

INDUSTRIAL PROJECT REPORT

SUBMITTED TO THE
NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL
IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE DEGREE OF
MASTER OF SCIENCE
IN
DAIRYING
(DAIRY ENGINEERING)

BY
RAVI SREENIVASA RAO
B.Sc. (D.T.)

DIVISION OF DAIRY ENGINEERING
NATIONAL DAIRY RESEARCH INSTITUTE
(DEEMED UNIVERSITY)
(I.C.A.R.)
KARNAL-132001 (HARYANA) INDIA

1993

Regn. No. 90-M-DE-142

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IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS OF THE
M.A.S.I. BOARD



DAIRY ENGINEERING

DAIRY ENGINEERING
BY
DR. B. S. CHANDRA
1994

INDUSTRIAL PROJECT TRAINING

AT

B.C.DAIRY

**Alfa Laval (India)Ltd.
DAPODI,PUNE-12.**

DURING

**the 2nd Semester of 1992-'93
(29th Jan. '93 -14th June '93)**

BY

RAVI SREENIVASA RAO

final year student of

M.Sc. DAIRYING

IN

DAIRY ENGINEERING

National Dairy Research Institute, Karnal

A C K N O W L E D G M E N T S

I express my profound sense of gratitude to Mrs. L.F. Poonawalla, Vice Chairperson and Managing Director, Alfa Laval (India) Limited for allowing me to carry out Industrial project training at Business Centre Dairy.

I owe a deep sense of gratitude to the Vice President and the Sr. Managers of the Food Engineering Group for their elderly guidance, constant assistance and valuable suggestions throughout the training period.

I am very much thankful to Dr. S.C. Sarma, Director N.D.R.I., Karnal and Dr. H.Abichandani, Head D.E. Division for giving me such an opportunity to expose myself to the most advance Dairy equipments manufacturer in India.

The financial assistance received from Alfa Laval (India) Limited as stipend during the training period and for the field market survey is gratefully acknowledged.

I thank all of my relatives, friends and well wishers who helped me in each and every stage of my endeavour to achieve this goal.

Dated 12.07.1993

Karnal

R. Sreenivasa Rao
(RAVI SREENIVASA RAO)

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Alfa Laval (India) Limited.

DAPODI (Bombay-Pune Highway)

PUNE - 411 012

Maharashtra State

CHAPTER 1

Alfa Romeo
 in the name
 such as
 Chemical
 Alfa Romeo
 equipment
 from
 installed
 project
 Gariboldi
 and Ref

COMPANY

It is
 Vulcan
 Swedish
 leading
 LAVAL, S.A.
 In
 manufacture
 preservation
 machinery
 Production
 Cigno and
 on the

COMPANY PROFILE

COMPANY PROFILE

Alfa-Laval (India)Limited is an engineering company engaged in the manufacturing of products for a wide variety of industries such as Dairy. Processed Foods, Beverages, Vegetable Oil, Chemical Process, Fertilizer, Pharmaceutical, Marine and Power. Alfa Laval's strength lies not only in the supply of individual equipment to these industries, but also in execution of projects from Pre-Project engineering to manufacture, supply, installation, commissioning and after sales services. It's project management capability has been proven in the field of Dairies, Breweries, Fruit processing, Vegetable Oil processing and Refrigeration.

COMPANY DEVELOPMENT

In 1937 the Company was incorporated under the name of Vulcan Trading Company Limited, a wholly owned subsidiary of the Swedish Match Company, Sweden. The Company represented several leading manufacturers in India, notable among them being ALFA-LAVAL, ELECTROLUX, KANTHAL SANDVIK, ATLAS COPCO and PRIMUS.

In 1961, the Company set up a factory at Dapodi, Pune for manufacture of machinery required for the processing, preservation and storage of food, and manufacture of plants and machinery required by the Chemical and Pharmaceutical industries. Production commenced in 1963. About the same time, Sandvik, Atlas Copco and Alfa-Laval set up independent manufacturing facilities on the neighbouring lands in Pune.

As Vulcan Trading and Alfa-Laval had complimentary facilities to serve the food industry, they merged in 1965 to form Vulcan-Laval Limited.

In 1982, a new manufacturing unit was set up in industrially backward district of Satara (116 km. South East of Pune). Production commenced initially with the manufacture of Milk Cans. The Satara unit is the manufacturing centre for Plate Heat Exchangers. It is one of the three units in Alfa Laval Industry world wide with plate pressing facility.

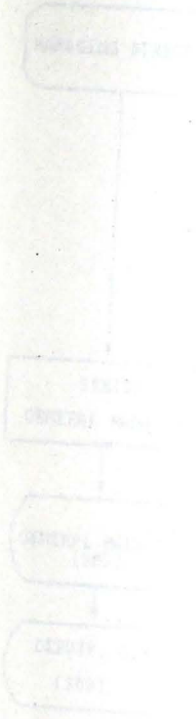
In 1987 the Company changed its name to Alfa Laval (India) Limited thus becoming a full-fledged member of the Alfa-Laval Group.

On January 1, 1993, the liquid food company Tetra Pak and the food processing and industrial company Alfa Laval were united in a new global entity called the "Tetra Laval Group". Alfa Laval (India) Limited has thus become a part of Tetra Laval Group. In India, Tetra Pak (India) Limited and Alfa Laval (India) Limited will continue to exist as two separate companies, though under Tetra Laval Group. Tetra Laval Group consists of four Industrial groups: Tetra Pak International, Tetra Laval Food, Alfa Laval Industry and Alfa Laval Agri.

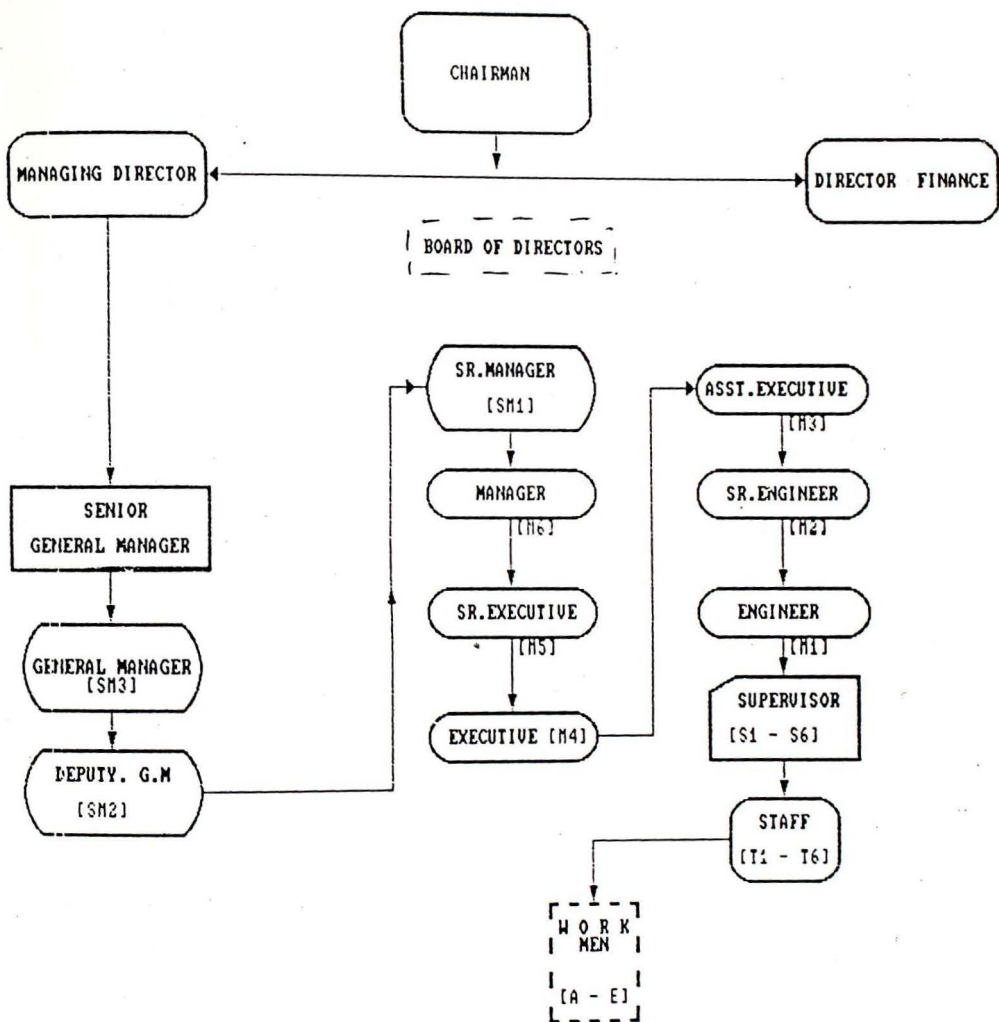
Alfa Laval (India) Limited has some sister companies located in Pune and Satara. They are Saunders Valves (India) Limited, Skansen Engg. & Consultancy Co., LKM (India) Limited and Dairy Farm Equipment (India) Limited.

The company has its Registered Office in Bombay and Head Office in Pune with manufacturing facilities at Pune and Satara. The Company has a very wide Sales and Service net work order to be close at hands of the customer. It's field and representative offices are located at Anand, Aurangabad, Bangalore, Bareilly, Baroda, Bhopal, Bhubhaneshwar, Bombay, Calcutta, Chandigarh, Cochin, Coimbatore, Delhi, Hyderabad, Jabalpur, Jaipur, Jamshedpur, Kolhapur, Lucknow, Madras, Nagpur, Pune, Patna, Raipur, Rajkot, Ranchi and Vishakhapatnam.

CHAPTER 2



CORPORATE STRUCTURE



THE CORE .

1. Food Engineering.
2. Thermal Engineering.
3. Separation Engineering.
4. Refrigeration Engineering.
5. Chemical Engineering.

THE FRONT LINE .

- A. Regional Sales.
- B. Area Sales.
- C. Branch Sales.

THE BACK - UP

After market.

MAIN STAY & PILLARS

1. Manufacturing.
2. Research & Technology Development
3. Quality Assurance.
4. Quality Circles.

THE BACK BONE.

- * **Central Planning and Co-ordination :**
Always a kaleidoscope but with certain objective.
- * **Purchase :**
Keeping the factory wheels moving.
- * **Maintenance :**
Protecting and enhancing the life of company's assets.
- * **Materials :**
Keeping a "watchful eye" on inventories and ensuring timely deliveries.
- * **Accounts & Finance :**
Providing fuel and applying brakes.
- * **Industrial Relations :**
Promotion of togetherness, harmony and participation.
- * **Management Services :**
Keeping on fast lanes through " On-line Computing".
- * **Strong Room :**
A store house of technology.
- * **Exports :**
Serving the share holders, clearing, forwarding all overseas consignments.

CHAPTER 3

The
equity

STATUS

Alfa Laval KEY STATISTICS

1. EQUITY STRUCTURE :

The subscribed and paid - up capital of the company by way of equity shares is distributed as follows :

Tetra Laval Group	51%
General Public	49%

2. ANNUAL TURNOVER (January to December) :

Millions

1989-90	:	Rs. 884.154
1990-91	:	Rs.1033.585
1991-92	:	Rs.1388.503
1992-93	:	Rs.1630.(approx)

3. WORKS & OFFICE :

	<u>Pune</u>	<u>Satara</u>
Total Area	7400 Sq. M (Free hold)	64000 Sq. M (Lease hold)
Built - up Area	21548 Sq.M	5810 Sq. M
Accommodation	19324 Sq.M	5810 Sq. M
Workshop Area	10500 Sq.M	4608 Sq. M
Total Cranage	80 Tons	30 Tons
Power Supply	Connected Load	250 KW

CHAPTER
4. MAN POWER :

Total number of employees	1310
Managers	537
Supervisors	90
Staff	166
Skilled workers	306
Semi Skilled	120
Unskilled	13
Others	78

CHAPTER 4

COLLABORATORS

MAJOR PRODUCT LINES & SERVICES AND COLLABORATORS

::S.NO.:: PRODUCT SERVICE TECHNICAL ASSOCIATION :

:: :: :: :

:: 1 Compact plate heat exchangers. }} :

:: 2 High speed centrifugal separators. }} :

:: 3 Stainless steel pumps, valves, }} :

:: pipes,fittings and joints. }} :

:: 4 Homogenizers }} :

:: 5 Vegetable oil refining systems. }}ALFA-LAVAL AB,SWEDEN. :

:: 6 Stainless steel fabricated vessel }} :

:: components,systems and process }} :

:: related to the food industry, }} :

:: dairy, beverages, fruit juice }} :

:: and others. }} :

:: 7 Continuous Ice-Cream Freezers }} HOYER A/S,DENMARK :

:: 8 Industrial refrigeration compress- }} STAL REFRIGERATION, :

:: ors,system engg. and turnkey }} SWEDEN. :

:: installation. }} :

:: 9 Drying & Evaporation systems and }} APV ANHYDRO A/S, :

:: equipments, spray dryers, fluid }} DENMARK. :

:: bed dryers,flash dryers and multi }} :

:: stage evaporators. }} :

:::10 Fabrication of custom designed }} TFL (Titanium Fabri- :

:: plants and equipments from exotic }} cators Ltd.),U.K. :

:: metals like Titanium , Nickel }} :

:: Tantalum etc. }} :

:::11 Continuous fermentation plants. }} NOBEL CHEMATUR, :

:: }} SWEDEN. :

:::12 Steam Dryers. }} STORK FRIESLAND :

:: }} SCANDINAVIA,AB: :

:: }} NETHERLANDS :

:::13 Bioearth-Scientific Composting }} FABCON Inc., :

:: of Spent Wash. }} PHILIPPINES :

:: }} :

CHAPTER 5

BUSINESS LINES

BUSINESS LINES

A. Processed Foods and Beverages :

Alfa-Laval (India) designs and engineers custom built plants for the Food and Beverages industry viz.

- Fruit processing, Fruit Juices, Concentrates, Sauces and Jams
- Beverages - Soft drinks, Fruit based drinks.
- Soy milk, Toffu, Soy yoghurt, Soy ice cream.
- Instant Tea / Coffee and Malted milk food.
- Beer alcoholic and non - alcoholic.
- Confectionery.
- Starch and starch derivatives.
- Coconut drinks, coconut cream and powder.
- Convenience foods.
- Bakers yeast, fooder yeast, dry yeast.
- Meat/Bone meal, technical and edible fat.
- Egg powder plants.

Complete turnkey projects including process know-how are offered by Alfa Laval (India) for the processing of fruits to final juice and aroma products such as concentrates as well as plants for reconstitution of concentrates to aerated/ still drinks with both aseptic and non-aseptic filling systems.

Today Alfa Laval (India) is one of largest suppliers in the country for stainless steel process equipment and vessels required in beer, fruit juice and beverage industry.

Specialised equipment from Alfa Laval (India) includes Plate Heat Exchangers, Scraped Surface Heat Exchangers, Spiraflo and Evaporators, Centrifugal Separators, Pumps, Homogenizers, Brew - House Equipments, Fermentators, Larger tanks, Falling film Evaporators, Spray Drying Plants, Refrigeration Plants, Process Vessels, Storage Vessels and Rising film evaporators.

B. Dairy :

Alfa Laval (India) is technically backed by Alfa-Laval, AB: Sweden, the world leaders in Dairy engineering and is among the leading and recognised Dairy machinery and equipment manufacturers in India. Several turnkey projects have been executed by Alfa Laval (India) all over India and also in other countries like USSR, Afghanistan, Maritius etc. Alfa-Laval (India) supplies a wide variety of Dairy equipment for collecting, chilling and transporting the milk and for every stage of milk processing; like Wholesome Pasteurised milk. Sterilized UHT milk, Cream or any other product like Baby Food, Milk Powder, Butter, Ghee, Cheese, Ice cream, Khoa for ultimate use by the customer and a variety of sub-systems for heat treatment (HTST) and preservation of milk.

Range of equipment manufactured for both large dairies and farms include Aluminium alloy Milk Cans, Road Milk Tankers, Stainless Steel Storage Tanks, Hermetic separators, Plate Heat Exchangers, Pasteurizers, Homogenizers, Evaporators and Spray Dryers, Scraped Surface Heat Exchangers and Evaporators, Stainless Steel Centrifugal Pumps. The company also offers compact Microtherm for instant pasteurisation of milk in remote places.

C. Vegetable Oil :

Alfa Laval (India) offers the most modern continuous process plant for processing of Vegetable Oil including Alkali refining, Steam refining, Bleaching and Deodorizing system.

The continuous Hermetic Short-Mix process offered is a well proven alkali refining system. The correct choice of proportion of reagents, suitable mixing, short contact time, reliable temperature control and efficient separation are the main factors affecting the quality of the final product. In Alfa-Laval Short-Mix Plants these factors are combined in an optimum manner, so that the neutralised oil is well suited for the subsequent processing stage. Process and equipment for oils requiring special treatments like Rice Bran oil, Cotton Seed oil are also offered.

Alfa-laval (India) can under take projects for continuous water Degumming and Batch-Bleaching and Deodorizing processes.

D. Flow :

To meet the Food and Dairy Industry's requirement of hygienic condition and the chemical industry's requirement of non-corrosive material of construction, Alfa-Laval (India) offers pumps and homogenizers in stainless steel construction. All contact parts are of high grade acid-proof stainless steel AISI 316 which resists corrosion.

Compactly built, the pumps are simple and sturdy in construction and are available in monobloc and coupled versions.

High pressure homogenizers are available from 200 lph to 20,000 lph in 4 models. Today not many products are available without the process of homogenization. The list is impressive - Milk, Fruit juices, Skim creams, Lubricants, Heavy Fuel Oils, Lacquers, PVC, Latex and all kinds of Emulsions and Dispersions. New applications are constantly being added to this list.

E. Chemical Engineering :

(i) Special metal fabrication

Alfa-Laval (India) caters in a big way to the needs of Chemical process, Fertilizer, Petrochemical, Chlor-Alkali, Nuclear and Space Research Industries.

In technical collaboration with Titanium Fabricators Ltd. of U.K. Alfa-Laval (India) undertake manufacturing and supply of custom built equipment for Desalination projects, Pressure vessels, Reactors, Shell and Tube Heat exchangers.

Alfa-Laval (India)'s speciality lies in the latest welding technology and fabrication from Exotic metals like Titanium, Tantalum, Zirconium, Stellite, Nickel and its alloys, Cobalt and its alloys and various grades of Stainless Steel.

Alfa-Laval (India) with its sophisticated fabrication facilities, meets the various international requirements of standard codes like BS, ASME, DIN, TEMA, IDF.

(ii) Dryers and Evaporators

Alfa Laval (India) in technical collaboration with APV ANHYDRO A/S, DENMARK undertake complete project engineering and supply of Spray Dryers and Evaporators to various industries like Chemical, Pharmaceuticals, Dyestuffs, Detergents, Ceramics, Food and Dairy.

Alfa Laval (India) has successfully installed and commissioned a large number of spray dryers and falling film evaporators both in India and neighbouring countries.

The company has excellent in-house facilities available.

It has already entered into technical collaboration with Stork Friesland Scandinavia AB, NETHERLANDS for manufacture of Steam Dryers for Bagasse, Wood particles, Corn Gluten, Paper pulp etc.

(iii) Continuous Fermentation and Bio-Earth Composting System.

Alfa-Laval (India) offers "Biostil" the latest process technology from Nobel Chematur, Sweden for continuous fermentation for manufacture of industrial alcohol from sugarcane molasses and other starchy substrates.

Alfa-Laval (India)'s manufacturing programme for the sugar industry also covers yeast re-cycle system for improvements in existing batch distilleries.

Alfa-Laval (India)'s Biostil process is characterised by substantial increase in yields and reduction in pollution. Biostil gives 20% more yield and is resistant to infection and reduces pollution volumes by 70%. Coupled with reduced space requirement, and continuous operation, Biostil leads to lower production costs and improved profitability.

Bioearth Composting System, from Fabcon Inc, Philippines, for treatment of distillery effluent is a novel zero pollution concept. Distillery spentwash contains a significant amount of organic material derived from crane crop. The Bioearth Composting System converts these organics into a valuable compost. This process solves the pollution problem of spentwash completely and creates a resource that helps environment.

(iv) Biotechnology

It is Alfa-Laval's constant endeavour to bring the latest technologies to the country. Therefore, it has entered the emerging field of Biotechnology. The company is engaged in the supply of plants, equipment, instrumentation as well as know-how for high-tech areas of Biotechnology. Backed by Technical Collaborations with highly specialized international companies, Alfa-Laval (India) offers a wide range of products and systems.

- Centrifugal Separators from Alfa-Laval, Sweden and Ultrafiltration plants from Alfa-Laval Denmark.
- Lab, Pilot and Industrial fermentors from Chemap AG, Switzerland.
- High pressure homogenizers from Bran & Luebbe, West Germany.

F. Thermal Engineering :

Alfa Laval (India) is pioneer in plate heat exchanger technology in India and specialise in design, engineering, manufacturing and application development.

Alfa-Laval PHEs are already in operation in industriessuch as Nulear, Thermal and Diesel engine power generation, Offshore and Onshore oil production, Chemical, Metal, Steel, Sugar and Distillery.

In Nuclear and Thermal power plants, PHEs are used in Secondary cooling systems for transferring large amounts of heat generated in the turbine bearings, stator winding and other auxiliary equipments to secondary cooling which can be raw water from river or sea. PHEs can be supplied in various sizes and can be assembled with plates made of variety of materials like AISI 316 Stainless Steel, Titanium and other special metals. Alfa-Laval (India) has supplied the largest PHE in the country to 500 MW thermal power plants for central cooling and is the leading suppliers of PHEs to sulphuric acid plants and process industries. It's PHEs operate at high thermal efficiency, are light weight, less demanding on its plants are, simple to maintain, totally free from vibrational failures and can be adapted to varying heat transfer demands. Fully counter current flow in PHE permits close temperature approaches and low hold-up volume ensures quick temperature control. The PHEs are made of Stainless Steel, Titanium, other exotic metals and also of special Graphite.

G. Separation Engineering

Alfa-Laval centrifugal separators are highly effective and efficient machines for mechanical separation. Invented in 1887 by Gustaf De Laval, the founder of Alfa-Laval Group, these separators are used for liquid-liquid separation duties. They find extensive use as mineral oil conservation equipments.

Alfa-Laval (India) in association with their principals are in a position to offer specially designed Centrifugal separators for :

* Marine and Power Industry :

For cleaning of distillate, blended and residual fuel oils including LSHS for use in Diesel Engines and Gas Turbines, Lube oils in Steam turbines and medium to large Diesel Engines.

* Engineering and Allied Industries :

Essential for cleaning of industrial oils, gear oils, hydraulic oils, soluble coolants and cutting oils, rolling mill oils and washing fluids.

* Process Industries :

Extensively used by Chemical, Pharmaceutical, Breweries, Distilleries, Yeast plants, Dairy, Vegetable oil refining, Textile and rayon, On and Offshore oil production, Mining and metal processing.

The centrifugal separators and Decanter centrifuges offered by Alfa-Laval (India) cover a wide range in variety of sizes and designs for fire hazardous products, sterilized versions for Biotechnological applications and hygienic and sanitary versions for Food and Dairy industry.

Alfa-Laval centrifugal separators take care of all contamination problems.

H. Industrial Refrigeration

Alfa-Laval (India) has been in Refrigeration business for over 20 years. During this period it has executed many refrigeration projects for a variety of applications ranging from water chillig plants to applications requiring low temperatures up to -60°C .

Besides catering to the Food & Dairy Industry, it has since last 9 years entered the field of industrial refrigeration. Some of the turnkey projects executed are :

- * Air Chilling for air liquefaction.
- * Refrigeration Systems for Chemical application like CO_2 reliquefaction, chloride reliquefaction, ammonia storage etc.

Alfa Laval (India) in collaboration with STAL Refrigeration AB of Sweden brings to this country the sophisticated technology of Screw compressors, Reciprocating compressors, Tube ice plants, Evaporative condensers, Air coolers, Chilling plants. Backed by sophisticated manufacturing facilities, Alfa-Laval (India) offers system designs with proven excellence in low temperature industrial applications.

Screw compressors are highly reliable even at extremely low temperatures, have negligible maintenance cost and have minimum operator disturbance risk. The screw compressor is most suited for high compression ratio and for optimum power generation. Available in all models ranging from $60 \text{ m}^3/\text{h}$ to $3900 \text{ m}^3/\text{h}$ with stepless capacity control.

Reciprocating Compressors are designed for silent running, available in 8 models with swept volume ranging from 60 m³ to 800 m³/h. The compressor has a robust & rugged construction, has unloaded starting and is provided with two stage protection against liquid hammer.

Tube ice plants are fully automatic with 10 T to 350 T per day capacity. Compact in size, these plants save 10% to 30% power as compared to block and flake ice plants.

Alfa-Laval (India) also offers "heat pumps" based on the Refrigerant compression cycle to recover waste heat from various chemical processes and "pumps" it to higher temperature levels to use fruitfully in other processors.

Alfa-Laval (India) Refrigeration units find applications in fertilizers, chemicals, industrial gases, pigments and dyestuffs, air chilling, LPG transportation, food, dairy and cold stores.

After Sales Services :

At Alfa-Laval (India) emphasis is on reliability and prompt after sales service. The company has a wide Sales & Service network covering the entire country and each office is manned with a service engineer for quick service to the customer. The company has acquired land at Thane, Maharashtra and set up a service centre is mainly a regasketting unit for plate heat exchangers.

QUALITY CONTROL ORGANISATION

The Quality Control Department in Alfa-Laval is an independent organisation reporting directly to the Chief Executive - Managing Director of Alfa-Laval. This department is headed by a Senior Manager- Quality Control and oversees quality of all products and services marketed by Alfa-Laval.

Alfa-Laval (India) Limited has a well documented Quality policy declared by the Managing Director and Quality Manual which gives guide lines for day to day operation of the various units/departments including Quality Control Department.

Quality Control Department has three main wings :

- A) Quality Control
- B) Quality Engineering
- C) Standard Room and Laboratories.

Their functions are described below :

A) Quality Control

This section is involved in inspecting and certifying the products manufactured in Alfa-Laval (India)'s manufacturing units. Further it is also responsible to ensure quality in various equipment purchased from outside vendors whether required by manufacturing units or by projects execution departments. Thus it ensures quality in :

- 1) Incoming (Receipt) Inspection : All incoming materials, raw materials, bought out items or subcontracted items are checked.
- 2) In process inspection : During the stages of manufacturing inhouse as well as at subcontractors premises, checks are carried out to ensure quality.
- 3) Final inspection : The final performance of the product is checked both for inhouse and subcontracted items.
- 4) Shipping inspection : The final painting, packing and correctness of supplies are verified to ensure defect free deliveries to customers and project sites.

This section is also responsible for proper records, systems and formats to ensure that defects do not occur.

B) **Quality Engineering** :

The responsibilities of this section are :

- 1) Laying down performance criterias, guaranteed parameters etc., as per the requirements of clients or outside inspection agencies. They finalise such requirements with clients/agencies, to ensure that what is accepted by Quality Control Section is as desired/specified.
- 2) Quality Audit : They carry periodic audits of accepted products /items. Audits of Quality Control Systems and procedures is another aspect of their operations. This results into improvements in Quality Systems and ensures their maintenance.

- 3) Project Site Audits : Audits are carried out at Project sites to ensure that the same levels of quality and workmanship are maintained in execution & commissioning as in manufacturing.
- 4) Vendor Evaluation : Evaluation of product vendors and subcontractors is done on a periodic basis as a part of Quality assurance programme. Vendors are rated and qualified for different categories of equipment. Vendors are guided for improvements in systems and technology and for modernisation of equipment and facilities.
- 5) Field Failure Analysis : Field failures are examined with the help of laboratories and product experts to improve designs manufacturing process and quality checks. Close liaison is also maintained with our collaborators to ensure exchange of technical expertise.
- 6) Training and Education : Training programmes are regularly arranged for quality control personnel. Vendors, site engineers and others.

C) Standards Room and Laboratories :

Alfa-Laval has fully equipped Standards Room and Chemical laboratories to undertake following work :

- 1) Physical and metallurgical testing of various materials.
- 2) Chemical testing of various materials.

- 3) Nondestructive testing (NDT) like Magnetic particle tests, Ultrasonic testing, Radiography etc., for testing of raw materials, products or process.
- 4) Periodic inspection and calibration of all gauges, instruments and equipment used in manufacturing shop and quality control departments. All requisite standards are maintained in Standards Room.
- 5) International standards for materials are received and equivalent applicable Indian standards are specified.
- 6) Alfa Laval (India) has approvals from the following outside inspection agencies :

-LRIS

-LRS

-PDK

-BV

-BHEL

-IRS

-FEDO

-EIL

-UHDE

-H & G

-BHPV

-TOYO ENGG.

-DAVY POWER GAS

RESEARCH & DEVELOPMENT

The company has an organized Research & Development Cell with well qualified and experienced personnel and modern machanical, metallurgical and chemical laboratories.

The R & D set-up is recognised by Department of Science and Technology, Govt. of India.

This Cell has its own workshop for manufacture of pilot scale equipment and also pilot plant installations with facilities to conduct experiments under simulated conditions.

Development of new products and processes is a continuous activity. The R & D Cell also adapts / adopts new technologies and is engaged in finding import substitutes.

CHAPTER 6

ACTIVITIES

AFRICA

*Kenya
Marocco
Nigeria
South Africa
Zimbabwe*

AMERICA

*Argentina
Brazil
Canada
Chile
Mexico
Peru
U.S.A.
Venezuela*

ASIA

*Hong-Kong
India
Indonesia
Iran
Japan
Malaysia
Singapore
Thailand*

EUROPE

*Austria
Belgium
Denmark
Finland
France
Germany
Italy
Ireland
Netherlands
Norway
Spain
Sweden
Switzerland
U.K.*

OCEANIA

*Australia
New Zealand*

**AGENCIES IN ANOTHER 100 COUNTRIES
MARINE SERVICE FACILITIES IN 75 MAJOR PORTS**

Alfa Laval's major fields of competence.

Separation engineering Thermal engineering Flow equipment engineering Automation engineering

Process and plant engineering Main contracting within food and dairy products processing Agricultural engineering Fish farm engineering

MARKET AND PRODUCT EVOLUTION.

1931	1917	1898	1878
Plate heat exchanger	Milking Plant	Yeast separator	Continuous cream separator

AGRI
BUSINESS

DAIRY & FOOD
INDUSTRIES

NON-FOOD
INDUSTRIES

Industrial group main products.

SEPARATION EQUIPMENT

- * *Disc-stack separators*
- * *Decanter centrifuges*
- * *Ultrafiltration plants*

THERMAL EQUIPMENT

- * *Plate heat exchangers*
- * *Spiral heat exchangers*
- * *Scraped-surface heat exchangers*
- * *Evaporators*

FLOW EQUIPMENT

- * *Pumps*
- * *Valves*
- * *Fittings*

AUTOMATION EQUIPMENT

- * *Control systems for basic equipment, process lines and plants*
- * *Herd management for farms*

VARIOUS EQUIPMENT

- * *Dosing systems*
- * *Homogenizers*
- * *Weighing systems*
- * *Ice Cream freezers*

Industrial group process and contracting activities.

Process lines and Plants

- * *Beverages*
- * *Dairy products*
- * *Fish processing*
- * *Industrial alcohol*
- * *Prepared foods*
- * *Slaughterhouse by-products*
- * *Vegetable oils*
- * *Biostil*
- * *Process Drying*
- * *Refrigeration*

Main contracting

- * *Feasibility studies and
financing assistance*
- * *Project management and
administration*
- * *Project design and planning*
- * *Site management and project
start-up and commissioning*
- * *Management and personnel
recruitment*

IN THE FOREFRONT OF HIGH TECHNOLOGY.

INDUSTRIAL MICRO ELECTRONICS

INDUSTRIAL BIOTECHNOLOGY

INDUSTRIAL MOLECULAR FILTRATION

Industrial group main customers.

1. OIL AND MINERAL
MINING INDUSTRIES

2. DAIRY PRODUCT
PROCESSORS

3. FOOD AND BEVERAGE
INDUSTRIES

4. CHEMICAL, PHARMACEUTICAL
AND PETROLEUM INDUSTRIES

5. STEELWORKS

6. METALWORKING
INDUSTRIES

7. POWER GENERATION
INDUSTRIES

8. SHIPOWNERS AND
SHIPYARDS

Special interests in three key areas.

ENERGY PRODUCTION AND SAVINGS

- * *Heat recovery*
- * *Oil recovery*
- * *Synthetic fuel production*
- * *Heating, ventilation and air-conditioning*
- * *Energy saving processes*

FOOD PRODUCTION

- * *Milk production*
- * *Milk product processing and turn-key dairies*
- * *Animal and vegetable oil extraction and refining*
- * *Soy milk processing*
- * *Prepared foods*
- * *Fish farming*

ENVIRONMENTAL CARE

- * *Effluent water treatment*
- * *Product and heat recovery*
- * *Environment-friendly processes*

AGRI GROUP ACTIVITIES.

- ※ Milking and milk preservation
- ※ Feeding
- ※ Management systems
- ※ Energy recovery and utilization
- ※ Barn environment control
- ※ Farm consumables and accessories
- ※ Turn-key installations for cattle, sheep, goat, buffaloes and pigs

CHAPTER 7

STANDARD

MAJOR PRINCIPLES

ACTIVITIES

PUMPS

SEPARATORS

WORKS

FACTORY I

STANDARD PRODUCTS FACTORY

MAJOR PRODUCTS:-

1. CENTRIFUGAL PUMPS.
2. SEPARATORS.
3. COMPRESSORS.

ACTIVITIES & OTHER FEATURES:-

1. PUMPS :-
 - * Technical collaboration with LKM Denmark.
 - * Average production 1000 per year.
 - * Model : GM-1, EM-1, FM-3, ALC-2/ALC-3
 - * Motors, pumps casing, Base Plate, Pump cover, Seal etc. are sub contracted.
 - * Shaft matching, Assembling, Electrical connections etc. done at Pune Works.

2. SEPARATORS :-

- * Disc manufacturing
- * Machining of Separator Bowls.
- * Bowl balancing by vertically Dynamic balancing method i.e. Twin plane balancing (Top & Bottom)
 - i. Plane separation
 - ii. Calibration
 - iii. Eccentricity compensation (Excentric axis).
 - iv. Vibrations examination.

- * Distributer machining.
- * Separator shaft machining.
- * Separator frame machining by N/C machine.
- * Separator assembly, Gear & Motor assembly.
- * No load testing & water load testing.
- * Total Production 500 Separators per year.

SEPARATOR TYPES :

1. Farm and Hermetic type.

Models:- AE 108(500LPH), AE 29(1000LPH), S-2181M (5000LPH), SRG 509 (5000LPH) , 3191 (10000LPH), HMRPX- 714 (20000LPH) (Hermetic type) S-2183 (Clarification), S-2184 (Concentrator)

2. Marine and Industrial type

Models:- MABIO3(1000LPH), MAB205(5000LPH), MAB206(6000LPH) MOBX207(5600 LPH) Self cleaning), BRPX207 (Breweries)

3. Others

BPB 204 (For serparting RBC from Plasma)
VLIG 409 (Textile Industry)
WSB 205 (For work shop oil)

3. COMPRESSORS FOR REFRIGERATION :-

Manufacture from 1988 in collaboration with STAL (Sweden).

* Machining of frame.

* Subcontracts : Pistons, Connecting rods, Crank shafts, Piston Cylinder, Cylinder liner

* Compressor assembly complete.

* Hydraulic testing. (Leakage test).

Types of compressors :

1. Reciprocating type :-

Model :-	Smaller type	Largest type
	P-2/P-23	U-4
	P-4/P-43	U-6
	P-6/P-63	U-8

The Numerical denotes the number of Pistons assembled.

2. Screw type compressors:- (Two screws one male (CONVEX) and one female (CONCAVE) in the housing

Model :-	Mini Screw	Largest Screw
	R-5	S-5
	S-2	S-7

* Production 200 compressors per year.

FACTORY II
LIGHT & CHEMICAL FABRICATION

- JOBS UNDER TAKEN :
1. Non proprietary items.
 2. When material is SS 304 or SS 316 (Light) when aterial Titanium, Nickle and alloys SS 310, Heat resistant Al. etc.
 3. Third party inspection EIL, LRIS, BV, UHDE.

- * Straight check right from Raw Material testing.
- * Planning (Optium cutting of plates etc.)
- * Raw material planning in 6 months advance.
(No over or under estimation)
- * All tailor made manufacturings.
- * Material released to shop floor as and when required.
- * Manufacturing Drawings made on basis of specifications from BC.
- * Manufacture Drawing supplied to shop.
- * Techniques of cladding etc. used to minmize cost.
- * Inspection and supervision at every stage.

- * Customer, if wants, to check while job in progress.
- * Third party inspection.
- * Welding is the major process.
- * Radiographic testing of welding.
- * Ultrasonic test to check bond between two plates.
- * Hydraulic testing of all storage vessels.
- * Development of better welding processes.
- * Training of welders.

MANUFACTURINGS : All types of Vessels, Tanks, Silos, reaction vessels, Tubular Heat Exchanges, Spiral Heat Exchangers, Evaporators, Spray Drying chambers, Process columns etc.

PROCESS EQUIPMENT DESIGN

This department functions to design the various equipments that are to be fabricated at Alfa Laval work shop. Specifications for the various items going in to the Project are supplied by the B.C.in cosultation with the collaborators and local suppliers. Fabrication drawings are prepared by this department and are supplied to the shop for manufacture. Also any additions or modifications in the existing Alfa Laval standard fabricated items are designed by this department.

A genereal arry of equipments designed by the department as per the requirements of various industries is :

* DAIRY : Alfa-Laval all type tanks, Evaporators, Powder silos, Spray dryers.

* VEGETABLE OIL : Bleachers,Hydrogenators, Holding vessels.

* BREWERY : Beer tanks, Larger tanks, Bright Beer tanks, Fermentors.

* CHEMICAL INDUSTRY : Drying Chambers, Biotechnological Applications.

* REFRIGERATION : Condensors, Chillers, Evaporators.

The above mentioned equipments for various industrial requirements when generalized for actual designing they are classified as :

1. Small tanks,
2. Large tanks,
3. Pressure vessels (Liquid & gas),
4. Reactors,
5. Heat exchangers,
6. Process columns,
7. Calandria,
8. Evaporators,
9. Drying chambers,
10. Special purpose equipments.

Once the item to be designed is identified as one of these, concentration is then given on the design points to be considered keeping in view the actual practical utilization of the equipment. A Generalized Design Methodology is used which is followed in sequence for each item of fabrication. Following points may be identified to ensure in such sequence.

1. Process requirements. eg. Capacities to be handled.
Type of material to be handled. Temperature, Pressure of process. etc.
2. Mechanical requirements. eg. Agitators to be incorporated.
3. Structural requirements. eg. Supports, Foundations etc.
4. Codes and Standards to be followed. eg. ASME (1905) standards followed for pressure vessels.
5. Aesthetic requirements eg. Food application of equipment needs smooth corners, high finish.

CHAPTER 8

MAJOR WORK at Alfa Laval

INTRODUCTION

During the course of training period, I have been associated with Sales division of Business Centre Dairy, Food Engineering Group. I was entrusted with the task of conducting a market feasibility survey of a self cleaning separator. Major part of the training period was allotted for this market survey. The title of the project is "Market feasibility of Self cleaning Hermetic Milk Separators HMRPX 510 TGD in the Indian Dairy Industry".

Gustaf De Laval is the pioneer in the manufacture of dairy sepatmas. The crean separators have been the greatest market products at Alfa Laval since the introduction of continuous centrifugal milk separators. With the advance of the technology, improved know-how and consistent research and development efforts at Alfa Laval, AB SWEDEN; Alfa Laval is now capable enough to have a range of centrifugal separators with different capacities for a variety of products handling to select by the customer.

Self-cleaning heretic milk separators are the one amongst those which were introduced in 1974. As of now, in India, most of the dairies are using solids retaining hermetic milk separators to fulfill their needs of milk separation. But these separators are cleaned manually. For cleaning the milk flow is to be diverted, the bowl is opened, the disk stack is taken out and in cleaned with cleaning solutions.

In order to operate these machines successfully, there is always a necessity to keep standby machines which are put into process lines while others are being cleaned manually. Large numbers of these machines occupy a lot of processing floor space.

At present in India, a few number of dairies are equipped with selfcleaning hermmetic milk separators. These separators are of 20,000 LPH capacity which have been supplied by Alfa Laval to

some of the largest dairies which have financed by NDDDB. These HMRPX 714 i.e. 20,000 lph separators, which are being manufactured in India, are too big for most of the dairies. There is a scope to motivate the medium capacity dairies, which have got 10,000 lph solid-bowl separators, to adapt equal capacity self-cleaning separators i.e. HMRPX 510 TGD (10,000 Iph) and incorporate these in their process lines.

OBJECTIVES

The objectives of the present survey are :

1. to study the marketing feadibility of the self-cleaning hermetic milk sepaarators of 10,000 lph capacity i.e. HMRPX 510 TGD in the Indian Dairy Industry.
2. to arrive at how many dairies are willing to adapt these separators in the near future.
3. to know the response of the prospective customers about the price structure of the HMRPX 510 TGD separators.

METHODOLOGY

The survey is proposed to be personal visits to the selected dairies. The dairies with an installed capacity more than one lakh liters per day are listed from the Milk plants and Dairy Co-operatives given in Dairy India, 1992. The plants identified consisted of Govt. Dairies and Co-operative owned dairies. The private dairies are not considered for this survey.

For field visits to the selected dairies, a questionnaire is prepared and the market information was collected.

The dairies were listed from each state in alphabetical order. A total number of 84 dairies are listed from the 15 major dairying states.

The information collected from the 20 dairies on the 6 states will be analyzed and the number of dairies interested in self cleaning separators will be finalized. The analysis of the information will be projected to an entire range of 84 dairies in India.

DATA COLLECTION

Out of the 84 dairies listed from the 15 states with an installed capacity more than one lakh liters per day, only 20 dairies (including the two dairies from Pune city) are selected from 6 states for the actual field survey. The states selected are Andhra Pradesh, Karnataka, Tamilnadu, Madhya Pradesh, Haryana and Punjab. Since the dairies to be surveyed are scattered over the length and breadth of the Indian subcontinent, the survey is decided to be carried out in three

phases. First phase covers the state of Andhra Pradesh, the second phase Karnataka and Tamilnadu, and the third covers Madhya Pradesh, Haryana and Punjab.

CRITERIA FOR SAMPLE SELECTION

The state of Maharashtra is eliminated from the survey area as the company Head office and Regional office are located in this state and the dairies are very much in proximity to these two offices so these can be surveyed by the team at the Head office.

The dairies selected are Lalpet Dairy, Hyderabad; Visakha Dairy, Visakhapatnam; Sangam Dairy, Vadlamudi; Vijayawada Dairy in Andhra Pradesh; Dharwad Dairy, Dharwad; Banglore Dairy; Gejjelegere Dairy, Mandya in Karnataka; and Salam Dairy; Erode Dairy; Madurai Dairy and Ambattur Dairy, Madras in Tamilnadu; Indore Dairy; Gwalior Dairy In Madhya Pradesh; Rohtak Dairy in Haryana; and Sangrur Dairy; Jalandhar Dairy and Gurdaspur Dairy in the State of Punjab. The two dairies in the Pune city are Katraj Dairy and Govt. Dairy, Pune.

These dairies selected have higher installed capacities amongst the dairies installed in their respective states.

Two dairies from Pune are selected for field testing of the questionnair prepared for the market survey.

FINDINGS

1. The Bangalore Dairy had sent a requisition to National Dairy Development Board., Bangalore for the supply of two self-cleaning separators of 10,000 LPH capacity each.
2. Katraj Dairy, Pune; Sangam Dairy, Vadlamudi, AP; and Ambattur Dairy, Madras are serious in going for the separators by the end of this year. Katraj Dairy, Pune and Sangam Dairy, Vadlamudi will go for one 10,000 LPH capacity separator each. Ambattur dairy, Madras is interested in a self-cleaning separator with 20,000 Iph capacity, although it had a self-cleaning separator from HMT which is non-operative now.
3. Visakha Dairy, Visakhapatnam and Vijayawada Dairy, both from Andhra Pradesh are interested in going for separators with a capacity of 5,000 Iph capacity, once the price of the separator is acceptable to them and the performance is guaranteed to them. They like to see the performance of these separators in any one of the existing dairies and like to have performance guarantee certificate of these separators.
4. Smithkline Beecham, Consumer Products (P) Ltd. Dowalaiswaram, AP is interested in having separators with 5,000 Iph capacity, but in two/three years from now.
5. Dharwad Dairy had already got two self-cleaning separators, i.e. HMRPX 214 TGV in their regular operation which were commissioned in 1984. In this dairy expansion plans for the

milk processing capacity are under consideration and the discussions are on with the personnel of NDDB, Bangalore and AL, Bangalore.

6. In Gejjelegere Dairy, Mandya, the expansion from 1.5 LLPD to 2.5 LLPD capacity is being carried out at present by the NDDB personnel and the necessary equipment for the milk processing was obtained from HMT, Aurangabad.
7. The remaining dairies i.e Pune dairy, Lalapet dairy, Hyderabad; Salam Dairy; Erode Dairy, Madurai Dairy are not interested in going for this self-cleaning separators immediately in view of the high price of the separators.
8. Jalandhar Dairy and Sangrur Dairy are much interested in separators with a capacity of 20,000 and 10,000 lph respectively in their plants, but will go for these in the near future.
9. Gurudaspur Dairy, Rohtak Dairy and Indore Dairy are fascinated by this kind of equipment, but at present they do not have any financial capability to go for this kind of separator in the near future as well.
10. Gwalior Dairy has got two self cleaning separators from HMT and is satisfied with their performance.
11. Out of the total 20 dairies surveyed, 3 dairies have been actually looking for the self cleaning milk separators for the last few years and 13 dairies have shown enthusiastic response about these. These dairies are potential customers for the self-cleaning separators in the next 2-3 years. The

remaining 4 dairies have not shown any interest in these because of the financial constraints and under-utilization of the existing installed capacities of these dairies.

CONCLUSION AND SUGGESTIONS

1. Co-operative dairies are not ready to invest large amounts of capital on a single equipment, though the advantages are overwhelming in terms of better skimming efficiency, reduced downtime of the separator and labour saving.
2. NDDB personnel must be persuaded to go in for our self cleaning separators especially HMRPX 714 and HMRPX 510 TGD wherever the expansion or modernisation of the existing dairies is taking place in OF-III phase. HMT is pressurising the NDDB to accept their product range for the new plants.
3. Most of the dairies have got standby separators and the cost of replacement of the existing solid bowl separators with self-cleaning separators is too high and for this, a dairy can not take decision on it's own. For replacement or purchase of a new separator, the deciding body is the respective state's Milk Producers Co-operative Federation.
4. The solids bowl separators are being run in the dairies for 8-10 hours a day on an average in a year. Even in the flush season, the centrifuges are under operation for a maximum of 16 hours a day. Sufficient time is available for cleaning of the separators after every 6-8 hours of operation and as such sufficient sufficient force is available in the dairies for cleaning the separators manually.

5. Advantages of the self-cleaning separators are not completely outweighing the cost of replacement of the existing separators unless the situation warrants a dairy to go for such kind of separators.
6. Wherever the automation of the plant operation is necessary and whenever a new Dairy is being set up or modernisation/expansion of the existing dairy is planned, we shall offer these separators to the customers.
7. Three dairies have shown immediate interest and are ready to go for 5 HMRPX 510 TGDs i.e. 10,000 lph capacity separators, one HMRPX 714 HGV i.e. 20,000 lph capacity.
8. Out of the 20 dairies, 3 dairies have shown immediate interest for five 10,000 lph separators and 8 dairies have shown their willingness to purchase seven 10 kph separators in the near future i.e. in the next 2-3 years. One dairy has shown interest in 20,000 lph separator in the near future and the other has shown interest for 5,000 lph separator.
9. So the total number of dairies interested in 10,000 lph capacity separators are ten out of the twenty dairies visited. Three are interested in 20 kph capacity separators and three in 5,000 lph capacity separators.
10. Looking at the response of the dairies visited for this market survey and projecting the results to the whole number of dairies, we can safely conclude that there is a definite market for about 40 separators of 10,000 lph capacity. Since

we do not have 5,000 lph self-cleaning separators in India from our factory, we can offer our 10 klph separators to those dairies which are interested in 5 klph separators.

11. The dairies which have shown interest in 10 klph separators are with installed capacities less than or equal to 1.5 LLPD. Considering the fact that in India, 50% of the dairies are with installed capacities less than 1.5 LLPD and the above conclusion can be noteworthy.
12. This fact enables us to prepare ourselves for the manufacture of these separators and this should be coupled by intensive marketing efforts.
13. Regarding the price structure of the separators, most of the respondents felt that the price of the self-cleaning separators is too high. The dairies are interested in purchasing these separators at about 1.5 - 2 times the price of the solid bowl separators of the same capacity. The present capacity pricing of these separators at 3 times that of the solid bowl separators was not acceptable to most of the dairies. So we should concentrate on pricing policy of these separators also.

MILK PLANTS WITH INSTALLED CAPACITY MORE THAN 100.000 LPD

<u>STATE</u>	<u>INST. CAPACITY</u> (PROP. CAP.)	<u>AVE. THPUT</u>
1. <u>ANDHRA PRADESH</u>		
M.P.F. CHITTOOR	150,000 LPD	140,000 LPD
PRODDATUR, M.P.F.	150,000 LPD	50,000 LPD
* SANGAM DAIRY, VADLAMUDI	250,000 LPD	150,000 LPD
* MPF, LALAPET, HYDERABAD	250,000 LPD	---
MOTHER DAIRY, HAYATHNAGAR, HYD.	---	---
* M.P.F., VIJAYAWADAA	200,000 LPD	57,750 LPD
M.P.F. NANDYAL	150,000 LPD	---
M.P.F., ONGOLE DAIRY	100,000 LPD	---
* VISAKHA DAIRY, VIZAG	(UNDER CONSTR.)	---
* S.B.C.P. RAJAHMUNDRY	100,000 LPD	140,000 LPD
	80,000 LPD	---
2. <u>BIHAR</u>		
BARAUNI DAIRY, BEGUSARAI DIST.	100,000 LPD	---
PATNA DAIRY PROJECT, PATNA	100,000 LPD	---
3. <u>DELHI</u>		
DELHI MILK SCHEME, NEW DELHI	415,000 LPD	360,000 LPD
MOTHER DAIRY, DELHI	450,000 LPD	---
NANAK DAIRY PLANT, NEW DELHI	---	---
HODAL (HARYANA)	100,000 LPD	---
FATEGARH CHURIAN (PUNJAB)	130,000 LPD	---
4. <u>GUJARAT</u>		
UTTAM DAIRY, AHMEDABAD	--	94,000 LPD
BANASKANTHA DAIRY, PALANPUR	175,000 LPD	170,000 LPD
BARODA DAIRY, BARODA	100,000 LPD	220,000 LPD
ABAD DAIRY, AHMEDABAD	300,000 LPD	201,000 LPD
JUNUGADH DAIRY, ZAFFER MAIDAN	100,000 LPD	70,000 LPD
SURENDRANAGAR DAIRY, WADHVAN RD.	100,000 LPD	--
AMUL DAIRY, ANAND	880,000 LPD	1,030,000 LPD
DUDHSAGAR DAIRY, MEHSANA	750,000 LPD	697,000 LPD
PANCHAMAHAL DAIRY, GODHRA	100,000 LPD	104,000 LPD
SABAR DAIRY, HIMATNAGAR	450,000 LPD	388,000 LPD
SUMUL DAIRY, SURAT	200,000 LPD	250,000 LPD
5. <u>HARYANA</u>		
JIND DAIRY, HANSI RD.	100,000 LPD	---
* ROHTAK DAIRY	100,000 LPD	---

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KARNATAKA

* BANGALORE DAIRY, HOSUR RD.	150,000 LPD	250,000 LPD
MOTHER DAIRY, YELAHANKA		--
* DHARWAD DAIRY, RAYAPUR DISTT.	200,000 LPD	--
* GEJJALAGERE DAIRY, MANDYA DISTT.	120,000 LPD	--
	100,000 LPD	90,000 LPD

KERALA

ERNAKULAM DAIRY, TRIPUNITHURA	100,000 LPD	--
THIRUVANANTHAPURAM DAIRY (PATTO PALACE P.O.)	40,000 LPD	--
(AMBALATHARA, P.O. POONTHURA)	(100,000 LPD)	110,000 LPD

MADHYA PRADESH

BHOPAL DAIRY, HABIBGANJ	100,000 LPD	44,000 LPD
* GWALIOR DAIRY	200,000 LPD	--
* INDORE DAIRY	200,000 LPD	70,000 LPD
JABALPUR DAIRY	100,000 LPD	--
RAIPUR DAIRY, URLA, DUNG DISTT.	100,000 LPD	--
UJJAIN DAIRY, UJJAIN	60,000 LPD	111,450 LPD
	(250,000 LPD)	

MAHARASHTRA

AHMEDNAGAR, MIDC AREA, BOMBAY	130,000 LPD	100,000 LPD
BEED, BARSHI RD. BOMBAY	100,000 LPD	--
CENTRAL DAIRY, AAREY, BOMBAY	250,000 LPD)	
MOTHER DAIRY, KURLA, BOMBAY	400,000 LPD)	1,021,000 LPD
WPRLI DAIRY, WORLI BOMBAY	450,000 LPD)	--
CENTRAL DAIRY, DHULE	200,000 LPD	--
MIRAJ DAIRY, MIRAJ	200,000 LPD	--
NAGPUR DAIRY, NAGPUR	200,000 LPD	--
NANDED DAIRY, NANDED	100,000 LPD	--
* PUNE DAIRY, PUNE	150,000 LPD	--
UDGIR DAIRY, OSMANABAD DISTT.	120,000 LPD	--
MAHANAND DAIRY, GOREGAON, B BAY (AAREY)	400,000 LPD (500,000 LPD)	--
JALAGAON DAIRY, JALAGAON	200,000 LPD (300,000 LPD)	221,000 LPD
KOLHAPUR DAIRY, KOLHAPUR	200,000 LPD (300,000 LPD)	239,000 LPD
* KATRAJ DAIRY, PUNE	120,000 LPD (300,000 LPD)	369,000 LPD
AKLUJ DAIRY, VIZURI	100,000 LPD	--

PUNJAB

BHATINDA DAIRY	100,000 LPD	--
* GURUDASPUR DAIRY	150,000 LPD	--
HOSHIARPUR DAIRY	100,000 LPD	--
* DOABA MILK PLANT, JALANDHAR	300,000 LPD	--
LUDHIANA DAIRY	125,000 LPD	--
MOHALI DAIRY	100,000 LPD	--
PATIALA DAIRY	100,000 LPD	45,000 LPD
* SANGRUR DAIRY	150,000 LPD	42,000 LPD

RAJASTHAN

AJMER DAIRY	100,000 LPD	50,000 LPD
ALWAR DAIRY	100,000 LPD	65,000 LPD
BHILWARA DAIRY	100,000 LPD	28,000 LPD
BIKANER DAIRY	100,000 LPD	150,000 LPD
HANUMANGARH DAIRY	100,000 LPD	39,000 LPD
JAIPUR DAIRY	150,000 LPD	80,000 LPD
JODHPUR DAIRY	100,000 LPD	150,000 LPD

TAMILNADU

* AMBATTUR DAIRY, MADRAS	300,000 LPD	--
	(400,000 LPD)	
COIMBATORE DAIRY	100,000 LPD	110,570 LPD
	(200,000 LPD)	
* ERODE DAIRY, PERIYAR DISTT.	300,000 LPD	
KRISHNAGIRI DAIRY, (DHARMAPURI)	100,000 LPD	80,600 LPD
MADHAVARAM DAIRY, MADRAS	175,000 LPD	
* MADURAI DAIRY	150,000 LPD	--
	(200,000 LPD)	--
* SALEM DAIRY, SALEM	300,000 LPD	
VELLORE		247,000 LPD

UTTAR PRADESH

FEEDER BALANCING DAIRY, MEERUT	100,000 LPD	--
FEEDER BALANCING DAIRY, VARANASI	100,000 LPD	--

WEST BENGAL

CENTRAL DAIRY, BELAGACHI RD. }		
CENTRAL DAIRY, HARINGHATA }	300,000 LPD	210,000 LPD
CALCUTTA }		
MOTHER DAIRY, CALCUTTA	400,000 LPD	345,000 LPD
KEVENTRERS AGRO LTD. BARASAT }		
NORTH 24 PARAGANAS }	(400,000 LPD)	
MATIGARA DAIRY, DARJEELING DIST.	100,000 LPD	

NOTE : * DAIRIES VISITED FOR THE FIELD MARKET SURVEY.

QUESTIONNAIRE

1. NAME OF DAIRY --
2. LIQUID MILK/MILK PRODUCT FACTORY --
3. INSTALLED CAPACITY OF THE DAIRY --
4. FREQUENCY OF MILK COLLECTION (ONCE/TWICE A DAY)
5. RATION OF MILK COLLECTION (MORNING: EVENING)
6. PEAK MILK RECEPTION IN THE DAIRY --
7. MINIMUM OF MILK RECEPTION IN A YEAR --
8. AVERAGE THROUGHPUT --
9. PASTEURIZATION CAPACITY --
10. NO. OF PASTEURISERS INSTALLED NO'S CAPACITY

11. NO. OF SEPARATORS/CLARIFIERS NO'S CAPACITY
12. SEPARATORS IN ACTUAL OPERATION NO'S CAPACITY
13. STANDBY SEPARATORS NO'S CAPACITY
14. DUTY NEEDED SEPARATION/STANDARDIZATION/CLARIFICATION
15. HOURS OF SEPARATOR OPERATION --
16. FREQUENCY OF CLEANING (AFTER EVERY ... HR OF OPERATION)
17. SEPARATOR CLEANING TIME --
18. WOULD YOU FEEL MORE COMFORTABLE WITH SELF-CLEANING HERMETIC
MILK SEPARATORS OF SUITABLE CAPACITY IN PLACE OF EXISTING
SEPARATORS IN YOUR PROCESS LINES ?

YES/NO

19. IF YES, AT WHAT CAPACITY SEPARATOR AND AT WHAT PRICE YOU
WOULD LIKE TO HAVE THIS SEPARATORS IN YOUR DAIRY ?

5000 LPH/ 10,000 LPH / 20,000 LPH / 30, 000 LPH

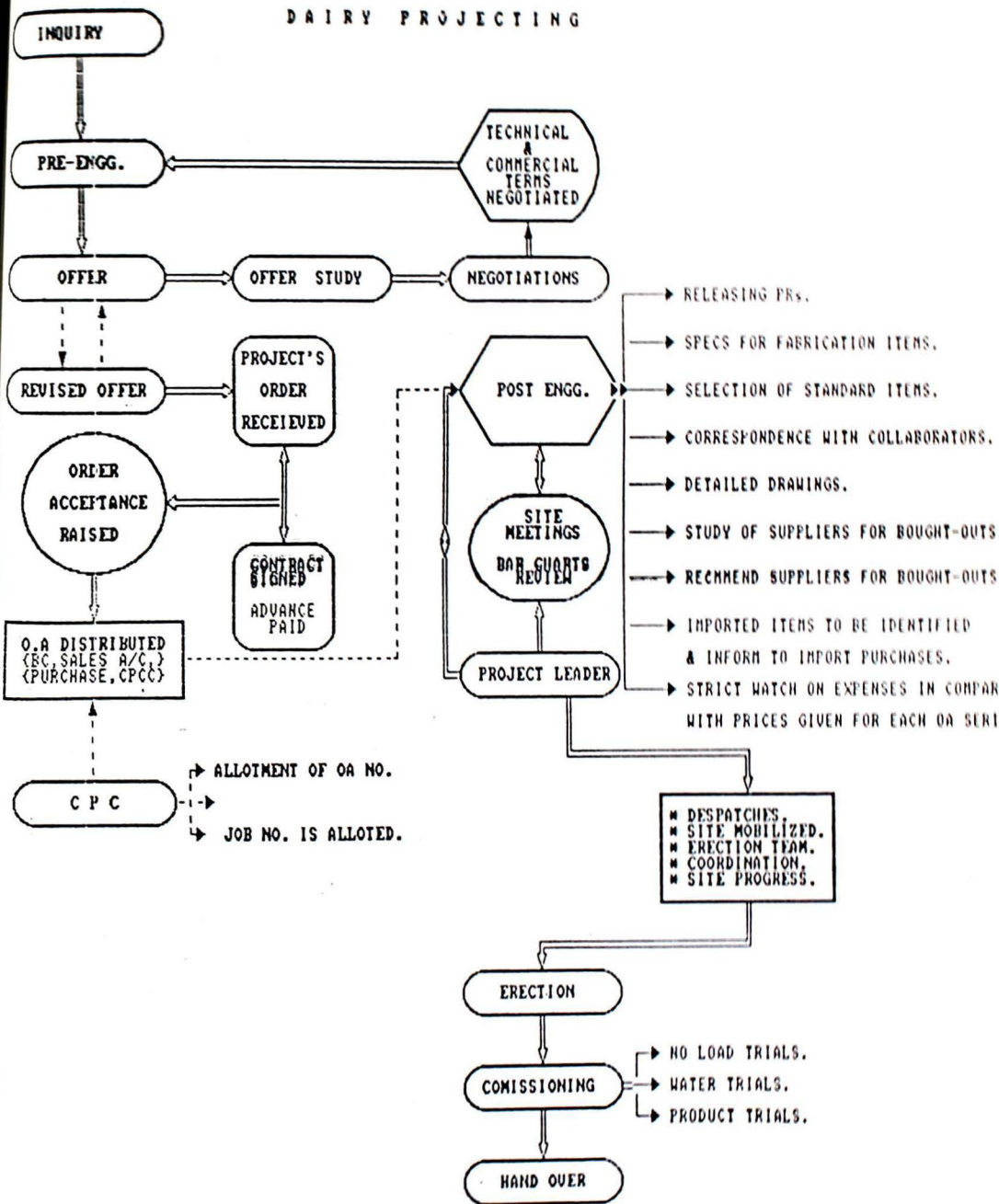
ANALYSIS OF THE MARKET SURVEY DATA ON SELF-CLEANING SEPARATORS HMRPX 510 TGD

S.No.	INSTALLED CAPACITIES	NUMBER OF DAIRIES		NO. OF DAIRIES INTERESTED		NO. OF DAIRIES NOT INTERESTED
		IN INDIA	VISITED	IN THIS YEAR	IN 2-3 YEARS	
1.	LESS THAN 1.5 LLPD	44	5	1	3	1
2.	1.5 LLPD	10	5	1	2	2
3.	2.0 LLPD	10	3	-	2	1
4.	2.5 LLPD	4	2	1	1	-
5.	3.0 LLPD	16	5	-	5	-
TOTAL		84	20	3	13	4

CHAPTER 9

PROJECT SET UP

DAIRY PROJECTING



INQUIRY

PRODUCT BALANCE

BLOCK DIAGRAM

PRE-PROJECTING

QUOTATION FROM SUB-SUPPLIER PROCESS EQUIPM.

FLOW CHART

MACHINERY SPECIFICATION

TIME SCHEDULE

CONSUMPTION LIST

QUOTATION FROM SUB-SUPPLIER SERVICE

MACHINERY LAYOUT 1:100

QUOTATION FROM SUB-SUPPLIER BUILDING

MACHINERY SPECIFICATION

COMPLETE SPECIFICATION

BUILDING SPECIFICATION

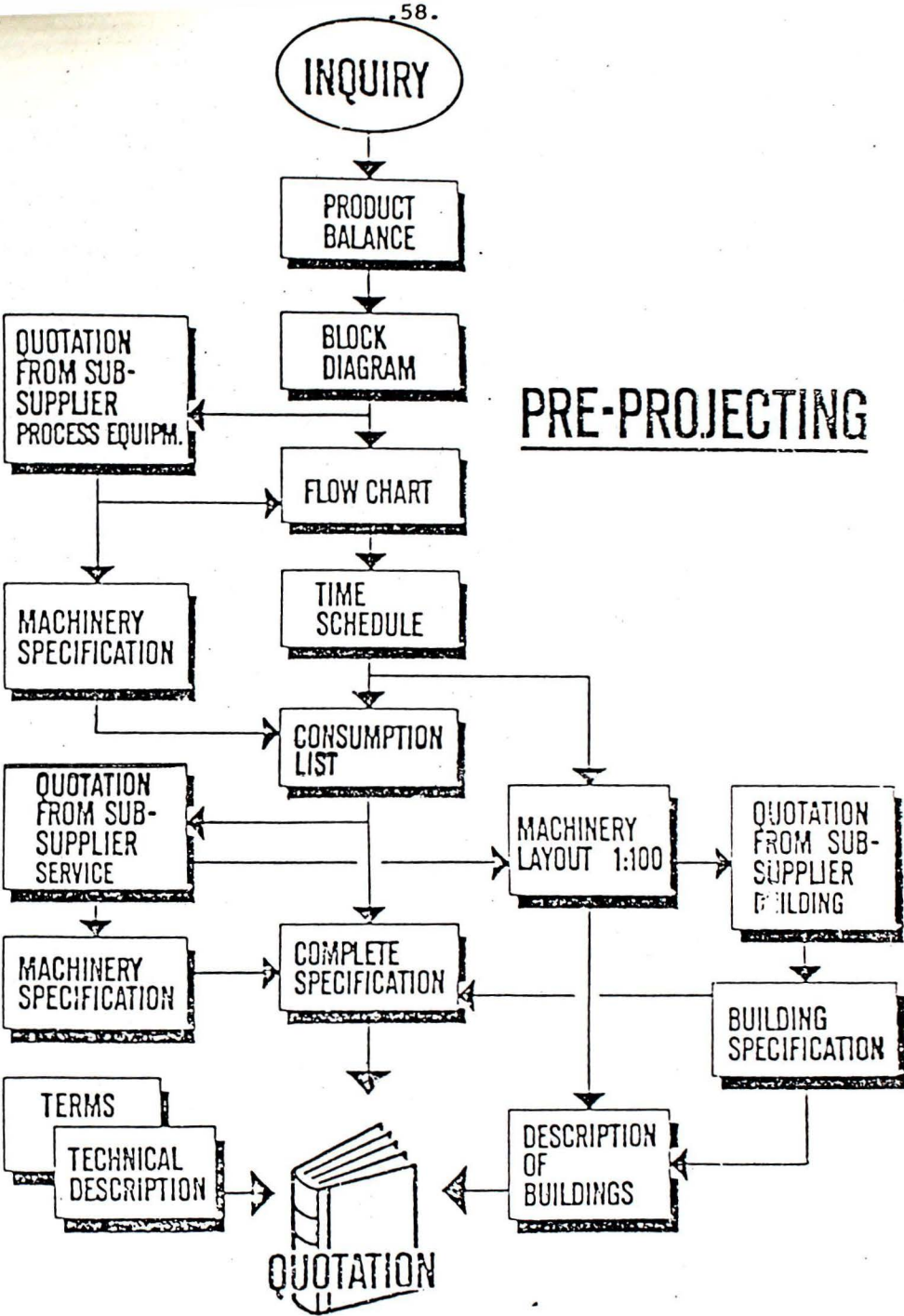
TERMS

TECHNICAL DESCRIPTION

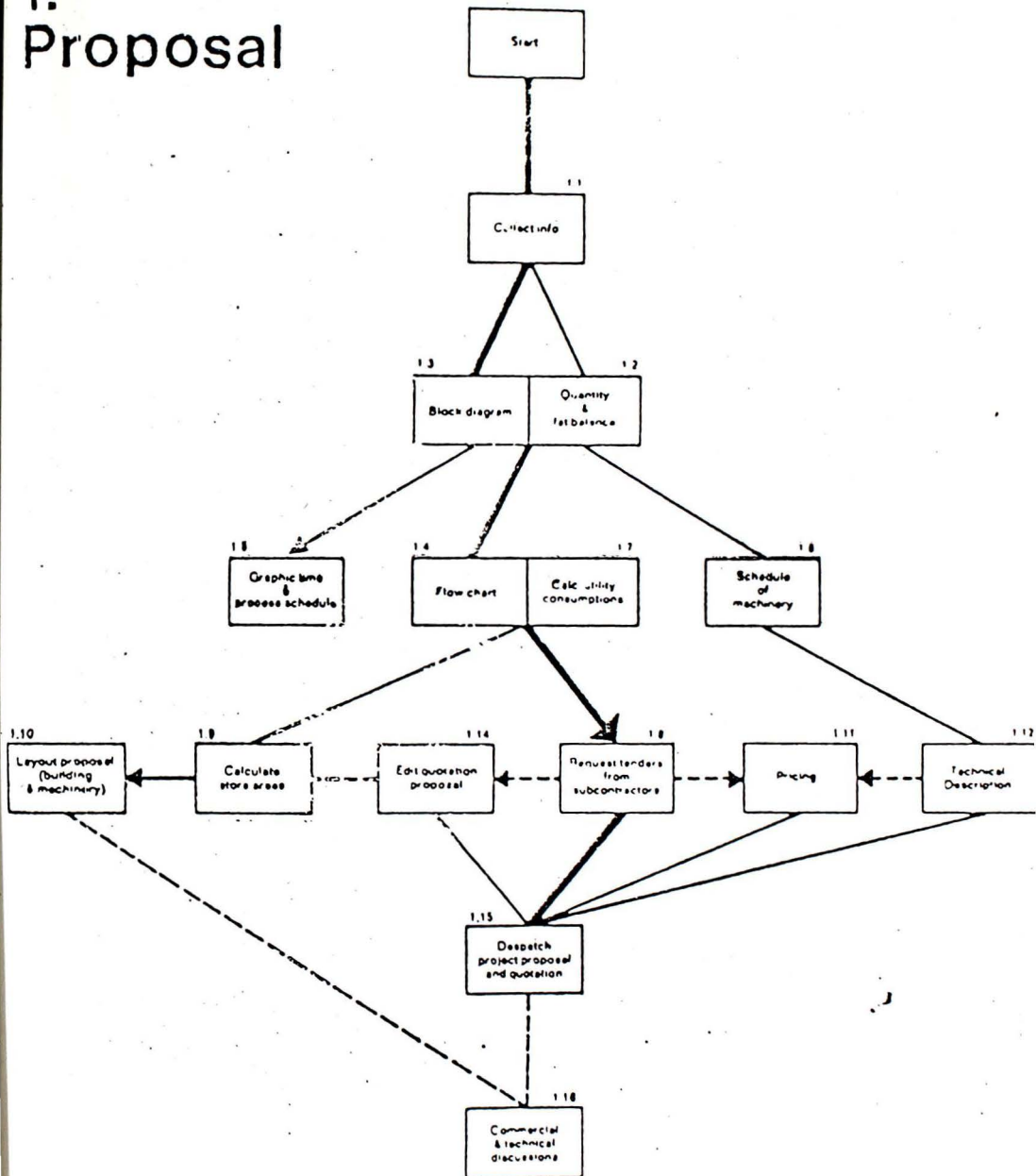
DESCRIPTION OF BUILDINGS



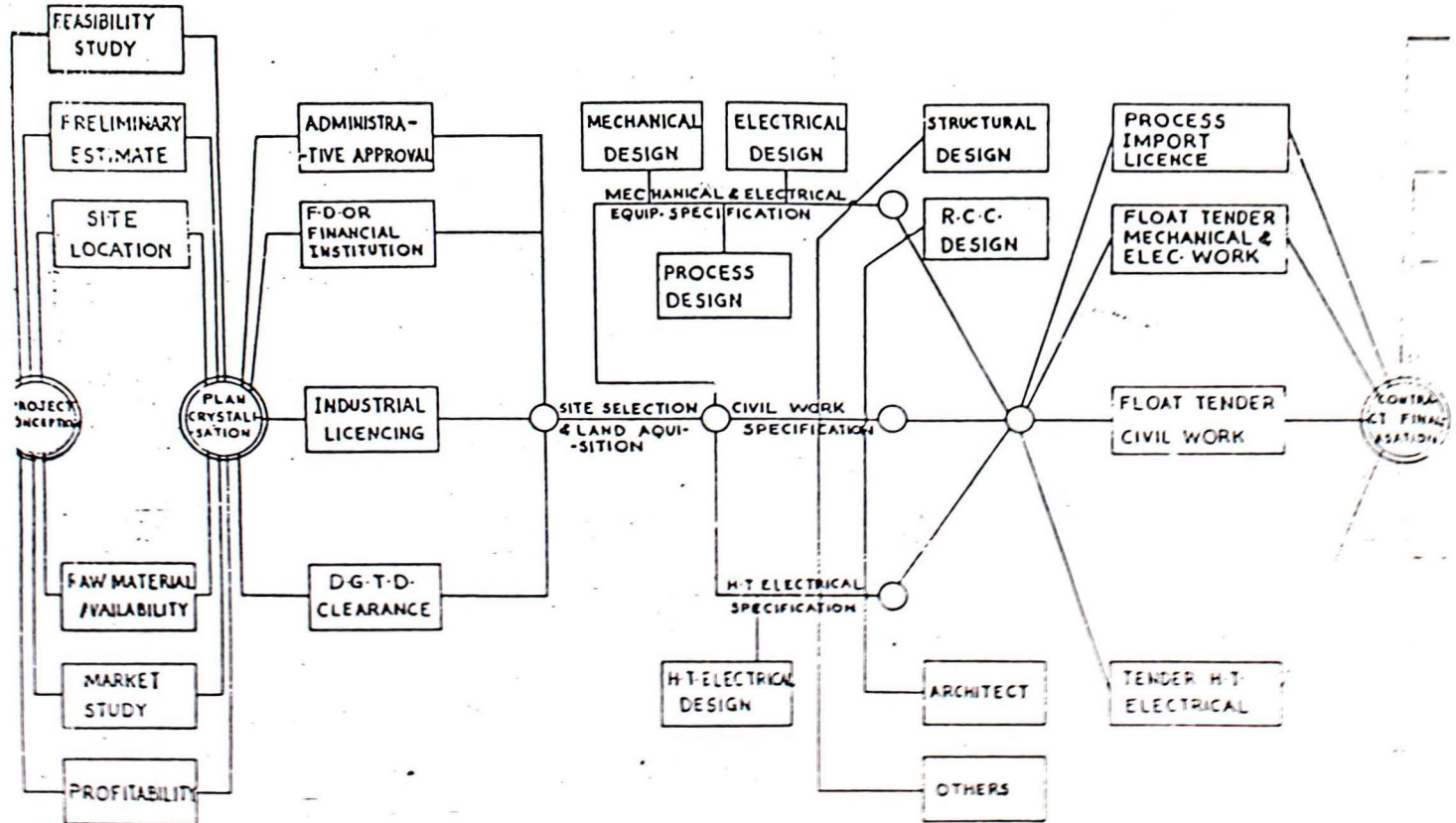
QUOTATION



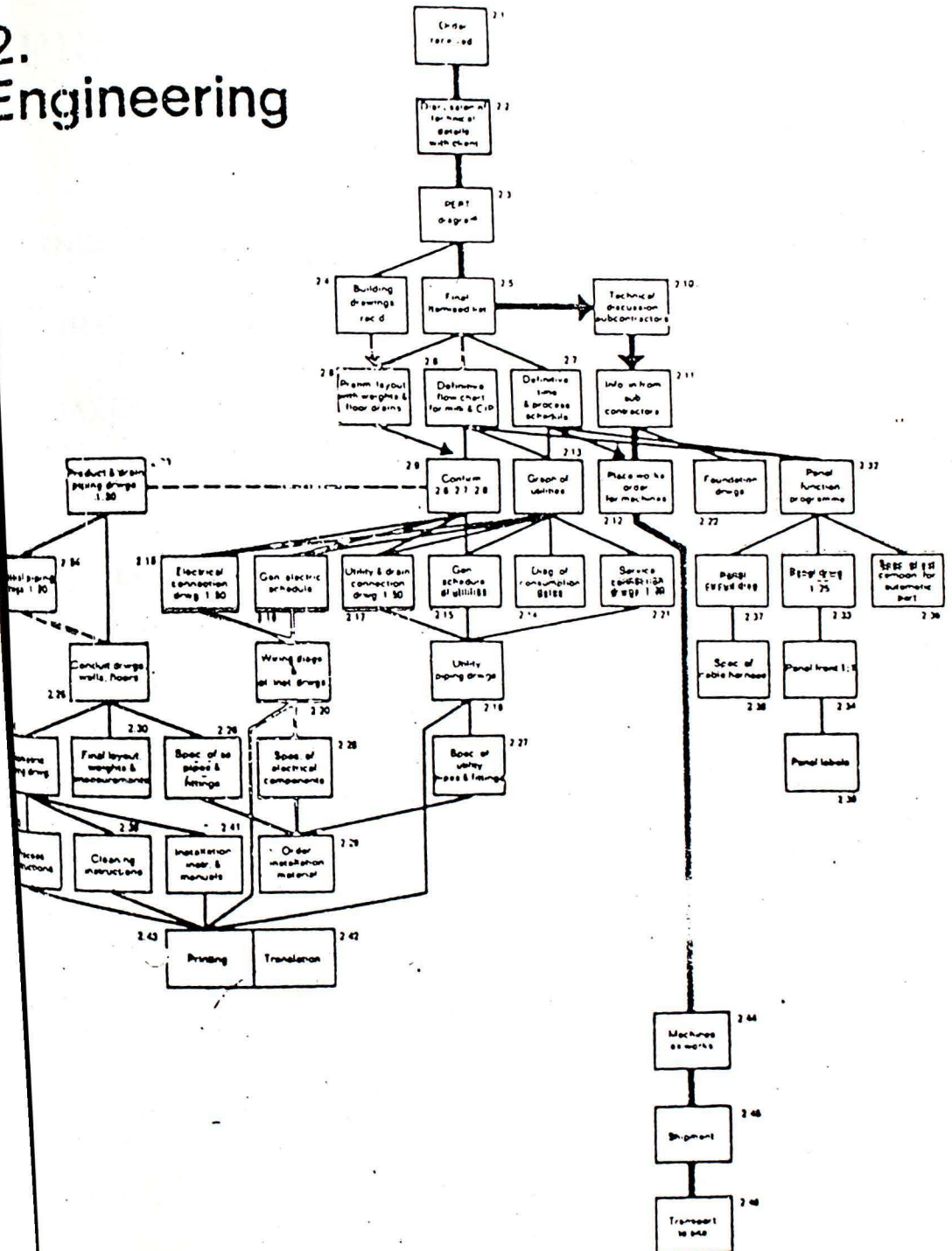
1. Proposal



PROJECT - PLANNING



2. Engineering



PRINCIPLES OF PLANT DESIGN

- * ENGINEERED SYSTEM
- * FIRST CLASS PRODUCT QUALITY
- * MAXIMUM HYGIENE
- * ECONOMIC OPERATION
- * MINIMUM FEED STOCK & PRODUCT LOSS
- * RELIABILITY IN OPERATION
- * CORRECT LEVEL OF PROCESS CONTROL
- * FUNCTION RESPONSIBILITY

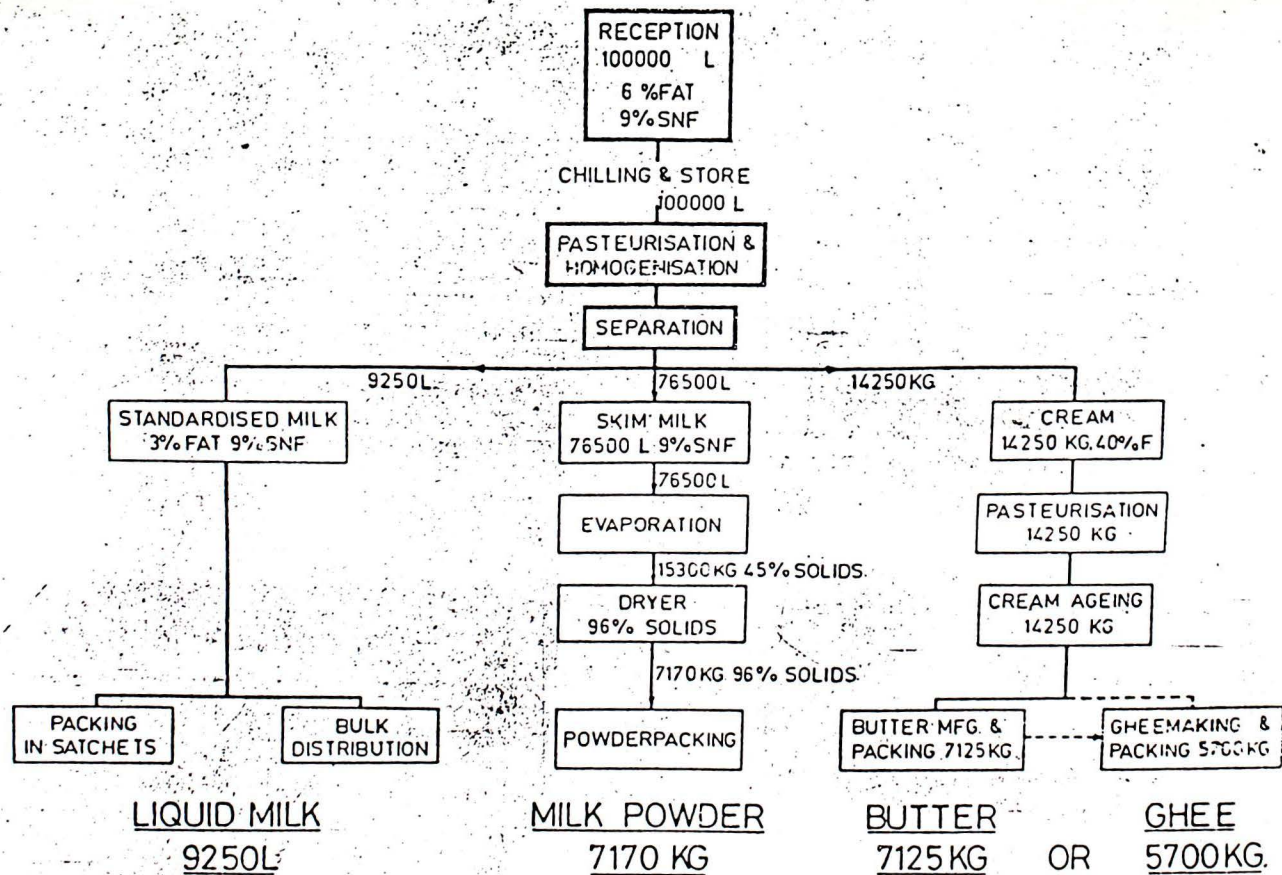
ENVIRONMENTAL FACTORS CONSIDERED IN PLANT DESIGN

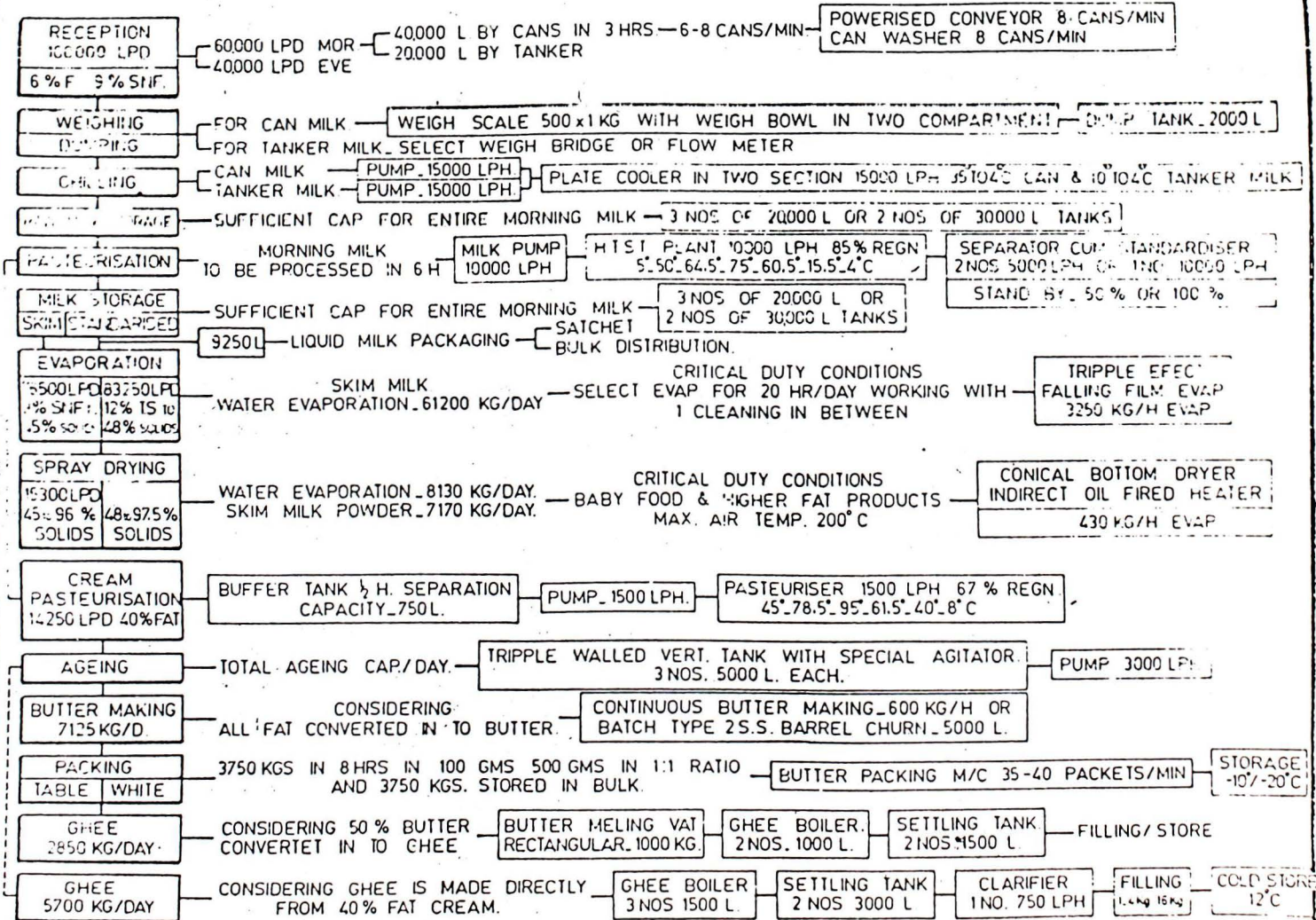
* EXTERNAL ENVIRONMENT

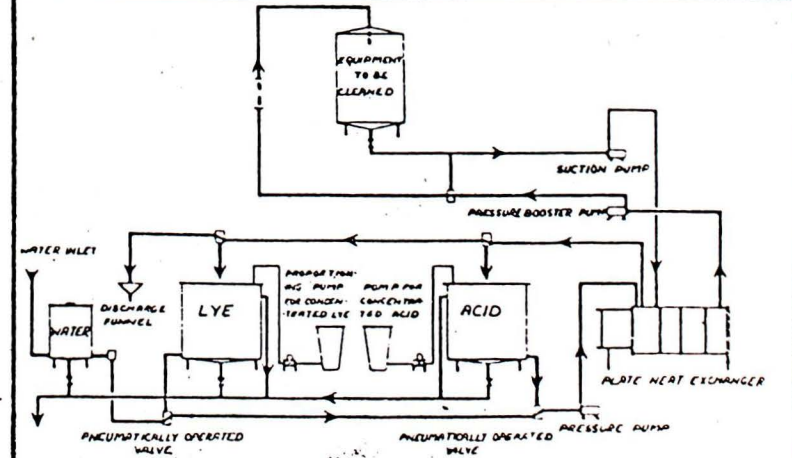
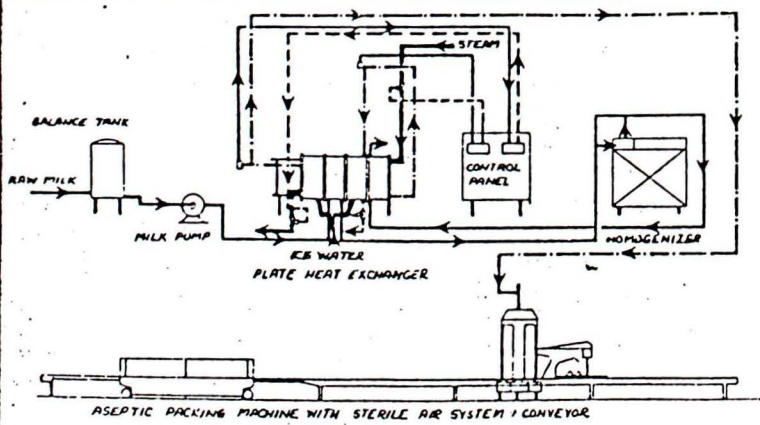
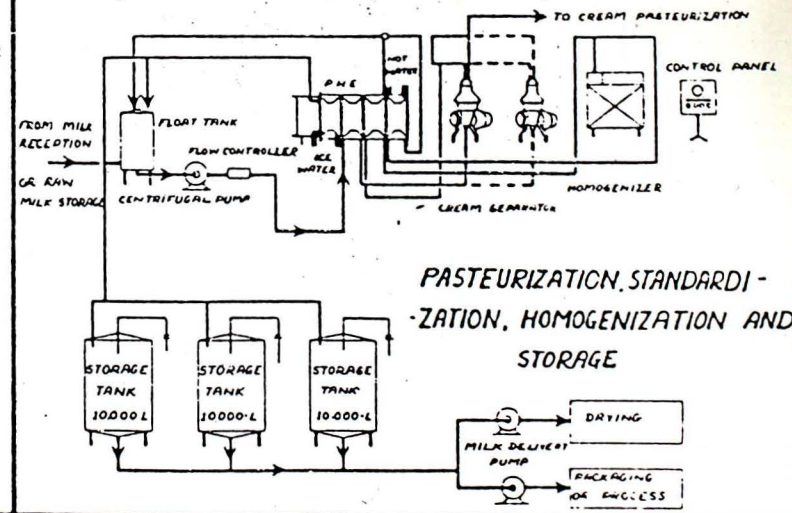
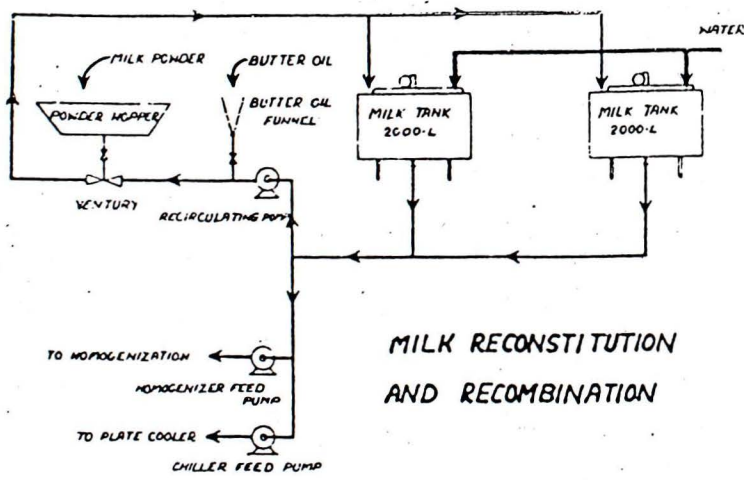
- * Water Demand
- * Effluent
- * Dust from powder driers
- * Solid Wastes
- * Chemicals
- * Odours
- * Noise
- * Traffic

* INTERNAL ENVIRONMENT

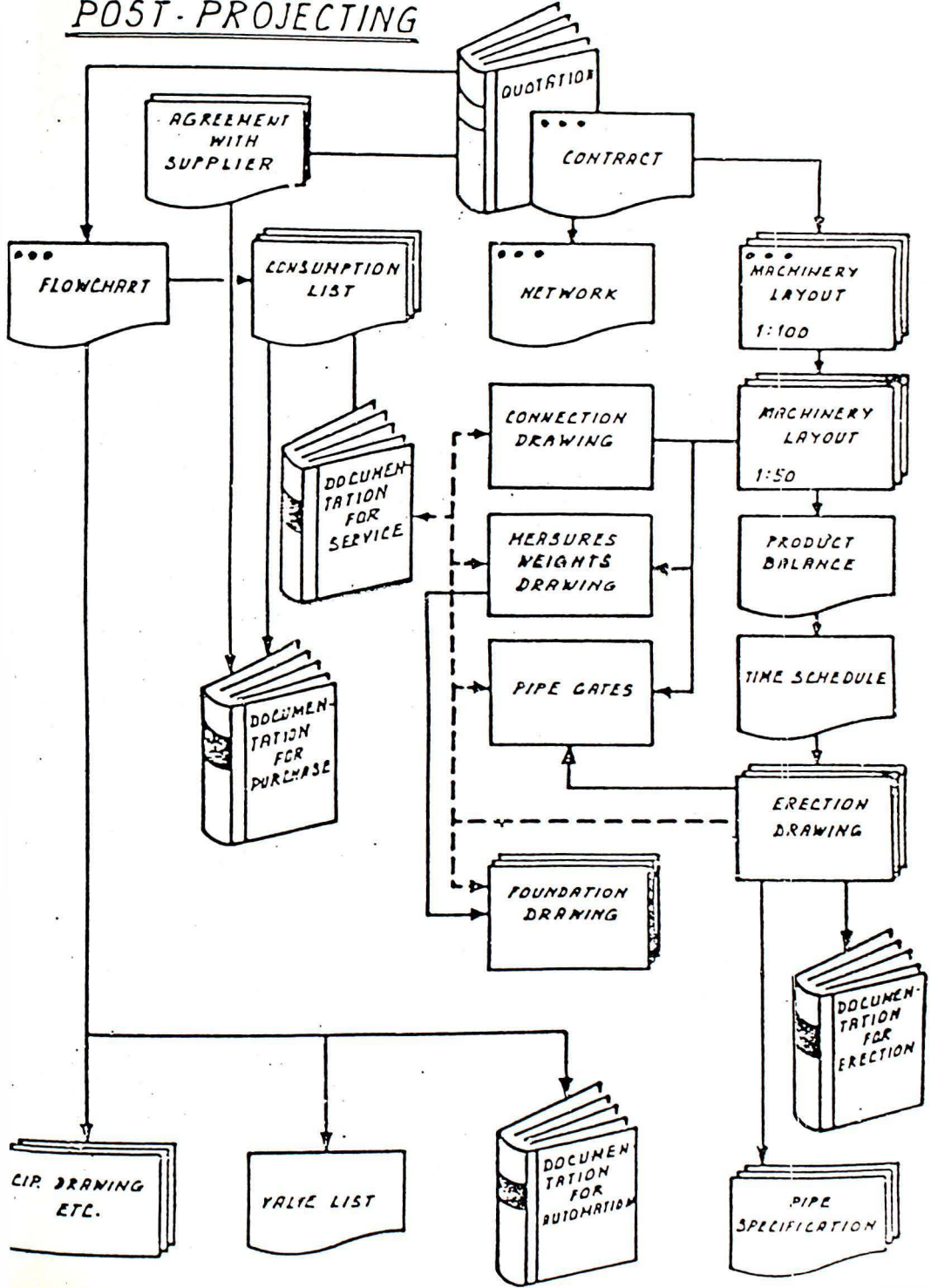
- * Work safety against accidents
- * Heat and cold
- * Moisture and condensation
- * Light
- * Dust and fumes - Odours



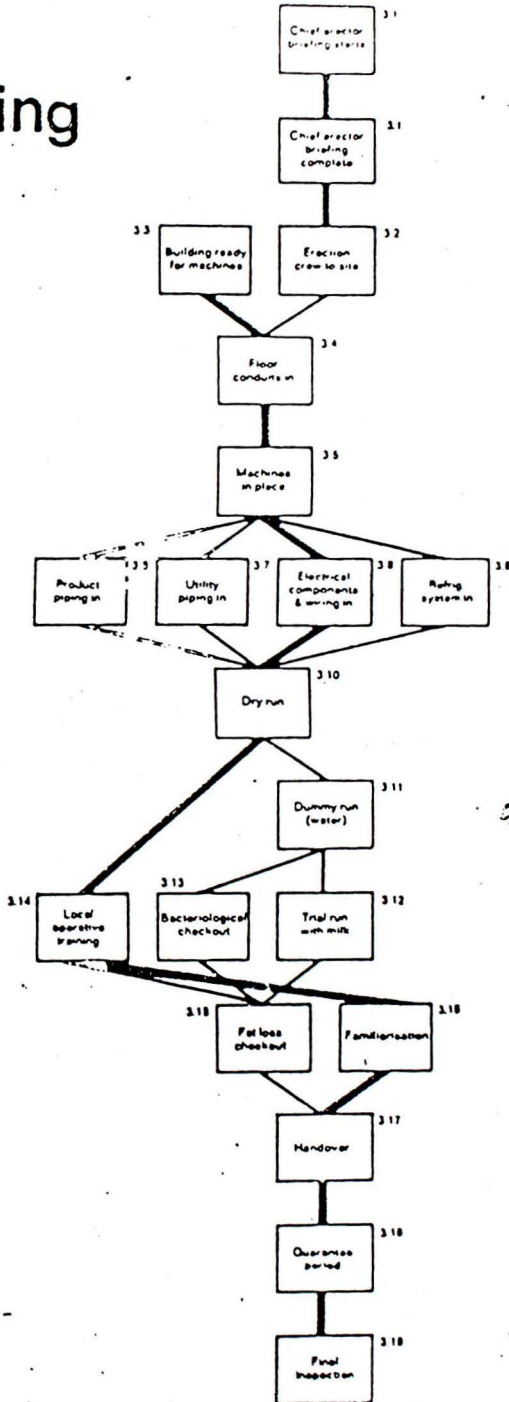




POST-PROJECTING

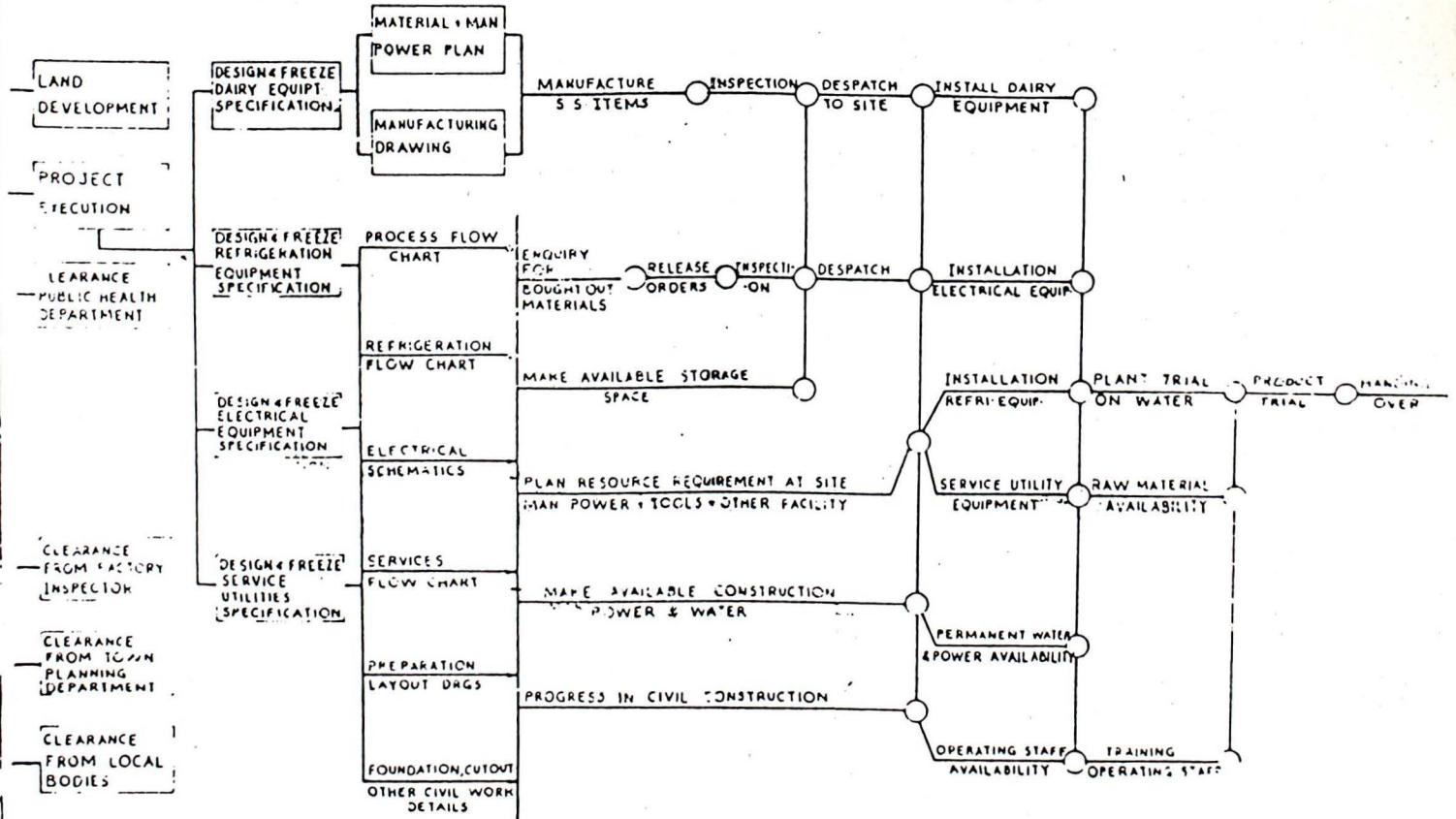


3. Contracting



ADVANTAGES FOR THE CLIENT TO USE A MAINCONTRACTOR

- * One competent contract partner
- * Clear definition of responsibility
- * Clear guarantee
- * Control of cost
- * Latest experience - solid overall know-how
- * Integrated & standardised documentation
- * Advantage to the clients organization
- * Training of personnel



PLANT COMPLETION



**MECHANICAL
COMPLETION
TEST**



**PRE-START-UP
TEST**



**PERFORMANCE
TEST**

CHAPTER 10

APPENDICES

Application

Separation and standardization of hot milk.
Designed for continuous operation and CIP.

Working Principle

The separator has the following distinguishing features:

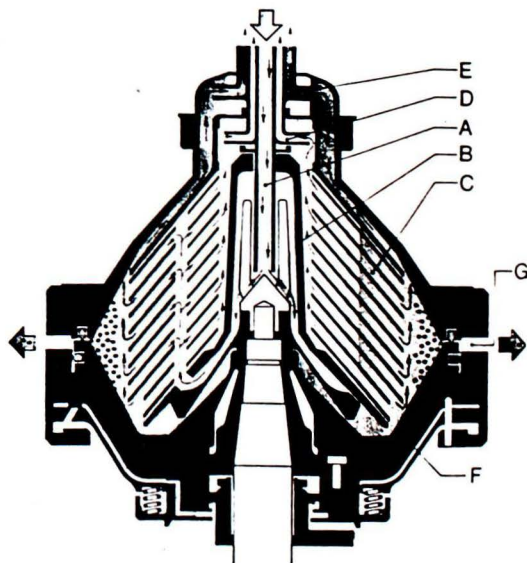
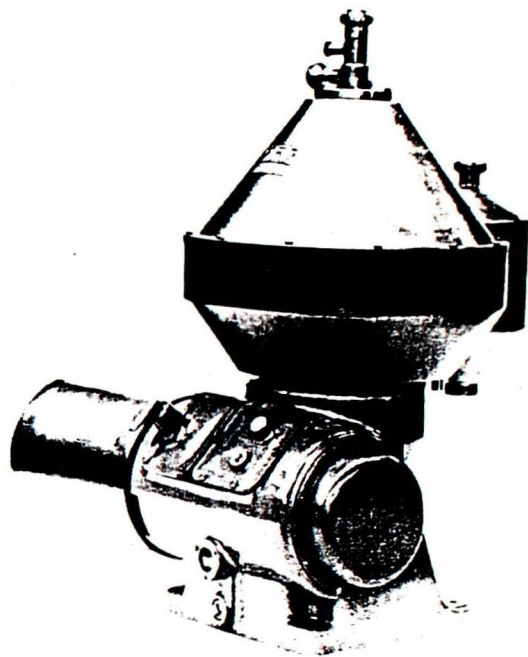
1. Milk Feed. Milk is fed into the separator bowl from the top through a stationary pipe A. Inside the distributor B the milk finds its own level depending on feed capacity and outlet pressures. The milk is smoothly accelerated and by the time it enters the disc stack it has achieved almost bowl speed. This gentle acceleration eliminates shattering of the fat globules and prevents air being picked up. Both these facts improve the skimming performance of the separator.

2. Paring Discs. The milk and cream outlet flow is achieved by means of paring discs D and E.

3. Automatic Sludge Discharge. Sludge collecting in the conical sludge space of the bowl is automatically discharged at preset intervals. This is achieved by the sliding bowl bottom F dropping briefly (<1 second) allowing the sludge to be ejected without disturbing the feed. The opening and closing of the bowl is done with water and controlled by a program system unit. The bowl opens for such a brief instant that only sludge escapes (partial discharge).

4. Cleaning-in-Place. The machine is designed for cleaning-in-place and should be incorporated in the plant automatic CIP system. All parts of the separator in contact with milk as well as the outside of the bowl, the inside of the frame hood, and the sludge outlet are cleaned perfectly without the need for any manual labour.

5. Low noise level. The separator is designed in such a way that the noise level is low.



Longitudinal section through bowl shown in closed position

- | | |
|----------------------------|-------------------------------|
| A Inlet pipe | E Skimmilk outlet paring disc |
| B Distributor | F Sliding bowl bottom |
| C Disc stack | G Sludge ejection ports |
| D Cream outlet paring disc | |

Basic Unit

Material. The upper part of the machine and all parts in contact with milk are of acid-resistant stainless steel. The motor casing and sludge cyclone are also of stainless steel, and the lower part of the frame is of enamelled cast iron.

Standard Equipment. Included are motor, base plate, revolution counter, manual brake and cyclone to absorb the kinetic energy of the ejected sludge.

A spare parts kit is also provided.

Technical Data

Capacity. Hot milk separation: up to 7,000 l/h (16,000 lbs/h).
Standardization up to 10,000 l/h or 22,700 lbs/h).

Connections. Inlet 38 mm (1.5 in). Skimmilk outlet 51 mm (2 in). Cream outlet 25 mm (1 in). SMS unions.

Motor. 15 kW flange motor for 380/660 V, 50 or 60 Hz phase AC. (Other voltages on request.) Motor drives stator bowl via a friction clutch and worm gear.

Motor Speed. 6,035 rpm.

Storage Space. 4.1 l (1 U.S. gal).

Water Consumption. Operating water: Intermittent flow (3 sec.) of up to 0.5 l/s (0.13 U.S. gal/s) for discharge. Water consumption for cooling of transmission oil, make-up water and inside frame hood: approx. 150 l/h (39.6 U.S. gal/h). Sludge flushing water: 25 l (6.6 U.S. gal) per discharge.

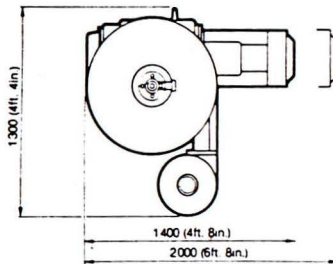
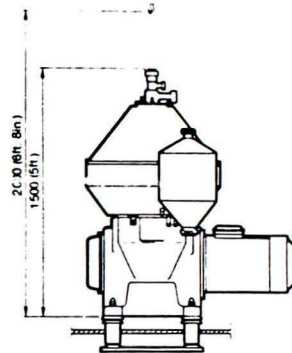
Water Consumption. None by basic unit.

Operating Pressure. 30–40 kPa (0.3–0.4 bar or 4.3–5.8 psig)

Maximum Inlet Pressure. 50–100 kPa (0.5–1 bar or 7.2–14.5 psig)
Maximum overflow pressure in skimmilk outlet (approx. 500 kPa or 7.25 psig working pressure).

Overhead Hoist for 10 kN (1,000 kp or 1 ton) is required.

Dimensions (mm)



Lifting Data

Basic unit:
Weight, appr 1,050 kg (2,300 lbs)
Lift weight, appr 1,150 kg (2,500 lbs)
Volume, appr 2.10 m³ (74 ft³)

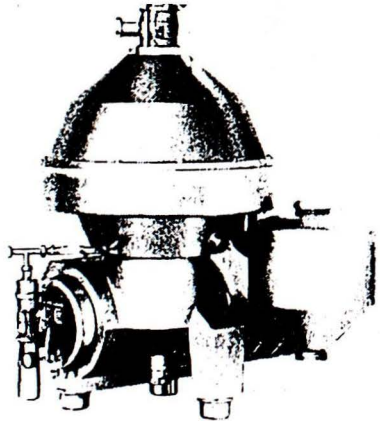
Additional Equipment necessary for operation

Item No.	Description	Cannot be combined with item No.	Requires item No.
	Set of tools (one set for every three machines)		
	Cream flow meter		
	Flow controller		
3	Manual regulating valve on skimmilk outlet + LKAP-valve (CIP), adapted to DPE-80 C	16	18.3
3	Constant pressure unit on skimmilk outlet + LKAP-valve (CIP), adapted to DPE-80 C	14 15	18.3
3	Discharge program system equipment DPE-80 C Y/D starter		

Note: Items 14 and 15 are alternatives to one another.

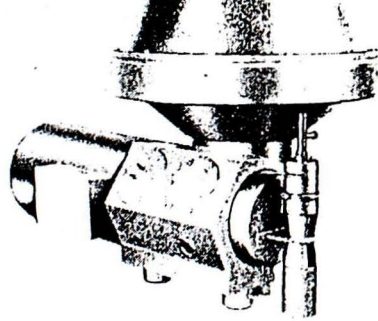
Optional Equipment

Item No.	Description	Cannot be combined with item No.	Requires item No.
	Inlet flow meter		
	Remixing device	3 14	
1	Standardizing device, manual	3 13	
	Constant pressure unit for operating water		
	Extra spare parts (for 8,000 hours running)		
	Lower frame with stainless steel cover		



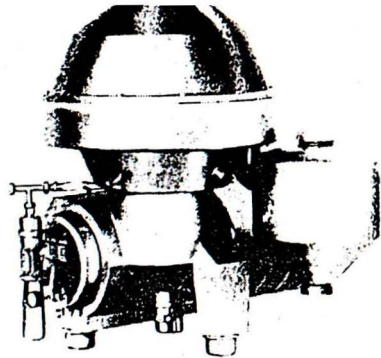
ALFA-LAVAL Hermetic Cold Milk Separators

Separator	Skimming l / h	Standardizing l / h	Rated power kW	Bowl speed rpm
HMRPX714HGV	10000	20000	22	5120
HMRPX518HGV	15000	25000	22	3955



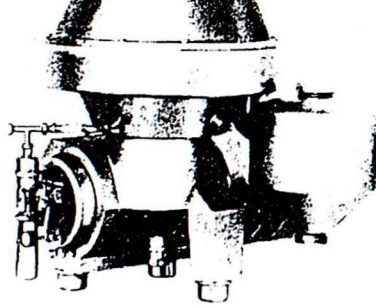
ALFA-LAVAL Clarifiers for Milk and Whey

Clarifier	Flowrate max, l / h	Sediment space litre	Rated power kW	Bowl speed rpm
DMRPX407SGP	10000	4.1	11	7310
DMRPX510SGD	20000	8.8	18.5	6240
DMRPX714HGV	25000	12	22	5120
DMRPX413SGV	30000	15	18.5	4575
DMRPX618HGV	40000	21	37	4265
DMRPX517SGV	50000	25	37	3955



ALFA-LAVAL Hermetic Hotmilk Separators

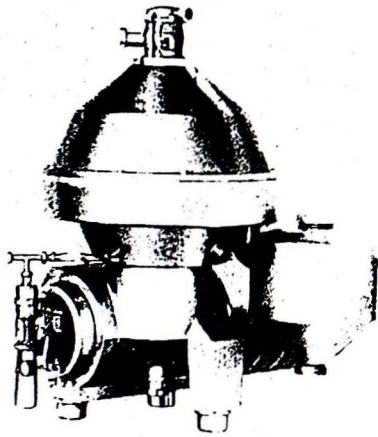
Separator	Skimming l / h	Standardizing l / h	Rated power kW	Bowl speed rpm
HMRPX610HGD	10000	15000	18.5	6240
HMRPX614HGV	15000	25000	18.5	4265
HMRPX714HGV	20000	30000	22	5120
HMRPX518HGV	25000	35000	22	3955
HMRPX618HGV	30000	40000	25	4265
HMRPX718HGV	35000	50000	25	4265



ALFA-LAVAL Hermetic Whey Separators

Separator	Effective capacity with filter l / h	Effective capacity with clarifier l / h	Rated power kW	Bowl speed rpm
HMRPX610HGD	9000	11000	18.5	6240
WMRPX614HGV	13500	16500	18.5	4265
WMRPX714HGV	*	22000	22	5120
WMRPX518HGV	22500	27500	22	3955
WMRPX618HGV	27000	33000	25	4265
WMRPX718HGV	*	38000	25	4265

* Recommended with pre-clarification only



ALFA-LAVAL Hermetic BACTOFUGES

BACTOFUGE	Flowrate max, l / h	Rated power kW	Bowl speed rpm
BMRPX714HGV	15000	22	5120
BBRPX714HGV	25000	22	5120
BMRPX618HGV	25000	25	4265
BBRPX618HGV	40000	25	4265

Plate Heat Exchanger Type P22 HRBD

APPLICATION

General milk cooling duties; operates with liquid/ gas media

WORKING PRINCIPLE

Heating surface consists of a number of corrugated plates clamped together in a frame and sealed at the edges by means of gaskets.

Plates have ports at the corners, and the gaskets are arranged so that the two media of the heat transfer flow through alternate spaces between plates.

The flow pattern is generally chosen so the two media flow in opposite directions, countercurrent flow.

The frame consists of a frame head, an upper carrying bar and a lower guide bar and a support column. The plates are suspended from and aligned by the carrying and guide bars with hangers.

The pressure plate is suspended from the upper carrying bar and the plate pack is clamped between the frame head and the pressure plate by means of six bolts.

The two media are sealed against one another in such a way that a leakage space open only to the surrounding atmosphere is created. Thus mixing of the two media has been completely eliminated. The gaskets are glued in the gasket tracks.

UNIT

- Floor mounting on ball feet, stainless steel
- Stainless steel SS304/SS316
- Nitrile rubber, other materials optional.

TECHNICAL DATA

Heating surface 0.12m²
 Plate dimensions 710 x 250 mm
 Thickness (uncorrugated) 0.6 mm
 Weight, incl gasket 0.88 kg
 Chamber volume 0.35 l
 Gasket size 70mm

ACCESSORIES

- Spanners
- Stem type thermometers.

- Available with Glue-free "CLIP-ON" type gaskets.

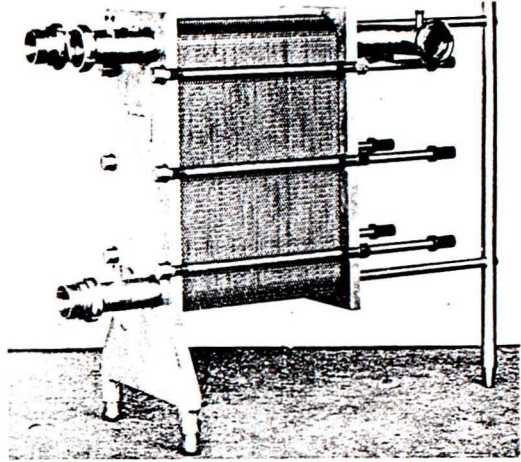


Fig 1 P22 HRBD



Fig 2 P22 plate

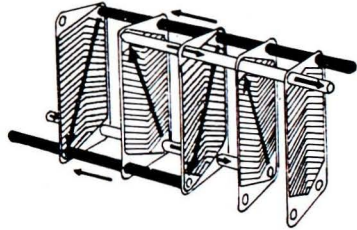


Fig 3 Flow principle of plate heat exchanger

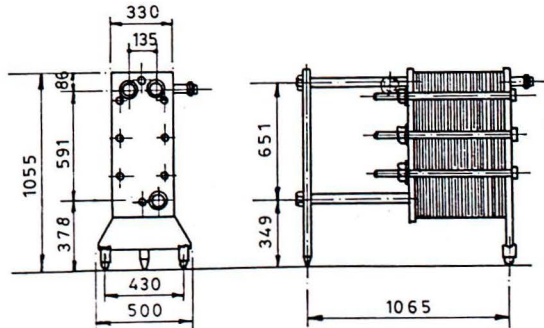


Fig 4 P22 HRBD



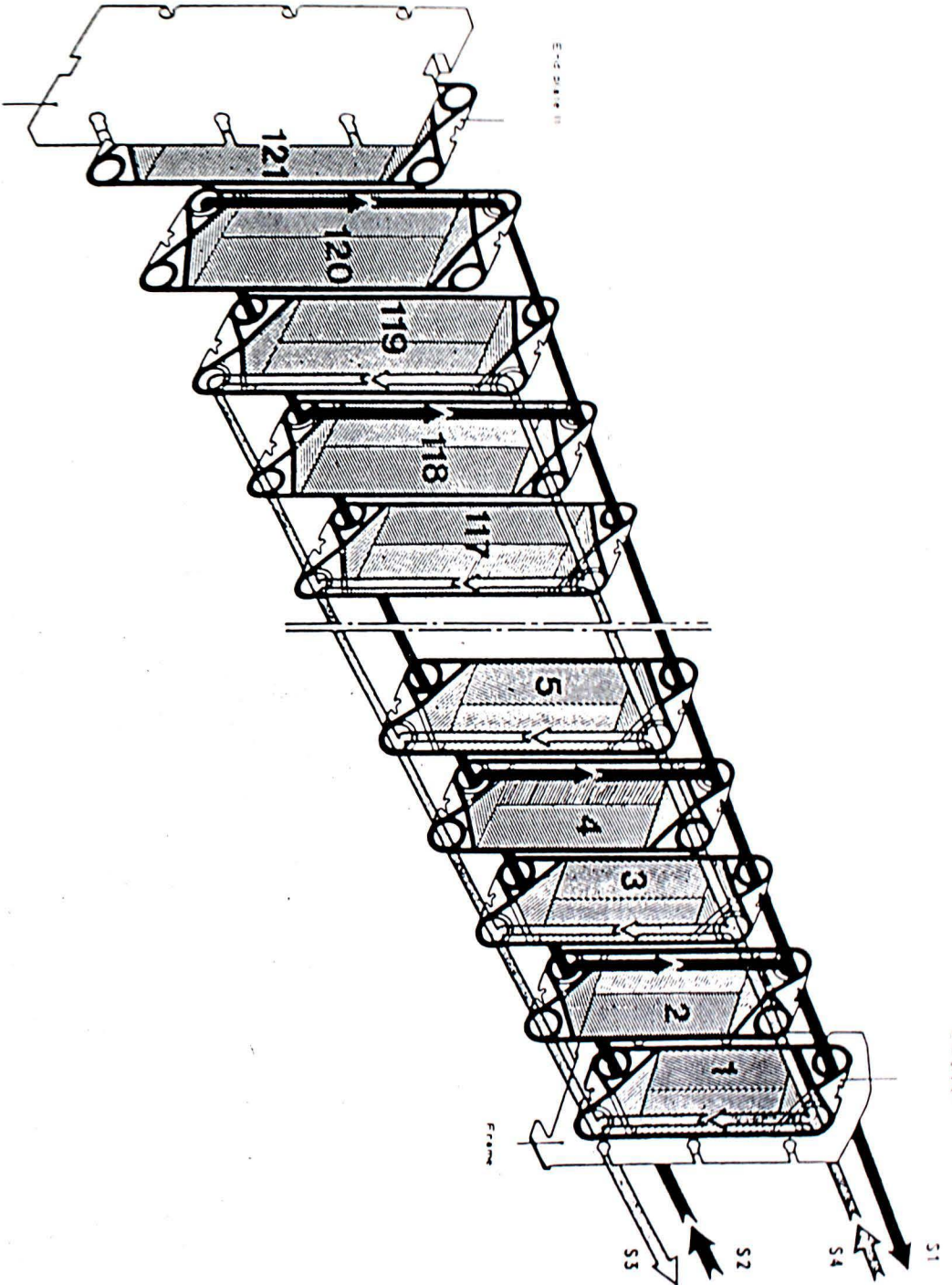
**INSTRUCTIONS FOR
PLATE HEAT EXCHANGERS
TYPE P**

CONTENTS

PRINCIPLE	.....	3
PLATES	.....	6
OUNTING	.....	7
UNNING CONDITIONS	.....	9
LEANING	.....	9
TERILIZATION	.....	11
MAINTENANCE	.....	11
EXCHANGE OF PLATES	.....	12
AULT-DETECTING	.....	12

Pressure plate

END VIEW II



Platage Diagram

A platage diagram is sometimes delivered with the PHE, together with the computer list. The platage diagram shows the sequence of the plates in the heat exchanger, the location of the connections and the special purposes for which the apparatus is intended.

An example is given below.

A liquid is heated by steam in the first section, including plates 1-4, and is cooled by water in the second section, plates 5-11.

When viewing the apparatus in the direction of the arrow in the figure, the process liquid enters at the lower left-hand side of the frame and discharges at the lower left-hand side of the pressure plate.

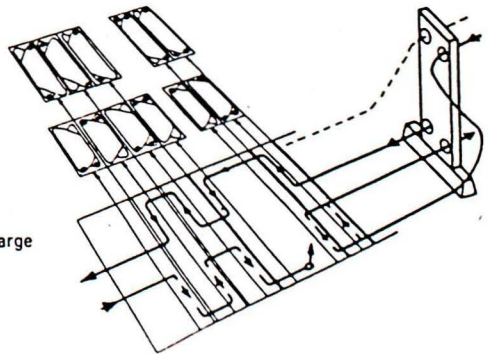
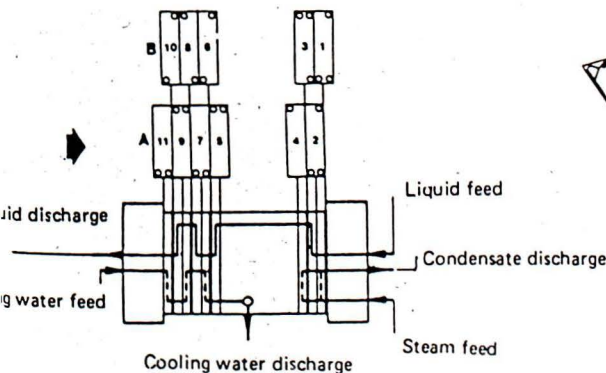
Steam enters at the upper right-hand side of the frame and condensate discharges at the lower right-hand side of the frame.

Cooling water enters at the lower right-hand side of the pressure plate and discharges at the upper right-hand side of the connection plate.

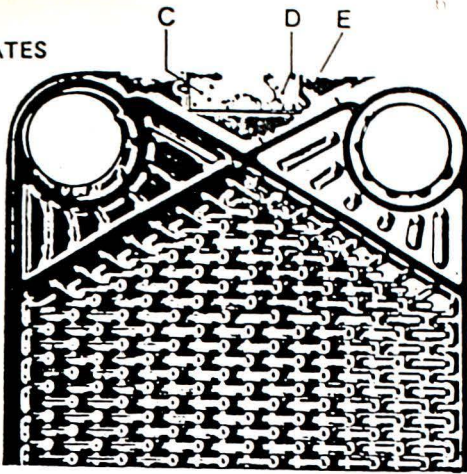
All connections are horizontal except for the one conveying the discharging cooling water, which is vertical. The ring signifies a vertically directed connection.

Plates 1 and 5 are end plates I (toward frame), 4 and 11 end plates II (toward pressure plate). Plates 2, 3, 6, 7, 8, 9 and 10 are channel plates.

Plates drawn in single lines in the diagram are called A-plates, and in double lines B-plates.



PLATES



NUMBERING

Identification

C = Plate No. (followed by "A" or "B")

D = Year of manufacture

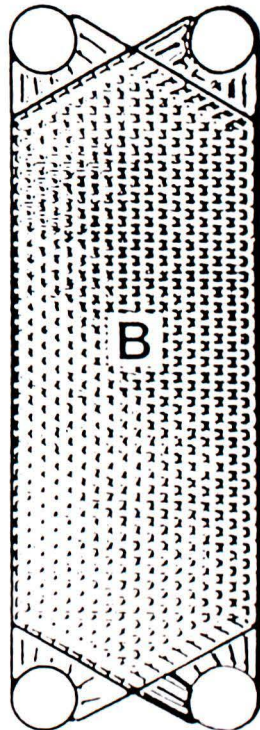
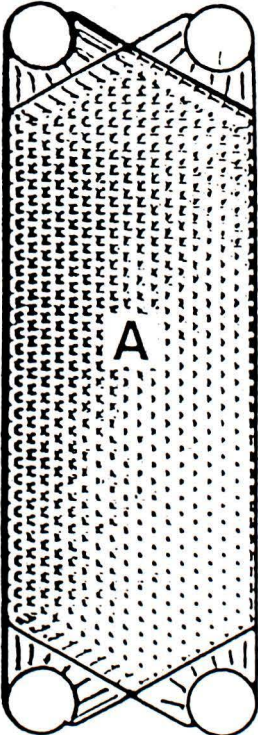
E = Material identification

Turning of Plates

In the heat exchanger every other plate is an A-plate (inlet to the left as seen from the gasket side) and every other a B-plate (inlet to the right as seen from the gasket side).

The plates can be inverted. An A-plate transformed into a B-plate and vice-versa. See Figure.

The plates are suspended with the gasket side facing the pressure plate and the back towards the frame.



Unpacking

For convenient and safe transport any instruments, valves and pipe lines supplied with the heat exchanger are delivered unmounted.

Feet

Some types of apparatus are delivered with feet and lower supporting column detached. These parts must be mounted before placing a apparatus on the floor.

Check all parts against the packing list. If any part is missing or damaged, notify the supplier immediately.

Instruments

Avoid scratching or denting painted or stainless surfaces. Handle the instruments with care. Capillaries, which have been coiled during transports, must be bent carefully into correct shape after the instruments have been mounted in place, but must not be given too narrow bends. The bend radius should not be less than 2" (50 mm). The excess length of the capillaries should be coiled up.

MOUNTING

Mount the heat exchanger on floor or wall, free-standing or bolted down, in accordance with the special manual for the type of apparatus.

Tightening a new apparatus

Mount instruments etc. according to the accompanying drawings. When delivered, the heat exchanger is not fully tightened. Before fitting pipe lines etc. check that the apparatus is tightened to correct plate pack length.

Holding tube

Holding tubes should be mounted at such a slope that all air can be evacuated through the vent cock.

Pipe Fitting

When mounting steam and liquid conduits to other parts than the frame, consider that the plate pack will gradually be compressed somewhat more than is normal in a new apparatus. The pipe lines should therefore be arranged so that they can yield when the apparatus is tightened, without pipes or couplings suffering damage.

Steam pipes

The pipe line dimensions must be chosen large enough to avoid too great pressure drops. Steam pipes with too small dimensions will make automatic temperature control difficult and may even make it impossible to obtain desired temperature.

Pumps

The pumps feeding the plate heat exchanger should be provided with regulating valve. If they are able to produce a pressure higher than that allowed in the exchanger, a safety valve should be provided. The pumps must not suck air.

MOUNTING

Tightening

Plate pack length

The diagrammatic drawing for each heat exchanger indicates a measurement for the plate pack length, which equals the distance between the inner surfaces of the frame and the pressure plate with normal tightening and new packings. As the packings get older, it may be necessary to tighten somewhat more to avoid leakage. The green mark on the scale indicates normal tightening with new packings, the red mark indicates the smallest measurement to which the apparatus may be tightened as the packings get older.

Note carefully that the nuts do not reach the inner positions if the plate pack has been reduced by one or several pairs of plates having been removed.

GOING BELOW THE SMALLEST PERMISSIBLE MEASUREMENT MEANS POSSIBLE DAMAGE TO THE PLATES. P45 is an exception. Only one dimension is given. A deviation of ~~1%~~ of the total length of the plate pack can be permitted.

Never go inside the green mark until this is necessary to keep the heat exchanger tight. The packings expand and seal better when warmed up. If an apparatus, which normally works at higher temperature leaks a little when cold, the compression should normally not be increased.

Never tighten the plates more at the bottom than at the top, as the pressure plate would then tend to rise above the other plates.

Tightening is generally possible only when the heat exchanger is not under pressure.

Loosen when
washing and
sterilizing

To spare the packings and increase their lifetime the compression in the whole heat exchanger should be reduced if the apparatus is warmer during cleaning and sterilization than in normal operation. This should be done also when the apparatus is out of use. To this end increase the plate pack length by a measurement approximately equalizing the difference between the normal and the minimum values for compression, i. e. the distance between the green and the red mark on the scale.

On heat exchangers provided with distance pieces indicating marks are fastened to the side of the distance pieces at a level with the upper supporting column. With other types of apparatus a plate pack length gauge is supplied.

THE FUNCTIONING AND LIFETIME OF THE APPARATUS
DEPENDS HIGHLY ON THE EXACTNESS OF TIGHTENING.

RUNNING CONDITIONS

Pumps must be started against closed valves and valves operated as smoothly as possible.

Avoid that pumps temporarily run empty on the suction side.

In automatized installations program pump starts and stops and actuation of valves, so that amplitude and frequency of pressure variation will be as low as possible.

Use efficient dampers at in- and outlet of homogenizer connected to the PHE.

Venting of liquid circuits has to be considered. Pumps must not draw air into the PHE. When the velocity is low, e.g. for viscous products, venting possibilities at the uppermost points of the circuit may be necessary. It should be possible to vent a tubular holder.

CLEANING

~~Immediately~~ after a production cycle, the product side is normally cleaned with ~~lye~~ and/or ~~acid~~. Sterilization is performed immediately ~~before starting~~ the next production cycle.

Cleaning flow rate

Should always be at least the same as the production flow rate. Increased cleaning flow rate may be required in special cases as e.g. milk sterilization and processing of viscous liquids.

Cleaning agents

1% by weight NaOH at max. 70°C. Dissolve 1 kg of caustic soda in 100 litres of water or mix 2.2 litres of 33% NaOH solution in 100 litres of water.

0.5% by weight HNO₃ at max. 70°C. Mix 0.7 litres of 53% (36°Be) nitric acid in 100 litres of water.

In special, exceptionally severe cases, e.g. milk sterilization, concentration and temperature mentioned above may be exceeded. Follow Alfa-Laval recommendations!

Detergents containing wetting and complex-formed agents beside the caustic soda or nitric acid may also be used. The maximal NaOH and HNO₃ concentrations by weight should be respected.

Detergents must be dosed gradually in order to avoid excessive concentration locally and temporarily.

Use clean water, free from chlorides, for cleaning solutions.

Check the cleaning result

A new heat exchanger should be opened and the plate surfaces carefully inspected already after the first test run. The interval can then be extended according to practical experience. ~~Once a month,~~ usually is regarded ~~as a good practice.~~

Cleaning of deposits from cooling medium of heating medium

Solid deposits can be removed by opening the heat exchanger and cleaning it with a ~~soft~~ brush and ~~10%~~ nitric acid. Note! Rinse well.

IMPORTANT

CAUSTIC SODA AND NITRIC ACID CAN CAUSE SERIOUS INJURIES TO SKIN AND MUCOUS MEMBRANES. HANDLE WITH GREAT CARE! ALWAYS USE PROTECTIVE GOGGLES AND PROTECT YOUR HANDS WITH RUBBER GLOVES.

EXAMPLES OF CLEANING PROGRAM

Products, rich in proteins, e.g. milk, egg, meat extract		Products, poor in proteins, with a high content of insoluble components, e.g. nectar and tomato juice		Products, poor in proteins, with a low content of insoluble components e.g. beer and wine		
Cooler		Pasteurizers and other heaters				
Daily	Weekly	Daily	Daily	Weekly	Daily**	Weekly
Rinsing 5 min.	Rinsing 5 min.	Rinsing 5 min.	Rinsing 10 min.	Rinsing 10 min.	Rinsing 5 min.	Rinsing 5 min.
Lye 20 min.	Acid 15 min.	Acid 15 min.	Lye 30 min.	Lye 30 min.	Lye 15 min.	Lye 15 min.
Rinsing 10 min.	Rinsing 5 min.	Rinsing 5 min.	Rinsing 10 min.	Rinsing 5 min.*	Rinsing 10 min.	Rinsing 5 min.*
Stop	Lye 20 min.	Lye 20 min.	Stop	Acid* 15 min.	Stop	Acid* 15 min.
Steriliz. 10 min.	Rinsing 10 min.	Rinsing 5 min.*	Steriliz. 10 min.	Rinsing 10 min.	Steriliz. 10 min.	Rinsing 10 min.
	Stop	Acid 15 min.*		Stop		Stop
	Steriliz. 10 min.	Rinsing 10 min.		Steriliz. 10 min.		Steriliz. 10 min.
		Stop				
		Steriliz. 10 min.				

* The need for an additional acid cycle in order to remove chalk deposits depends on the product. In many cases it is possible to carry out cleaning at considerably longer intervals. Sometimes it is possible to eliminate acid cleaning altogether.

** In some cases, where the risk for growth of micro-organisms is slight, it is possible to eliminate daily cleaning and replace it by:
Rinsing 20 min. — stop — sterilization 20 min.

STERILIZATION

BEFORE PASTEURIZATION

- By Heat** Circulate water of 90°C until all parts of the system have been kept at the final temperature for at least 10 minutes.
- Chemically** Before introducing the hypochlorite solution, make sure that the equipment is clean and free from deposits and that no acid residues are left.
- Dose gradually 100 cm³ of hypochlorite solution, containing max. 150 g/l active chlorine to 100 l of circulating water at a max. temperature of 20°C.
- Treat for 5 minutes (up to max. 15 minutes).
- Rinse well after the sterilization.

MAINTENANCE

- Sheet Material** Even stainless steel can corrode. Chloride ions are hazardous.
- Avoid cooling brines containing chloride salts as NaCl and, most harmful, CaCl₂.
- Inspect the plates regularly, say once a month, for possible corrosion attacks, especially on a new installation and after changing the running conditions.
- Gasket rubber** On opening the PHE, check that all gaskets are clean, in good condition and correctly positioned in the grooves of plates and connections.
- Store room for spare gaskets should be cool and dark. Gaskets must not be stored hanging or twisted or subject to great load.
- EXCHANGE OF RUBBER GASKETS IN PLATES
SEE SEPARATE CEMENTING INSTRUCTIONS
- Stainless steel cladding** on frame, pressure plate and connection plates is satin polished.
- Clean with cloth wetted by paraffin oil. Do not degrease the surface!
- The satin surface can be brightened up by using a common liquid metal polisher. Even slightly abrasive materials such as steel wool or "Scotch-brite" may be used — but rub strictly up and down, never sideways!
- Lubrication** Keep bolt threads lubricated, preferably with molybdenum disulphide grease (Molykote).
- Grease the suspension wheels on pressure and connection plates.

EXCHANGE OF PLATES

A damaged plate can easily be replaced by an identical spare plate. Two adjoining 4-port plates can be removed without being replaced. The capacity of the heat exchanger will usually only be slightly reduced. The plate pack length will be reduced by the assembly length of 2 plates.

Use protection gloves when handling plates in order to avoid any risk for hand injuries.

FAULT-DETECTING

Performance of the PHE with regard to heat transfer and/or pressure drop is abnormal

Check the plating. A consequence of wrongly located plates can be that some channels are bypassed, whereby a sack is formed. Stagnation will follow, making circulation cleaning impossible and creating immediate risk of corrosion.

Leakage to the outside

Check A-measure.

If the leakage continues, mark the leaking plates, open and replace the gaskets in question.

Liquids mixing, inside leakage

Apply water pressure on one side of all the sections in the unit. Fill the other side with water and then open all connections on that side. If a plate is perforated, water will pour out through one of the corresponding open connections.

The plates of the faulty section are then examined by means of current crevice-detection liquids. A large plate section may be divided and the pressure test repeated in order to reduce the number of plates on which the crevice-detector has to be applied.

When corresponding with Alfa-Laval regarding defect on plates, please specify:

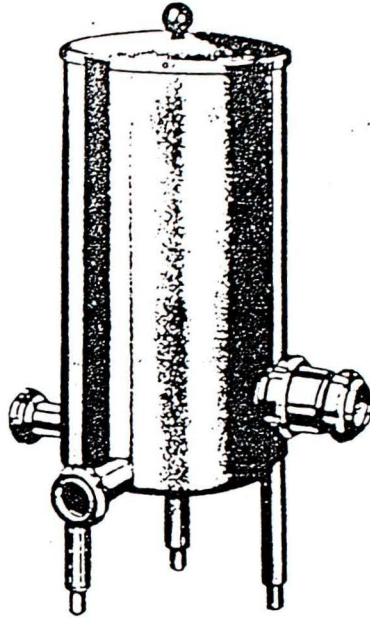
PHE fabrication number

Plate fabrication number

Position of plate in PHE (Note on plate specification or plating diagram)

Liquid(s) in contact with damaged surface

Other relevant observations



**INSTRUCTION MANUAL
FOR BALANCE TANK
TYPE BTD -250**

DESCRIPTION AND FUNCTION

The balance tank consists of a tank vessel with four connections. There is one inlet and the other connections are intended for the pump, flow diversion valve and C.I.P. return. The inlet is provided with a float valve to maintain a constant level.

As the level of the liquid in the tank rises, the float valve (19) rises. The arm (18) is pulled up and the connecting links (15) pushes the valve cone (14) closer to the valve seat in the valve housing (9), thereby reducing the inlet area.

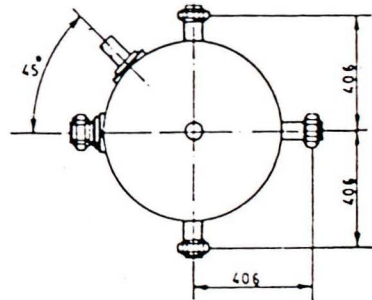
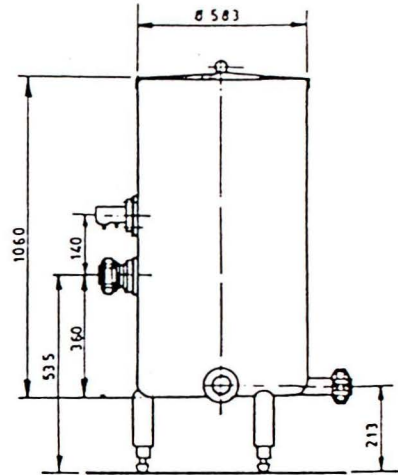
INSTALLATION

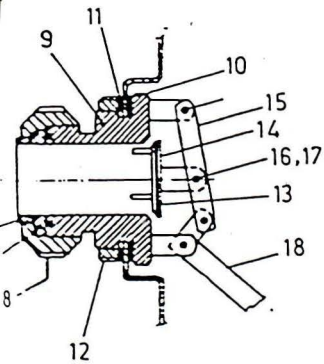
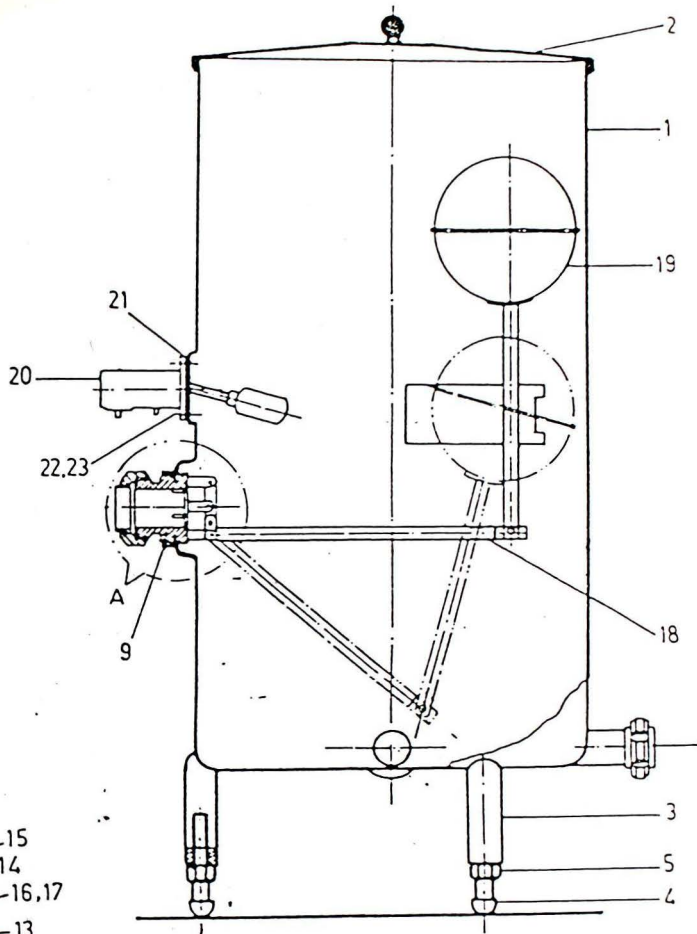
The tank is to be installed free standing on the floor. It is levelled by means of adjustable feet so that the outlet is in level with the pump inlet. The pump should be connected to the balance tank via a short, straight, stainless steel pipe. The float valve must not be burdened with the weight of heavy pipe or valve arrangement at the inlet. If required a support from the floor must be fitted.

DISMANTLING

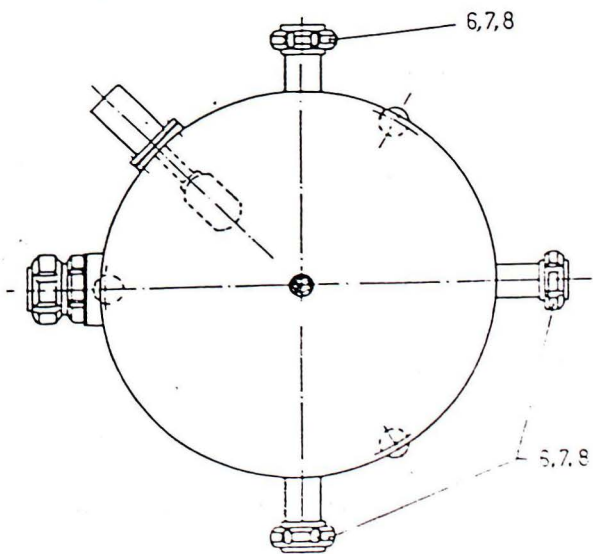
The float valve is dismantled by removing 'O' ring (17) and pulling out the guide-pins (16). The float (19), lever arm (18), the connecting links (15), and the valve cone (14) come out automatically. Loosen the ring nut (12) to remove the valve housing (9).

The assembling is to be done in the reverse manner.





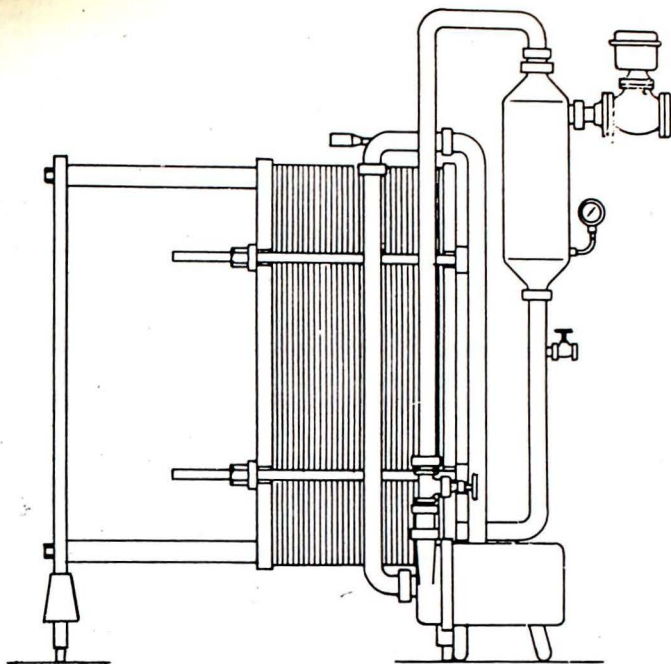
DETAILS AT 'A'



ITEM NO.	QUANTITY	DESCRIPTION	PART NO.
1.	1	Vessel	11677-1
2.	1	Cover	11677-2
3.	3	Leg pipe	31542-0240
4.	3	Ball feet	31542-0259
5.	3	Lock nut	32248-0546-1
6.	4	Liner	190632
7.	4	Packing	190606
8.	4	Union nut	190618
9.	1	Valve housing	11677-4
10.	1	Rubber packing (INT.)	99-0174
11.	1	Fibre packing (EXT.)	99-0175
12.	1	Ring nut	25-2131
13.	1	'O' Ring	99-0023
14.	1	Valve cone	25-2124
15.	2	Connecting link	25-2132
16.	5	Guide pin	25-2133
17.	10	'O' ring	99-0028
18.	1	Lever arm (Horz.)	11677-6
19.	1	Float	11677-7
20.	1	Float operated magnetic switch	LEVCON LS-380-61S
21.	1	Packing	
22.	4	S.S. Washer	M 8
23.	4	S.S. Nut	M 8

ALFA-LAVAL

MODEL TYPE



**INSTRUCTIONS AND
PARTS LIST FOR
HOT WATER UNIT TYPE
HW-C**

APPLICATION

To supply, e.g. heat exchangers, with hot water.

WORKING PRINCIPLE

Water is heated by means of the condensation of steam in a closed water system. The temperature can be detected in the product or in the water and is controlled by a temperature controller and a steam regulating valve.

MOUNTING

Mount the hot water unit according to flow diagram 31145-0153. The unit should be mounted vertical and the overflow valve close to the heat exchanger. Connect for water supply to the system through valve BSP 1/2" on pipe between heater and PHE.

Mount steam regulating valve as close to the hot water unit as possible. Fit a shut-off valve in the steam line. The steam pressure before the steam regulating valve should normally be 3 - 5 bar g. (= kp/cm^2).

Connect the temperature controller to the steam regulating valve and supply with compressed air, 1.4 bar g. (= kp/cm^2). The temperature transmitter of the controller can be fitted either in the product circuit (I) or in the water circuit (II). The transmitter should be fitted in counter flow in an instrument bend.

From a safety point of view the connection should be carried out so that the air supply to the steam regulating valve is interrupted automatically when the pump stops.

Thermometers should be fitted on inlet and outlet of the heat exchanger.

OPERATION

Fill the system with water. Start circulation pump and then open very carefully for steam. Adjust the circulating water flow rate by means of the throttling valve. Calculate according to the following formula:

$$G_2 = G_1 \times \frac{(t_4 - t_3)}{(t_1 - t_2)}$$

G_1 = Product flow rate

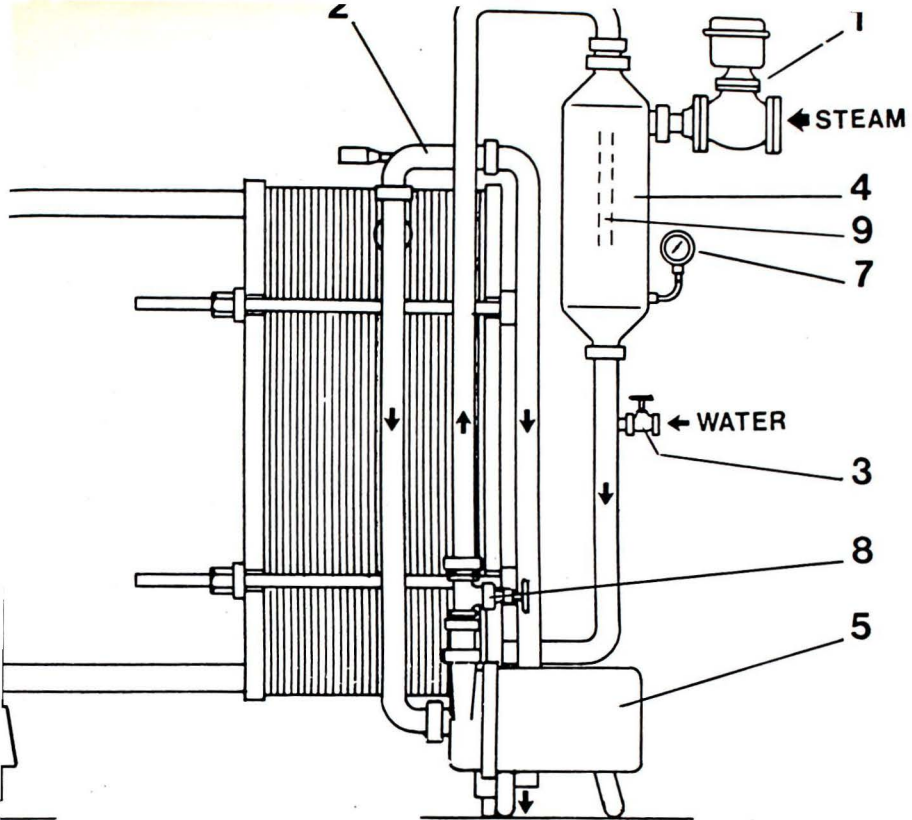
G_2 = Circulating flow rate

t_1 = Water temp. to heat exchanger

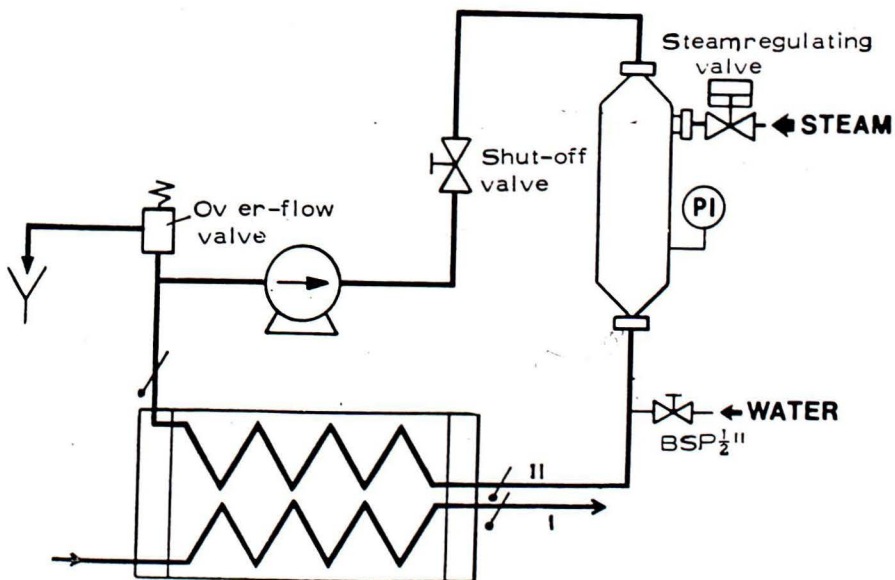
t_2 = Water temp. from heat exchanger

t_3 = Product temp. to heat exchanger

t_4 = Product temp. from heat exchanger



FLOW DIAGRAM 31145-0153



Pos Quant.Description

Alfa Laval Part number

			Size 1	Size 2	Size 3
	1	Water heater compl.	31145-0164-1	31145-0159-1	31145-0154-1
1	1	Steam regulating valve	See sep.instr	See sep.instr	See sep.instr.
	2	Packing IT dias.70/30x1	65514	65514	65514
		dias.107/51x1	74040	74040	74040
		dias.127/76x1	223328-02	223328-02	223328-02
		dias.142/89x1	223330-01	223330-01	223330-01
2	1	Overflow valve,PRV-A	31348-0014-2	31348-0014-2	31348-0014-2
3	1	Valve,BSP 1/2"	2542100-04	2542100-04	2542100-04
4	1	Water heater	31145-0167-1	31145-0162-1	31145-0157-1
5	1	Pump	See sep.instr	See sep.instr	See sep.instr
6	1	Temperature controller	See sep.instr	See sep.instr	See sep.instr
		Packing for temperature transmitter for temp. control. NAF 10xdias22/12	32249-0311-2	32249-0311-2	32249-0311-2
		For temp.controller TC-2 10xdias.22/13	32249-0311-3	32249-0311-3	32249-0311-3
7	1	Pressure gauge	990069-03	990069-03	990069-03
8	1	Gate valve,BSP 1"	260160-01		
		Gate valve,BSP 2"		260180-02	
		Gate valve,BSP 3"			260180-03
9	1	Heating tube	31145-0165-1	31145-0160-1	31145-0155-1

Hot water unit type HW-C

Dimensions

	HW-C1	HW-C2	HW-C3
A	Ø 38	Ø 63.5	Ø 76
B	Ø 38	Ø 63.5	Ø 76
C	Ø 38	Ø 63.5	Ø 76
D	Ø 101.6	Ø 205	Ø 255
E	110	180	210
F	410	585	760
G	570	820	1035

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VERIFIED
Manjeet Singh
Signature

