

ISMA* Technical Meetings

Landskrona, Sweden
2-4 September 1947

**In 1982, the name of the International Superphosphate Manufacturers' Associations (ISMA) was changed to International Fertilizer Industry Association (IFA).*

Danish Sulphuric Acid and Superphosphate Works Ltd.,Short Description of the Company's Factory
at Kalundborg.

The principal product of this factory is superphosphate; practically all the sulphuric acid produced is used for the manufacture of superphosphate and only a very small portion is sold as sulphuric acid.

The situation of the plant at the far end of the deep and wide Fjord of Kalundborg ensures connection with the ocean by way of the Cattegat, thus enabling ships of up to 10,000 tons to go to the quay of the factory for unloading their cargoes of raw materials, imported nitrogen and potash fertilisers or other goods. From the factory the superphosphate and the imported fertilisers can be sent by ship, railway or truck to all parts of the country.

The harbour consists of two parts, i.e., firstly, of the quay, mentioned above, with a depth of water of 25 ft., where the raw materials are unloaded and where also pyrites cinders are shipped and, secondly, of a 16 ft., deep basin, protected by a breakwater, mainly used for loading superphosphate into small vessels.

The factory and its harbour are shown on the attached plan which has been worked out for the guidance of the visitors, and below will be found a short survey of the manufacturing process with reference to the items on this plan.

1. Crane.

The crane serves to unload the incoming raw materials, i.e., pyrites and phosphate rock. The crane consists of a stationary framework and a jib with a revolving travelling grab, which dumps the materials into a hopper. The capacity is about 110 - 130 tons per hour according to the material being discharged and the construction of the ship. From the hopper the materials are dropped into one of the bottom-discharge cars of a monorail-system which brings the materials to the storage building for raw materials (2). The track system also leads to the store (12), where preferably imported fertilisers and other goods are stocked, and further to the superphosphate store (11), thus permitting parts of this building to be used also for the stocking of other goods.

Each of the man-operated cars of the monorail takes about 6 tons of phosphate rock or 8 - 10 tons of pyrites.

2. Storage Building for Raw Materials.

This building is divided into 10 separate bins, each containing about 3000 tons of phosphate rock or about 5000 tons of pyrites.

3. Transport of Pyrites to the Burner House.

This transport too is carried out by monorail, by means of cars, filled with an orangepeel grab, particularly suitable for handling heavy and hard materials.

4. Pyrites Burner House.

The burner house comprises four air-cooled furnaces for pyrites.

The furnaces with a diameter of 7 metres have nine hearths plus a drying hearth. In each furnace 25 - 35 tons of pyrites can be burnt daily.

The burner gases are led from the furnaces through horizontal brick-built flues to the Central dust precipitators which completely separate the dust from the gases.

There is one double-filter for every two furnaces.

5. Silos for Cinders.

From the furnaces the cinders go to 5 cylindrical silos, each holding 1000 tons. An elevator enables the pyrites cinders to be tipped direct into the hold of the ship.

6. Pump House.

Salt water is taken in from the fjord and serves as cooling water for the sulphuric acid system, requiring 300 to 400 cubic metres per hour.

7. Sulphuric Acid System.

The gas coming from the electrostatic dust chambers enters the sulphuric acid system which is a tower system, comprising 7 acid-proof masonry towers (with lead sheathing) of which the first two are Glover towers (4 metres in diameter) the third (4.25 metres) and the fourth (9 metres) are production towers, the fifth, sixth and seventh (9 metres) are Gay-Lussacs. The first 3 towers are packed with acid resisting packing units of special form. The other towers are packed with flint. To ensure that the towers can withstand the pressure from the filling material, the lead sheathing is fitted with steel bands.

A series of acid pumps delivers the circulating acid to the towers in different circuits. The acid from the hot towers passes through a large cooling system of cast-iron elements submerged in water.

8. Acid Tanks.

For storage the acid is pumped into two spherical tanks of iron plate holding 1000 tons each.

9. Grinding Plant.

Monorail trucks with grabs bring the raw phosphate from the store to the grinding plant, where the phosphate is dumped into concrete bins, and here the different kinds of phosphate can be measured in the proportions desired before going to the mills.

In the phosphate grinding plant there are 3 ring-roll mills each combined with an air separator, and a bucket elevator to circulate the material. All the mills and transport devices are connected with an automatic dust filter. The "fines" are transported to 5 bins for ground phosphate in the superphosphate plant.

10. Superphosphate Plant.

The mixing of the sulphuric acid - which is prepared beforehand in the proper concentration - and the ground phosphate is carried out on the top floor of this building. The sulphuric acid measured in measuring

tanks and the phosphate, weighed on automatic scales, are filled into the mixers and, after mixing, the mass is dumped into the Beskow den on the floor below. Here the reaction of the sulphuric acid and the phosphate continues and when the contents of the den - amounting to 150 tons - are solidified the den is cradled by a hoist forward the block of superphosphate towards the cutting excavator from which the superphosphate passes through a hopper to a pulverizer, known as the slicer or the "schabe". This "schabe" consists of revolving blades, placed immediately beneath the floor of the Beskow den. Here the superphosphate is pulverized and ejected into a big chamber, the superphosphate silo. Openings in the bottom of this silo permit the discharge of the superphosphate to a conveyor, which brings it up to the superphosphate store.

11. Superphosphate Storage Building.

At the top of this building the conveyor delivers the superphosphate through vibrating screens to hoppers, where monorail cars, taking loads of 7 tons, carry the superphosphate out into the big storage space. The trills, as from the screens are recirculated to the "schabe" to be pulverized once more.

The superphosphate store has a floor area of 11,000 square metres and, since the 3 tracks of the monorail permit storage of the superphosphate in piles 10 metres high, 70,000 tons of superphosphate can be stored here.

After proper curing the superphosphate is bagged with the aid of big, mobile bagging machines. The machines excavate, pulverize, screen and weigh the superphosphate and finally close the bags on the stitcher. The capacity of each machine is about 300 bags of 100 kilos (220 lbs) or 400 bags of 50 kilos (110 lbs) per hour. Then the bags are wheeled to the belt conveyors, which convey them direct to the ship or to the railway wagons. Out of doors the conveyors as well as the latches are tar-painted, thus enabling shipments to be made even in wet weather.

For the dispatch in railway wagons there are 5 rail tracks, i.e., one track along the middle of the storage building and two on each side, the innermost protected by the roof.

12. Warehouses for Imported Fertilisers and other Goods.

Two buildings are provided for the storage of imported fertilisers and other goods, which the factory receives for reselling without special treatment. The building by the quay is particularly suitable for goods in bulk which are bagged as described above and conveyed to railway or ship.

13. Storage Building for Bags.

Here the very large quantities of bags required for the goods and products of the factory are stacked and stacked.

14. Workshop.

This building comprises workshops for machine-fitters, electricians and carpenters as well as lunch rooms, cleaning rooms and sanitary installations.

15. Office Building.

Here are found the works office and offices for the engineers as

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well as a laboratory.

The power supply is electric.

Electricity is provided from the high-tension works of Kalundborg, which are linked up with other high-tension works on Sealand and these, in turn, are linked up with the high-tension system of Sweden. The consumption of the factory amounts to about 4 million kWh yearly.

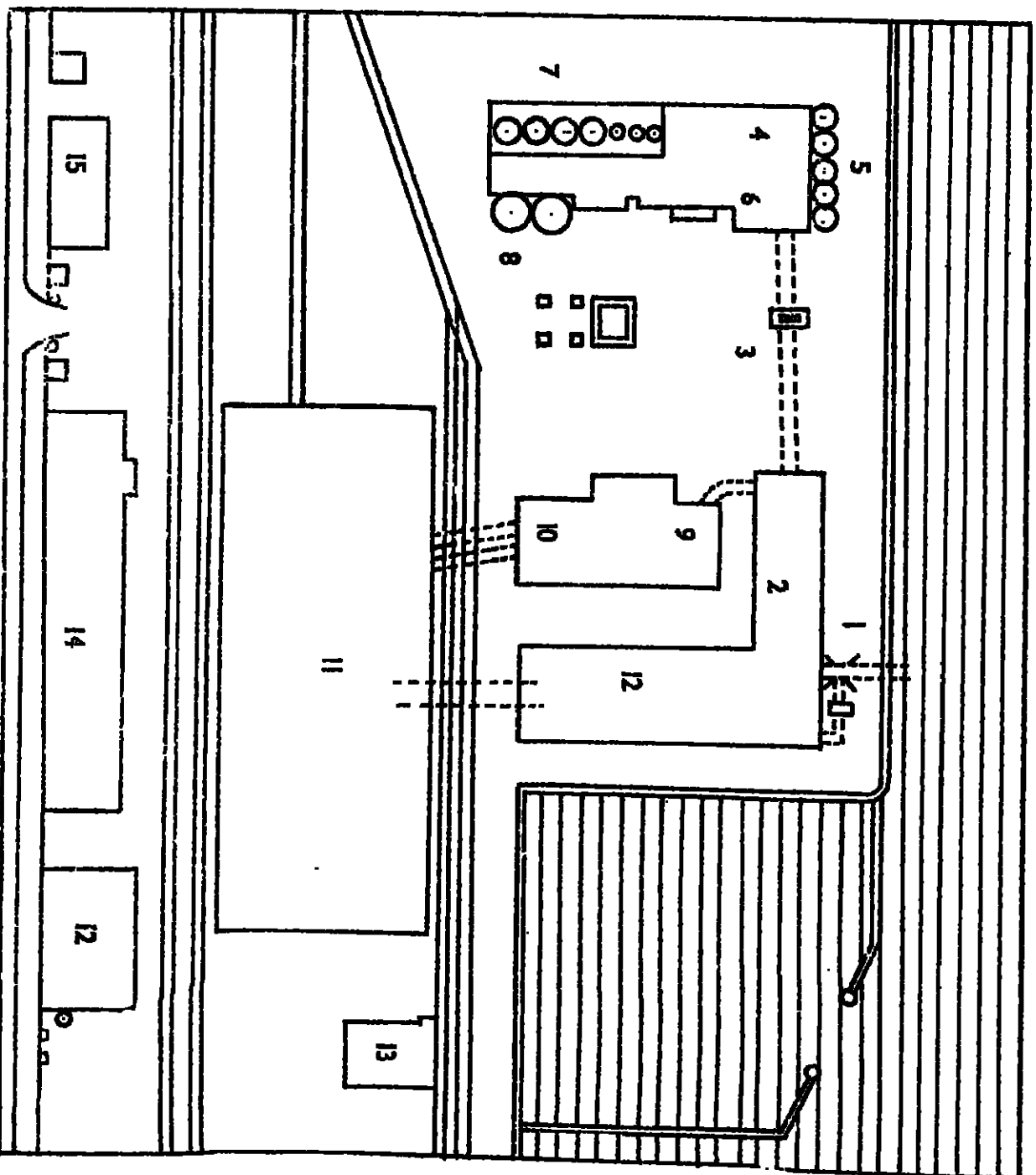
The capacity of the factory is about 140,000 tons of super-phosphate a year.

The area of the factory is about 14 acres.

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August 1947.

A/S DANSK SVOVLSTRE - OG SUPERPHOSPHAT - FABRIK.
KALUNDBORG WORKS - USINE DE KALUNDBORG.



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|----------------------------|---------------------------------|
| 1) Discharge Crane | Grue de décharge. |
| 2) Raw Material Store | Magasin des matières Premières. |
| 3) Monorail | |
| 4) Pyrites Burner House | Bâtiment des fours à Pyrites. |
| 5) Silos for Cinders | Silos à cendres. |
| 6) Pump-house | Bâtiment à pompes. |
| 7) Sulphuric Acid Towers | Tours à acide sulfurique. |
| 8) Acid Tanks | Reservoirs à acide. |
| 9) Grinding Plant | Installations à moulage. |
| 10) Superphosphate Plant | Installation de Superphosphate. |
| 11) Superphosphate Storage | Magasins de Superphosphate. |
| 12) Warehouses | Magasins. |
| 13) Bag Storage | Magasin à sacs. |
| 14) Workshop | Atelier. |
| 15) Office Buildings | Bureaux. |