FILE: G-105
ISIC: 3512

HOW TO START MANUFACTURING INDUSTRIES

LIQUID PESTICIDES MANUFACTURING PLANT

Pesticides are chemical compounds used, in certain formulations and forms, to control plant disease, pests and weeds, as well as parasites on animals and humans. The damage caused by agricultural pests is enormous, amounting to as much as US $ 55-75 billion per year. Damage in countries with a highly developed agriculture ranges from 15 to 20%, while in developing countries it amounts to 30-50% of the total crop value. Enormous quantities of pesticides are used worldwide to protect over 3,000 plant species from about 10,000 pest species. The largest quantities of pesticides are used to protect maize, rice, cotton and fruit orchards. An annual increase in pesticide consumption of 14% is expected in the future.

Pesticide production can be devided into base and formulation production. Base production is the production of active substances; in general, it involves complex processes of organic synthesis requiring very expensive plants. The aim of formulation production is to give pesticides a form suitable for application. The types of formulations most frequently used today are wettable powders (WP) and emulsion concentrates (EC). The plant described here produces liquid pesticides.

PROCESS DESCRIPTION

Raw materials are subjected to physical/chemical tests prior to production process. This refers also to the finished products which are subjected to physical/chemical tests prior to packing.

Liquid pesticides are composed of solid or liquid active substances to which auxiliaries and solvents are added. Production takes place in two reactors of 4,000 litres each.

A part of the solids is melted in melting chambers. The reactor is charged with the solvents by means of a pump through a flowmeter. The melted materials and the liquid ingredients are fed into the reactor by means of a vacuum. The solids are then added through a special opening in the reactor. When the reaction has been completed the product is transported by means of compressed air into two reservoirs of 10 m^3 each.

Packaging into cans and drums is carried out on scales, while bottles of 0.1 - 1 lit. are filled on an automatic packaging line consisting of two rotary tables, a filling machine, a machine for closing the bottles and a labeling machine. The bottles are put into carton boxes and palletized. The palletized finished products are taken to the warehouse by fork-lift trucks.

NOTE: The active pesticide components, as well as the finished products, are often very strong poisons. Additionally they are rather aggressive chemicals. Solvents are inflammable and explosive. For this reason in the process of pesticides production special precaution and safety measures are required. All engines and electrical equipment have to be explosion-proof. All machinery and equipment must be grounded. All equipment that may come in contact with raw materials and finished products must be made of stainless steel.

The plant must be ventilated. The waste water shall be subjected to special treatment (boiling and neutralization) prior to exhaust into the sewerage.

Special attention must be assigned to safety at work. In the process of manipulation of raw materials and finished product workers must obligatorily wear protection masks, special clothes and footwear.

In liquid pesticides manufacture a batch method of production is used.

PRODUCTION CAPACITY

The production capacity of the plant is 4,800 tons of finished products per year. This can be broken down as follows:

- herbicides	1,920 t/year
- instectisides	2,400 t/year
- fungicides	480 t/year
TOTAL:	4,800 t/year

This calculation is based on 8 hours per day and 300 days per year. Work in two or three shifts would double or treble the production capacity.

REQUIRED MACHINERY AND EQUIPMENT

I t e m	No.
Melting chamber	1
Reactors	2
Filling machine	1
Machine for closing the bottles	1
Labeling machine	1

Rotary tables	2
Compressors	2
Vacuum pumps	2
Solvent tanks	2
Tanks for the finished product	2
Compressed air tank	1
Vacuum station tank	1
Scales	6
Ventilation equipment	2
Internal transport equipment	2
Other equipment: electrical equipment, pneumatic equipment, laboratory equipment, firefighting equipment.	

FOB price of machines and equipment	US dollars	850,000
Project documentation	US dollars	50,000
Know-how and start-up	US dollars	70,000
TOTAL:	US dollars	970,000

REQUIRED RAW MATERIALS

The following approximate quantities of production materials are needed to produce 4,800 tons of liquid pesticides:

Active substances (concentrates).....	2,600 t
Auxiliaries	650 t
Various solvents	1,400 t

REQUIRED MANPOWER (for two shifts)

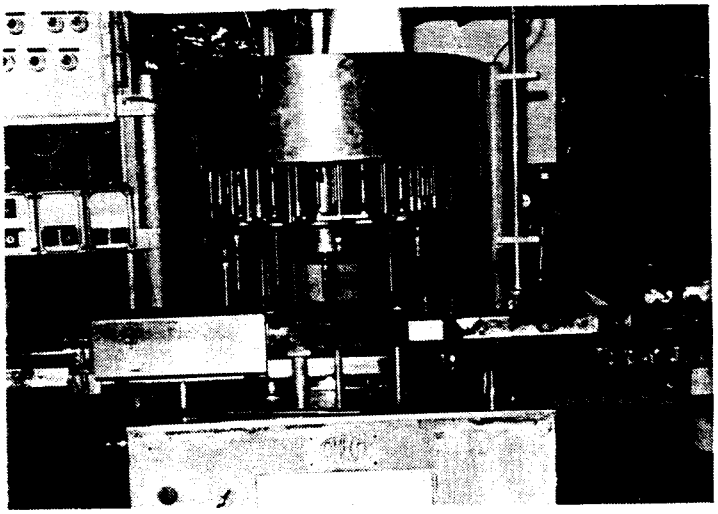
Qualification	No. of employees
Engineers	3
Foreman	1
Technicians	3
Skilled workers	15
Semi-skilled or unskilled workers	10
TOTAL:	33

REQUIRED UTILITIES

Electric power	100 kWh/ton of product
Steam	500 kg/ton of product
Water	10 m^3/ton of product

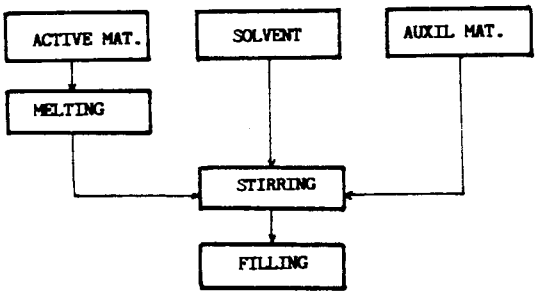
REQUIRED AREA FOR PLANT SITE

The plant occupies a total area of 10,000 m^2 including a building of 3,100 m^2 (production area, warehouses, offices, service facilities).

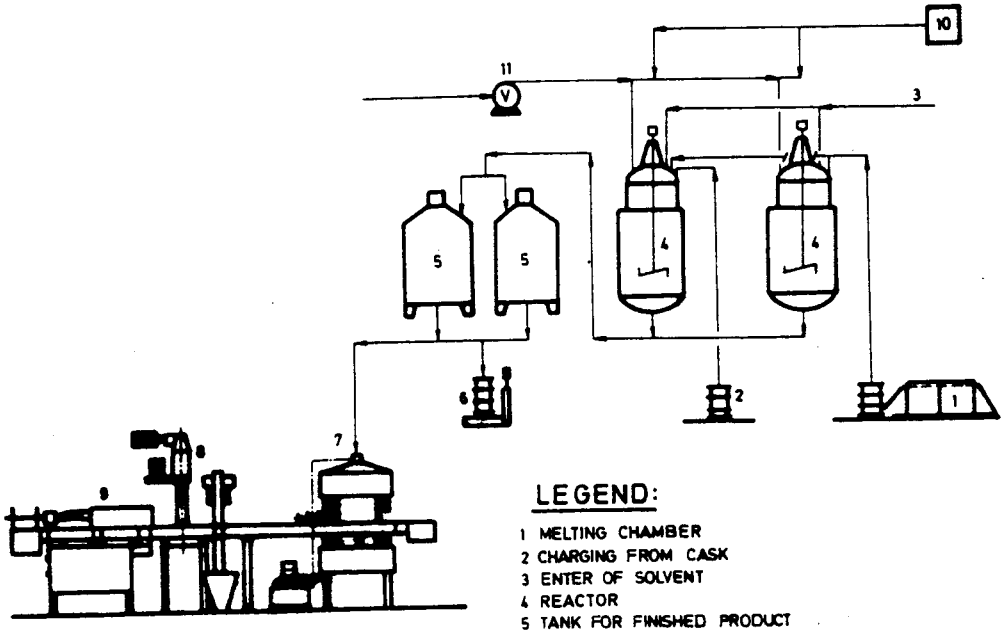


LIQUID PESTICIDES PRODUCTION

BLOCK DIAGRAM



PROCESS FLOW SHEET FOR LIQUID PESTICIDE PRODUCTION



LEGEND:

1 MELTING CHAMBER
2 CHARGING FROM CASK
3 ENTER OF SOLVENT
4 REACTOR
5 TANK FOR FINISHED PRODUCT
6 BIG PACKAGES