How To Start Manufacturing Industries

Aerosol Insecticide Making Plant

The Aerosol type insecticide first made its appearance during World War II when the U.S. Army, fighting in tropical jungles and faced with the need to cope with malaria, developed a pocketable type of pressurized insecticide container.

It was in the latter part of the 1950s that this type of aerosol insecticide came into use in Japan. At first, the aerosol container made in Japan consisted of a can made from a single strip of tin plate, or was seamless. Accordingly, while it displayed great resistance to internal pressure, it naturally involved a high manufacturing cost.

In addition, as the refrigeration system was adopted for filling the can with insecticide, the can making process called for the additional use of facilities such as freezer and was then rather inefficient. Moreover, the valve essentially comprising the spray mechanism had to be imported.

Since then, the side-sealed (crimp-soldered) type can came to be mass-produced, artistically designed for maximum consumer appeal. In parallel, the pressure-filling method, or under-cap method, came to be adopted for insecticide filling, which involved less loss in pressurized gas and allowed for mass-production of aerosol cans by an automatic process. At the same time, the spray mechanism (valve) was improved and became available at a far lower price through mass production.

Today, roughly 25 years after the appearance of the first aerosol type can, a countless number of commercial products has become available in convenient, aerosol type cans – hair sprays, household insecticides, garden insecticides, deodorants (for space and human body), paints, glass cleaners, perfumes, medical products (disinfectants, asthma suppression, etc.), perspiration inhibitors, and the widest scope of foodstuff.

In fact, it is claimed that roughly 6 billion aerosol type products are produced annually throughout the world. In Japan, some 350 million cans of aerosol type products are turned out annually.

A wide variety of aerosol type products can be produced with the same production facility, excepting for special types of products, although it will be necessary to clean the pipeline thoroughly when switching from the production of one product to another.

Where aerosol type insecticides are concerned, petrolizers consisting primarily of pyrethrum essence (extracted from vermifuge chrysanthemum), filled in hand-pressing type of sprayer cans, had been used in Japan from before the outbreak of World War II. Today, aerosol type insecticide cans, worked with finger-tip touch, are naturally in widespread use.

Insecticides being indispensable for securing a sanitary national living environment, a large demand is anticipated for the product, with the result that no difficulty is expected in the management of the plant.

However, where the construction of an aerosol type insecticide making plant is concerned, preliminary survey will have to be conducted on the permits to be obtained from governmental organs. A survey should also be conducted on the existence of competitors, the chemical compositions of competitive insecticides, the kind of pressurized gas used, and on other factors.

Process Description

The process flow sheet of this aerosol type insecticide making plant is shown in the accompanying diagram. Essentially, the following processes are involved:

1) Aerosol can delivered by the can manufacturer are inspected carefully and temporarily stored in the materials warehouse, then conveyed from warehouse to can feeder (unscrambler) to place the cans on the insecticide filling line, where the insides of the cans are cleaned by suction by means of pneumatic can cleaners.
2) The insecticide is prepared by piping the prescribed volumes of insecticide, synergist, perfume and solvents into the mixing tank and mixing these ingredients. The insecticidal solution, after being removed of inclusions or impurities with the filtration system, is temporarily piped to the storage tank from whence it is led to the filling machine and filled in fixed volume into the cans expelled from the pneumatic can cleaners. Filled cans are sampled at random from time to time to check the insecticidal solution filling condition.
3) Valves (spray mechanism), upon their delivery, are sampled at random for inspection. These valves are mounted on the mouths of aerosol cans which have been filled with insecticide.
4) After this, propellant is charged under pressure from gas bomb to propellant filling machine, then filled in fixed volume into the valve-capped cans under high pressure. Here, too, gas filled cans undergo random sampling from time to time for inspection.
5) Cans filled with propellant the next passed through a hot water bath whose water is heated to a temperature of more or less 50°C as a means to check against cans having improper crimp, and cans with pressurized gas leakage (in the form of air bubbles) are removed from the production line.
6) At this stage, the valves of these cans are depressed for an instant to confirm spraying is achieved satisfactorily, and faulty cans are discarded.
7) The cans are next wiped clean to remove residual water, oil and other impurities.
8) The cans are then weighed to confirm they contain the prescribed volume of insecticide.
9) The caps are mounted on the cans.
10) The manufacturing serial numbers are imprinted on the bottom of the cans.
11) The cans are given final inspection to confirm the gas volume, insecticidal solution volume and internal gas pressure.
12) The cans are finally packaged for shipment.

Table 1: Production Scheme

1) Production capacity:	8,000 – 10,000 cans/day
2) Working hours:	8 hours/day 25 days/month 300 days/year

Note: Tables 2 – 6 are based on the above scheme.

Table 2: Required Machinery and Equipment

Item	No.
Automatic aerosol filling line	1 set
Pump unit for gas filling machine	1 set
Vacuum pump unit for gas filling machine	1 set
Compressor unit	1 set
Hot water bath	1 unit
Ventilation fan system	1 or 2 sets
Filtration system	1 set
Insecticide solution mixing tank with agitator	1 set
Insecticidal solution storage tank	1 set
Spray test conveyor	1 set
Packing conveyor	1 set
Ton container (for gas) elevating device	1 set
Control equipment	1 set
Inspection equipment	1 set
FOB price of machinery and equipment	(approx.) $US 167,000

Table 3: Monthly Requirement of Raw Materials

Item	Quantity
Insecticide (Allethrin, Resmethrin, Dichlorvos, Fenitrothion, etc.)	125 kg
Synergist	250 kg
Perfume	125 kg
Refined kerosene	30 k-liters
Propellant (Liquefied gases such as LPG, fron gas, etc.)	45 k-liters
Cans, valves, caps	75,000 pcs. each

Table 4: Required Utilities

Electricity	50 kWh
Water	125 tons/month

Table 5: Required Manpower

Item	No.
Manager and chief engineer	1
Skilled worker	2
Ordinary worker	11
Tester	1
Total	15

Table 6: Required Area for Plant Site

Building	1,250 m^2
Land	3,200 m^2

Note: Should the plant building and warehouse be contained in a single building, it will be necessary to use non-combustible such as concrete for the walls. The ceiling of the building should be slated roofing.

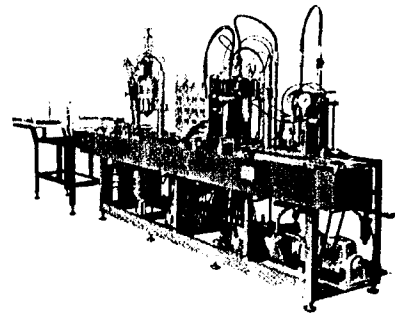
Locational Condition

The aerosol type insecticide making plant should be situated fairly well away from any densely populated region, and no public or private building or housing should be located anywhere within a distance of about 20 m from the plant compounds. No fire should be used in the plant itself, in the plant compounds or in the surrounding areas. In addition, the plant location should lend itself to easy procurement of raw materials.

Others

Where tanks (Insecticide solution mixing tank with agitator and Insecticidal solution storage tank) are concerned, their fabrication at the plant site may prove more economical.

As described earlier, the plant under study is designed with a daily (8 hours of operation) production capacity of 8,000 – 10,000 aerosol cans. With a daily output of about 8,000 cans, a comparatively small capital investment will suffice since a semi-automatic production line will serve the purpose. However, should the output exceed 30,000 cans daily, a large capital investment will become necessary since a propellant storage tank will have so be provided additionally, and since an insecticide filling line of higher performance will become indispensable.



Automatic aerosol filling line