
Net Income Statement in US Dollars, Thousands

Year	2006	2007	2008
Total sales, incl. sales tax	8460.037	8460.037	8460.037
Less: variable costs, incl. sales tax	2288.052	2288.052	2288.052
Variable margin	6171.985	6171.985	6171.985
As % of total sales	72.955	72.955	72.955
Non-variable costs, incl. depreciation	1737.580	1737.580	1737.580
Operational margin	4434.405	4434.405	4434.405
As % of total sales	52.416	52.416	52.416
Cost of finance	0.000	0.000	0.000
Gross profit	4434.405	4434.405	4434.405
Allowances	0.000	0.000	0.000
Taxable profit	4434.405	4434.405	4434.405
Tax	133.032	133.032	133.032
Net profit	4301.373	4301.373	4301.373
Dividends paid	0.000	0.000	0.000
Undistributed profit	4301.373	4301.373	4301.373
Accumulated undistributed profit	22922.260	27223.630	31525.000
Gross profit, % of total sales	52.416	52.416	52.416
Net profit, % of total sales	50.843	50.843	50.843
ROE, Net profit, % of equity	49.805	49.805	49.805
ROI, Net profit+interest, % of invest.	17.492	17.492	17.492



Projected Balance Sheets, construction in US Dollars, Thousands

Year	1992.1	1992.2	1993.1	1993.2
Total assets	2979.231	6148.447	19154.550	24503.360
Fixed assets, net of depreciation	0.000	2979.237	6148.226	19154.090
Construction in progress	2979.237	3168.989	13005.860	5267.727
Current assets	0.000	0.000	0.000	0.000
Cash, cash	0.000	0.000	0.000	0.000
Cash surplus, finance available	0.044	0.221	0.465	82.047
Loss carried forward	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000
Total liabilities	2979.281	6148.447	19154.550	24503.360
Equity capital	1492.824	2591.801	5018.087	8636.396
Reserves, retained profit	0.000	0.000	0.000	0.000
Profit	0.000	0.000	0.000	0.000
Long and medium term debt	1486.457	3556.647	14136.460	15867.460
Current liabilities	0.000	0.000	0.000	0.000
Bank overdraft, finance required	0.000	0.000	0.000	0.000
Total debt	1486.457	3556.647	14136.460	15867.460
Equity % of liabilities	50.107	42.154	26.198	35.245



Projected Balance Sheets, Production in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
Total assets	25761.460	24727.590	22836.690	20233.580	17153.330	14780.910	13789.780
Fixed assets, net of depreciation	22374.250	20696.290	18556.340	16416.380	14276.420	12136.460	10083.900
Construction in progress	482.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	537.620	830.245	1059.160	1153.512	1218.191	1218.191	1218.191
Cash, bank	66.534	74.530	94.677	107.623	120.329	120.329	120.329
Cash surplus, finance available	0.000	0.000	0.000	0.000	0.000	1010.553	2352.358
Loss carried forward	0.000	2321.048	3126.519	2556.065	1538.391	295.283	0.000
Loss	2321.048	805.471	0.000	0.000	0.000	0.000	0.000
Total liabilities	25761.460	24727.590	22836.690	20233.580	17153.330	14780.910	13789.780
Equity capital	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396
Reserves, retained profit	0.000	0.000	0.000	0.000	0.000	0.000	1229.646
Profit	0.000	0.000	570.453	1017.674	1243.109	1524.929	1396.376
Long and medium term debt	16329.460	14898.460	12306.230	9714.004	7121.774	4529.544	1937.315
Current liabilities	44.264	63.672	81.163	86.970	90.045	90.045	90.045
Bank overdraft, finance required	751.334	1129.057	1242.447	778.533	62.006	0.000	0.000
Total debt	17125.060	16091.190	13629.840	10579.510	7273.825	4619.589	2027.359
Equity, % of liabilities	33.524	34.926	37.818	42.683	50.348	58.429	62.629

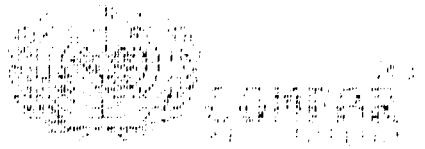
Projected Balance Sheets, Production in US Dollars, Thousands

Year	2001	2002	2003	2004	2005	2006	2007
Total assets	14283.820	16367.360	18744.580	23045.950	27347.320	31648.700	35950.070
Fixed assets, net of depreciation	8041.342	5993.783	3946.225	3882.331	3818.437	3754.543	3690.649
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	1218.191	1218.191	1218.191	1218.191	1218.191	1218.191	1218.191
Cash, bank	120.329	120.329	120.329	120.329	120.329	120.329	120.329
Cash surplus, finance available	4903.956	9035.059	13459.330	17825.100	22190.870	26555.640	30920.900
Loss carried forward	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	14283.820	16367.360	18744.580	23045.950	27347.320	31648.700	35950.070
Equity capital	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396
Reserves, retained profit	3126.023	5304.219	7640.920	10018.140	14319.510	18620.880	22922.260
Profit	2178.197	2336.701	2377.219	4301.373	4301.373	4301.373	4301.373
Long and medium term debt	253.157	0.000	0.000	0.000	0.000	0.000	0.000
Current liabilities	90.045	90.045	90.045	90.045	90.045	90.045	90.045
Bank overdraft, finance required	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	343.202	90.045	90.045	90.045	90.045	90.045	90.045
Equity, % of liabilities	60.463	52.766	46.074	37.475	31.580	27.269	24.023

Projected Balance Sheets, Production in US Dollars, Thousands

Year	2003
Total assets	40251.440
Fixed assets, net of depreciation	3626.755
Construction in progress	0.000
Current assets	1218.191
Cash, cash	120.329
Cash surplus, finance available	35286.170
Loss carried forward	0.000
Loss	0.000
Total liabilities	40251.440
Equity capital	8636.396
Reserves, retained profit	27223.630
Profit	4301.373
Long and medium term debt	0.000
Current liabilities	90.045
Bank overdraft, finance required	0.000
Total debt	90.045
Equity, % of liabilities	21.456

CASE 1/C



TYLOSIN TARTRATE PLANT
Sept.91
CASE 1/C - Production 100 ton/y

2 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 0.0370 units accounting currency
accounting currency: US Dollars, Thousands

Total initial investment during construction phase

fixed assets:	24421.81	50.085 % foreign
current assets:	0.00	0.000 % foreign
total assets:	24421.81	50.085 % foreign

Source of funds during construction phase

equity & grants:	8636.40	10.479 % foreign
foreign loans :	11327.10	
local loans :	4540.36	
total funds :	24503.86	49.919 % foreign

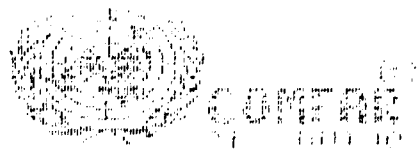
Cashflow from operations

Year:	1	3	5
operating costs:	2184.03	3787.56	4133.66
depreciation :	2047.56	2139.96	2139.96
interest :	1759.86	1657.86	1076.79
production costs	5991.45	7585.37	7350.40
thereof foreign	41.27 %	34.48 %	31.16 %

total sales :	3853.98	8742.07	9400.04
gross income :	-2137.47	1112.25	1975.56
net income :	-2137.47	1092.89	1922.22
cash balance :	-681.33	393.29	1395.64
net cashflow :	616.52	4643.37	5064.65

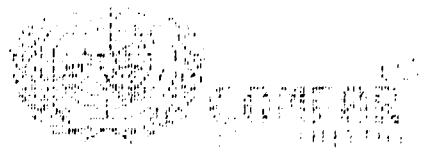
Net Present Value at: 10.00 % = 9635.00
Internal Rate of Return: 16.07 %
Return on equity1: 15.71 %
Return on equity2: 17.70 %

Index of Schedules produced by COMFAR



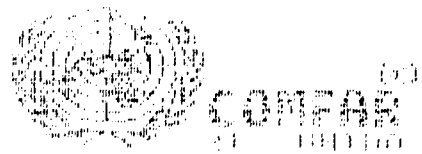
Total Production Costs in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
% of nom. capacity (single product).	41.667	69.444	87.963	92.593	92.593	92.593	92.593
Raw material 1	844.743	1407.906	1783.347	1877.208	1877.208	1877.208	1877.208
Other raw materials	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Utilities	172.421	263.169	323.668	338.792	338.792	338.792	338.792
Energy	149.345	211.572	253.057	263.428	263.428	263.428	263.428
Labour, direct	150.790	172.643	187.212	190.855	190.855	190.855	190.855
Repair, maintenance	152.346	152.346	304.728	380.882	457.074	457.074	457.074
Spares	0.000	76.283	152.556	228.838	305.111	305.111	305.111
Factory overheads	222.240	222.240	222.240	222.240	222.240	222.240	222.240
Factory costs	1691.885	2506.159	3226.808	3502.244	3654.708	3654.708	3654.708
Administrative overheads	275.948	275.948	275.948	275.948	275.948	275.948	275.948
Indir. costs, sales and distribution	216.200	371.300	284.800	203.000	203.000	203.000	203.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Depreciation	2047.558	2139.958	2139.958	2139.958	2139.958	2139.958	2047.558
Financial costs	1759.857	1779.492	1657.857	1367.321	1076.785	786.249	495.713
Total production costs	5991.449	7072.857	7585.372	7488.472	7350.399	7059.863	6676.927
Costs per unit (single product)	133.143	94.305	79.846	74.885	73.504	70.599	66.769
Of it foreign, %	41.271	39.328	34.478	32.207	31.157	30.125	28.022
Of it variable,%	18.476	26.085	30.809	32.850	33.467	34.844	36.843
Total labour	223.018	244.871	259.440	263.083	263.083	263.083	263.083



Total Production Costs in US Dollars, Thousands

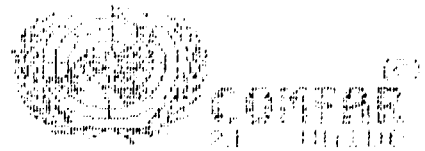
Year	2001	2002	2003	2004- 8
% of nom. capacity (single product).	92.593	92.593	92.593	92.593
Raw material 1	1877.208	1877.208	1877.208	1877.208
Other raw materials	0.000	0.000	0.000	0.000
Utilities	338.792	338.792	338.792	338.792
Energy	263.428	263.428	263.428	263.428
Labour, direct	190.855	190.855	190.855	190.855
Repair, maintenance	457.074	457.074	457.074	457.074
Spares	305.111	305.111	305.111	305.111
Factory overheads	222.240	222.240	222.240	222.240
Factory costs	3654.708	3654.708	3654.708	3654.708
Administrative overheads	275.948	275.948	275.948	275.948
Indir. costs, sales and distribution	203.000	203.000	203.000	203.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000
Depreciation	2047.558	2047.558	2047.558	63.894
Financial costs	205.177	41.771	0.000	0.000
Total production costs	6386.391	6222.985	6181.214	4197.549
Costs per unit (single product)	63.864	62.230	61.812	41.975
Of it foreign, %	26.738	24.814	24.306	8.817
Of it variable,%	38.519	39.530	39.798	58.605
Total labour	263.083	263.083	263.083	263.083



Net Working Capital in US Dollars, Thousands

Year	adc	coto	1994	1995	1996	1997	1998	1999-2008
Coverage								
Current assets &								
Accounts receivable	30	12.0	182.003	264.019	319.334	337.939	350.645	350.645
Inventory and materials	55	6.5	155.159	256.582	324.197	341.101	341.101	341.101
Energy	0	---	0.000	0.000	0.000	0.000	0.000	0.000
Spares	180	2.0	0.000	38.141	76.278	114.419	152.556	152.556
Work in progress	15	24.0	70.495	102.682	130.969	140.705	145.317	145.317
Finished products	30	12.0	163.986	228.361	284.934	304.405	313.630	313.630
Cash in hand	30	12.0	66.777	74.955	95.224	108.230	120.936	120.936
Total current assets			638.420	964.740	1230.935	1346.799	1424.183	1424.183
Current liabilities and								
Accounts payable	10	36.0	46.997	68.455	87.313	93.803	96.878	96.878
Net working capital			591.423	896.285	1143.622	1252.996	1327.305	1327.305
Increase in working capital			591.423	304.861	247.338	109.374	74.309	0.000
Net working capital, local			573.407	837.490	1064.189	1152.526	1198.988	1198.988
Net working capital, foreign			18.017	58.795	79.433	100.470	128.317	128.317

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

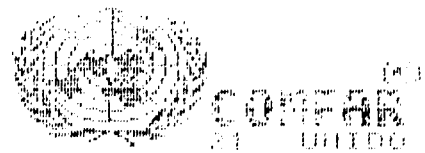


Cashflow Tables, construction in US Dollars, Thousands

Year	1992.1	1992.2	1993.1	1993.2
Total cash inflow	2979.281	3169.166	13006.100	5349.308
Financial resources	2979.281	3169.166	13006.100	5349.308
Sales, net of tax	0.000	0.000	0.000	0.000
Total cash outflow	2979.237	3168.989	13005.860	5267.727
Total assets	2925.673	2997.412	12506.160	4450.979
Operating costs	0.000	0.000	0.000	0.000
Cost of finance	53.565	171.577	499.704	816.747
Repayment	0.000	0.000	0.000	0.000
Corporate tax	0.000	0.000	0.000	0.000
Dividends paid	0.000	0.000	0.000	0.000
Surplus (deficit)	0.044	0.177	0.243	81.581
Cumulated cash balance	0.044	0.221	0.464	82.045
Inflow, local	1481.081	2450.566	4949.803	3390.308
Outflow, local	1481.092	2450.535	4949.783	3308.805
Surplus (deficit)	-0.000	0.031	0.020	81.503
Inflow, foreign	1498.200	718.600	8056.300	1959.000
Outflow, foreign	1498.156	718.454	8056.077	1958.922
Surplus (deficit)	0.044	0.146	0.223	0.078
Net cashflow	-2925.673	-2997.412	-12506.160	-4450.979
Cumulated net cashflow	-2925.673	-5923.084	-18429.240	-22880.220

Cashflow tables, production in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
Total cash inflow	4362.977	6868.615	8716.476	9332.448	9329.033	9325.958	9325.958
Financial resources	508.997	21.458	18.858	6.490	3.075	0.000	0.000
Sales, net of tax	3853.980	6847.157	8697.618	9325.958	9325.958	9325.958	9325.958
Total cash outflow	5044.311	6690.219	8323.191	8106.220	7933.394	7573.318	7293.121
Total assets	1100.420	326.320	266.195	115.864	77.384	0.000	0.000
Operating costs	2184.033	3153.407	3787.556	3981.192	4133.655	4133.655	4133.655
Cost of finance	1759.857	1779.492	1657.857	1367.321	1076.785	786.249	495.713
Repayment	0.000	1431.000	2592.230	2592.230	2592.230	2592.230	2592.229
Corporate tax	0.000	0.000	19.353	49.612	53.340	61.185	71.524
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	-681.334	178.396	393.284	1226.229	1395.639	1752.640	2032.837
Cumulated cash balance	-599.289	-420.893	-27.609	1198.620	2594.259	4346.898	6379.735
Inflow, local	46.997	100.650	256.432	402.448	399.032	395.958	395.958
Outflow, local	3223.887	3661.519	5227.840	5213.895	5155.896	4987.073	4870.282
Surplus (deficit)	-3176.890	-3560.869	-4971.408	-4811.447	-4756.864	-4591.115	-4474.324
Inflow, foreign	4315.980	6767.966	8460.044	8930.000	8930.000	8930.000	8930.000
Outflow, foreign	1820.423	3028.700	3095.352	2892.324	2777.498	2586.246	2422.840
Surplus (deficit)	2495.557	3739.266	5364.692	6037.676	6152.502	6343.754	6507.160
Net cashflow	616.524	3388.889	4643.372	5185.780	5064.654	5131.119	5120.779
Cumulated net cashflow	-22263.700	-18874.810	-14231.430	-9045.654	-3981.000	1150.118	6270.897

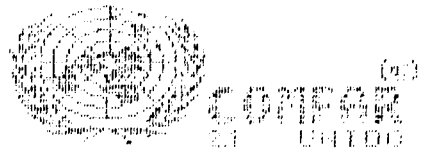


Cashflow tables, production in US Dollars, Thousands

Year	2001	2002	2003	2004	2005	2006	2007
Total cash inflow	9325.958	9325.958	9325.958	9325.958	9325.958	9325.958	9325.958
Financial resources	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	9325.958	9325.958	9325.958	9325.958	9325.958	9325.958	9325.958
Total cash outflow	6102.357	4512.363	4218.563	4272.122	4272.122	4272.122	4272.122
Total assets	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	4133.655	4133.655	4133.655	4133.655	4133.655	4133.655	4133.655
Cost of finance	205.177	41.771	0.000	0.000	0.000	0.000	0.000
Repayment	1684.157	253.157	0.000	0.000	0.000	0.000	0.000
Corporate tax	79.368	83.780	84.908	138.467	138.467	138.467	138.467
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	3223.601	4813.595	5107.395	5053.836	5053.836	5053.836	5053.836
Cumulated cash balance	9603.336	14416.930	19524.330	24578.160	29632.000	34685.840	39739.670
Inflow, local	395.958	395.958	395.958	395.958	395.958	395.958	395.958
Outflow, local	3842.924	3847.335	3848.463	3902.022	3902.022	3902.022	3902.022
Surplus (deficit)	-3446.966	-3451.378	-3452.506	-3506.065	-3506.065	-3506.065	-3506.065
Inflow, foreign	8930.000	8930.000	8930.000	8930.000	8930.000	8930.000	8930.000
Outflow, foreign	2259.434	665.028	370.100	370.100	370.100	370.100	370.100
Surplus (deficit)	6670.566	8264.973	8559.900	8559.900	8559.900	8559.900	8559.900
Net cashflow	5112.935	5108.523	5107.395	5053.836	5053.836	5053.836	5053.836
Cumulated net cashflow	11383.830	16492.360	21599.750	26653.590	31707.420	36761.260	41815.090

Cashflow tables, production in US Dollars, Thousands

Year	2008
Total cash inflow . .	9325.958
Financial resources .	0.000
Sales, net of tax . .	9325.958
Total cash outflow . .	4272.122
Total assets	0.000
Operating costs . . .	4133.655
Cost of finance . . .	0.000
Repayment	0.000
Corporate tax . . .	138.467
Dividends paid . . .	0.000
Surplus (deficit) .	5053.836
Cumulated cash balance	44793.510
Inflow, local	395.958
Outflow, local	3902.022
Surplus (deficit) .	-3506.065
Inflow, foreign . . .	8930.000
Outflow, foreign . . .	370.100
Surplus (deficit) .	8559.900
Net cashflow	5053.836
Cumulated net cashflow	46868.930



Cashflow Discounting:

a) Equity paid versus Net income flow:

Net present value	5536.15	at	10.00 %
Internal Rate of Return (IRRE1) ..	15.71 %		

b) Net Worth versus Net cash return:

Net present value	7756.79	at	10.00 %
Internal Rate of Return (IRRE2) ..	17.70 %		

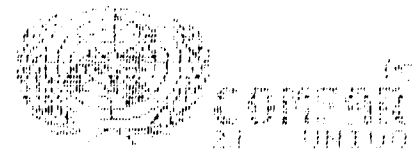
c) Internal Rate of Return on total investment:

Net present value	9635.00	at	10.00 %
Internal Rate of Return (IRR) ..	16.07 %		

Net Worth = Equity paid plus reserves

Net Income Statement in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999
Total sales, incl. sales tax	3853.980	6861.973	8742.066	9400.037	9400.037	9400.037
Less: variable costs, incl. sales tax.	1106.987	1859.793	2381.420	2534.049	2534.049	2534.049
Variable margin	2746.993	5002.180	6360.646	6865.988	6865.988	6865.988
As % of total sales	71.277	72.897	72.759	73.042	73.042	73.042
Non-variable costs, incl. depreciation	3124.604	3448.388	3590.543	3661.179	3813.644	3813.643
Operational margin	-377.611	1553.792	2770.104	3204.809	3052.344	3052.345
As % of total sales	-9.798	22.644	31.687	34.094	32.472	32.472
Cost of finance	1759.857	1779.492	1657.857	1367.321	1076.785	786.249
Gross profit	-2137.469	-225.700	1112.246	1837.488	1975.559	2266.096
Allowances	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	-2137.469	-225.700	1112.246	1837.488	1975.559	2266.096
Tax	0.000	0.000	19.353	49.612	53.340	61.185
Net profit	-2137.469	-225.700	1092.893	1787.876	1922.219	2204.911
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-2137.469	-225.700	1092.893	1787.876	1922.219	2204.911
Accumulated undistributed profit	-2137.469	-2363.169	-1270.276	517.600	2439.819	4644.730
Gross profit, % of total sales	-55.461	-3.289	12.723	19.548	21.017	24.107
Net profit. % of total sales	-55.461	-3.289	12.502	19.020	20.449	23.456
ROE, Net profit, % of equity	-24.750	-2.613	12.655	20.702	22.257	25.530
ROI, Net profit+interest, % of invest.	-1.578	6.410	11.234	12.828	12.157	12.125



Net Income Statement in US Dollars, Thousands

Year	2000	2001	2002	2003	2004	2005
Total sales, incl. sales tax	9400.037	9400.037	9400.037	9400.037	9400.037	9400.037
Less: variable costs, incl. sales tax.	2534.049	2534.049	2534.049	2534.049	2534.049	2534.049
Variable margin	6865.988	6865.988	6865.988	6865.988	6865.988	6865.988
As % of total sales	73.042	73.042	73.042	73.042	73.042	73.042
Non-variable costs, incl. depreciation	3721.244	3721.244	3721.243	3721.243	1737.579	1737.579
Operational margin	3144.744	3144.744	3144.745	3144.745	5128.409	5128.409
As % of total sales	33.455	33.455	33.455	33.455	54.557	54.557
Cost of finance	495.713	205.177	41.771	0.000	0.000	0.000
Gross profit	2649.031	2939.567	3102.974	3144.745	5128.409	5128.409
Allowances	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	2649.031	2939.567	3102.974	3144.745	5128.409	5128.409
Tax	71.524	79.368	83.780	84.908	138.467	138.467
Net profit	2577.507	2860.199	3019.193	3059.836	4989.941	4989.941
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	2577.507	2860.199	3019.193	3059.836	4989.941	4989.941
Accumulated undistributed profit	7222.237	10082.440	13101.630	16161.470	21151.410	26141.350
Gross profit, % of total sales	28.181	31.272	33.010	33.455	54.557	54.557
Net profit, % of total sales	27.420	30.428	32.119	32.551	53.084	53.084
ROE, Net profit, % of equity	29.845	33.118	34.959	35.430	57.778	57.778
ROI, Net profit+interest, % of invest.	12.458	12.426	12.408	12.403	20.227	20.227

Net Income Statement in US Dollars, Thousands

Year	2006	2007	2008
Total sales, incl. sales tax	9400.037	9400.037	9400.037
Less: variable costs, incl. sales tax.	2534.049	2534.049	2534.049
Variable margin	6865.988	6865.988	6865.988
As % of total sales	73.042	73.042	73.042
Non-variable costs, incl. depreciation	1737.579	1737.579	1737.579
Operational margin	5128.409	5128.409	5128.409
As % of total sales	54.557	54.557	54.557
Cost of finance	0.000	0.000	0.000
Gross profit	5128.409	5128.409	5128.409
Allowances	0.000	0.000	0.000
Taxable profit	5128.409	5128.409	5128.409
Tax	138.467	138.467	138.467
Net profit	4989.941	4989.941	4989.941
Dividends paid	0.000	0.000	0.000
Undistributed profit	4989.941	4989.941	4989.941
Accumulated undistributed profit	31131.290	36121.230	41111.180
Gross profit, % of total sales	54.557	54.557	54.557
Net profit, % of total sales	53.084	53.084	53.084
ROE, Net profit, % of equity	57.778	57.778	57.778
ROI, Net profit+interest, % of invest.	20.227	20.227	20.227

Projected Balance Sheets, construction in US Dollars, Thousands

Year	1992.1	1992.2	1993.1	1993.2
Total assets	2979.281	6148.447	19154.550	24503.860
Fixed assets, net of depreciation	0.000	2979.237	6148.226	19154.090
Construction in progress	2979.237	3168.989	13005.860	5267.727
Current assets	0.000	0.000	0.000	0.000
Cash, bank	0.000	0.000	0.000	0.000
Cash surplus, finance available	0.044	0.221	0.465	82.047
Loss carried forward	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000
Total liabilities	2979.281	6148.447	19154.550	24503.860
Equity capital	1492.824	2591.801	5018.087	8636.396
Reserves, retained profit	0.000	0.000	0.000	0.000
Profit	0.000	0.000	0.000	0.000
Long and medium term debt	1486.457	3556.647	14136.460	15867.460
Current liabilities	0.000	0.000	0.000	0.000
Bank overdraft, finance required	0.000	0.000	0.000	0.000
Total debt	1486.457	3556.647	14136.460	15867.460
Equity, % of liabilities	50.107	42.154	26.198	35.245

Projected Balance Sheets, Production in US Dollars, Thousands

Year	1994	1995	1996	1997	1998	1999	2000
Total assets	25612.140	24024.200	22150.440	20232.080	18294.870	17907.550	17892.830
Fixed assets, net of depreciation	22374.250	20696.290	18556.340	16416.380	14276.420	12136.460	10038.900
Construction in progress	462.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	571.643	839.785	1135.711	1238.569	1303.247	1303.247	1303.247
Cash, bank	66.777	74.955	95.224	108.230	120.936	120.936	120.936
Cash surplus, finance available	0.000	0.000	0.000	1198.627	2594.267	4346.907	6379.743
Loss carried forward	0.000	2137.469	2363.169	1270.276	0.000	0.000	0.000
Loss	2137.469	225.700	0.000	0.000	0.000	0.000	0.000
Total liabilities	25612.140	24024.200	22150.440	20232.080	18294.870	17907.550	17892.830
Equity capital	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396
Reserves, retained profit	0.000	0.000	0.000	0.000	517.600	2439.819	4644.730
Profit	0.000	0.000	1092.893	1787.876	1922.219	2204.911	2577.507
Long and medium term debt	16329.460	14898.460	12306.230	9714.004	7121.774	4529.544	1937.315
Current liabilities	46.997	68.455	87.313	93.803	96.878	96.878	96.878
Bank overdraft, finance required	599.287	420.889	27.605	0.000	0.000	0.000	0.000
Total debt	16975.750	15387.810	12421.150	9807.807	7218.652	4626.422	2034.193
Equity, % of liabilities	33.720	35.949	38.990	42.687	47.207	48.228	48.267

Projected Balance Sheets, Production in US Dollars, Thousands

Year	2001	2002	2003	2004	2005	2006	2007
Total assets	19068.870	21834.900	24894.740	29884.680	34874.630	39864.570	44854.510
Fixed assets, net of depreciation	8041.342	5993.783	3946.225	3882.331	3818.437	3754.543	3690.649
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	1303.247	1303.247	1303.247	1303.247	1303.247	1303.247	1303.247
Cash, bank	120.936	120.936	120.936	120.936	120.936	120.936	120.936
Cash surplus, finance available	9603.345	14416.940	19524.330	24578.170	29632.010	34685.840	39739.680
Loss carried forward	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	19068.870	21834.900	24894.740	29884.680	34874.630	39864.570	44854.510
Equity capital	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396	8636.396
Reserves, retained profit	7222.237	10082.440	13101.630	16161.470	21151.410	26141.350	31131.290
Profit	2960.199	3019.193	3059.836	4989.941	4989.941	4989.941	4989.941
Long and medium term debt	253.157	0.000	0.000	0.000	0.000	0.000	0.000
Current liabilities	96.878	96.878	96.878	96.878	96.878	96.878	96.878
Bank overdraft, finance required	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	350.035	96.878	96.878	96.878	96.878	96.878	96.878
Equity, % of liabilities	45.291	39.553	34.692	28.899	24.764	21.664	19.254

Projected Balance Sheets, Production in US Dollars, Thousands

Year	2008
Total assets	49844.450
Fixed assets, net of depreciation	3626.755
Construction in progress	0.000
Current assets	1303.247
Cash, bank	120.936
Cash surplus, finance available	44793.516
Loss carried forward	0.000
Loss	0.000
Total liabilities	49844.450
Equity capital	8636.396
Reserves, retained profit	36121.230
Profit	4989.941
Long and medium term debt	0.000
Current liabilities	96.878
Bank overdraft, finance required	0.000
Total debt	96.878
Equity, % of liabilities	17.327

ANNEX 8

HOECHST DECLARATION OF INTEREST
ON TYLOSIN TARTRATE PURCHASE

Hoechst

Hoechst AG · Postfach 800320 · D-6230 Frankfurt am Main 80

Hoechst Aktiengesellschaft
Postfach 800320 · 6230 Frankfurt am Main 80
Telefon: (069) 305-1 · Telex: 41234-0 hd
Telegramm: hoechstag frankfurtmain
Telefax: (069) 303665
Dresdner Bank AG, Frankfurt am Main
Commerzbank AG, Frankfurt am Main
Deutsche Bank AG, Frankfurt am Main
Hessische Landesbank — Girozentrale — Frankfurt am Main
Landeszentralbank in Hessen, Frankfurt am Main
Postgiroamt Frankfurt am Main

UB Pharmaceuticals Limited
1, Vittal Mallya Road
Bangalore 560 001.

INDIA

Ihre Zeichen	Ihre Nachricht vom	Unsere Zeichen	Telefon Durchwahl	Frankfurt am Main
		St/mg	(069) 305-3815	03.10.1991

Tylosyn Tartarate

We refer to the discussions we had with you in the abovementioned matter. Subject to quality and competitive price, we are interested in importing Tylosyn Tartarate from you in the region of 80 - 100 tons per annum for marketing in Germany and other countries.

Please contact us with further details.

Yours sincerely,
HOECHST AKTIENGESELLSCHAFT

[signatures]

ANNEX 9

INTEKIM REPORT

FIDIMI CONSULTING S.p.A.

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