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STUDY OF THE EVOLUTION OF THE SUPERPHOSPHATE INDUSTRY IN GREECE.

By A. Georgiou.

The destruction caused by incidents during the war as well as the reconstruction encouraged by the Marshall plan have given the Société Anonyme Hellénique de Produits et Engrais Chimiques the opportunity of realising plans for modernisation of superphosphate manufacture on a very large scale.

The whole line of production from the arrival of the raw materials to the loading of the fertilisers has undergone a complete transformation so much so that it is possible to speak of new works. Nevertheless a comparison between the results obtained in the old and new installations, above all in the domain of solubilising phosphates, enable us to draw useful conclusions from the first year of working.

(1) Raw Materials.

The Rock phosphates coming mainly from Gafsa are unloaded by travelling crane and conveyed by cable and bucket railway to a large depot with a capcity of 25,000 tons sufficient for the production of about two months. From this store the phosphate is conveyed by overhead travelling crane to the hoppers and weighers which feed a series of three mills of the Raymond No. 6699 type with a capacity of 10 metric tons per hour each. These mills, well known to the Superphosphate industry, render it possible to grind to an approximate fineness of

5%	on screen No.	80	American	ASTM
11%	"	100	"	"
30%	"	200	"	"

with a power consumption of about 20 kwh per ton of ground phosphate. It is not so much these figures, but especially the continuous and sure running without interruptions of important repairs which is the great advantage of these machines.

The ground phosphate is stored in silos the capacity of which corresponds to a few hours production. From here the Dorr installation for the manufacture of phosphoric acid and concentrated fertilisers is fed, as well as the Broadfield den.

I will confine myself to mention in passing, without going into details, that the sulphuric acid required for the manufacture of these fertilisers is supplied by two installations, one operating according to the Petersen tower system, the other according to the Monsanto contact process.

(2) Continuous Broadfield den.

It is well known that for some time there has been a tendency in the European Superphosphate industry to substitute continuous methods in place of the variety of batch methods still in use. This tendency has been the subject of several discussions for and against these two methods of operation.

The Société Hellénique being convinced that technical progress and rationalisation of work tend towards continuous methods, have installed a den of an hourly capacity of 20 to 30 tons according to the Broadfield process, and at the same time they have stopped two dens with the same capacity but working intermittently, according to the "Milch" process which operated up till then.

Thus the comparison obtained by the two methods one in 1951, the other (Broadfield) in 1952, enables us to draw conclusions which are useful to our industry:

(a) First of all, thanks to the better mixing effected by the mixer it was possible to increase the density of the sulphuric acid from 54.3 to 56.5° Baumé which corresponds to a decrease in the water contained in the acid of 3%. Owing to better aeration we have obtained a superphosphate with a lower moisture content. The change in moisture of the final product, after maturing, during 1952 as compared with 1951 is indicated on diagram No. 1 attached.

It will be seen that the average decrease in moisture of 1.5% has taken place from one year to the other.

(b) The ratio of the water-soluble and citrate-soluble portions in relation to the total phosphoric acid content, i.e., the conversion of P_2O_5 has increased approximately from 90 to 96% (see diagram No. 2 attached). This is due to the better attack of phosphate rock effected by the more intimate mixing of the phosphate with the acid and to the higher reaction temperatures.

(c) The two improvements mentioned have resulted in a higher content of the superphosphate using the same raw materials especially Gafsa phosphate the average content of which was as follows during the two years under review:

	1951	1952
Moisture	3.28%	3.61%
Natural P_2O_5%	27.82	27.77
Ca_2, P_2O_5%	61.65	60.53

(See diagram No. 3 attached)

(d) Owing to the automatic working of the Broadfield den which is the principal characteristic of continuous processes man-power is reduced to a minimum, the work of the men consisting, in the main, of controlling the running of the machines.

(e) The principal advantage is above all uninterrupted production. The stoppages of the mixer, the scraper and conveyor belts are reduced to a minimum. We have succeeded in running our Broadfield den for 21 hours with three shifts or for 14 1/2 hours with two shifts working 8 hours which corresponds to a 90% utilisation of time. A general cleaning lasting 8 hours per week or every six days ensures technical maintenance.

3. Storage.

In the Superphosphate industry the internal transport of materials exercises a necessary influence on the cost price. The qualities of the product and especially moisture, free acid content and the high temperature prevent the application of several methods used in other industries.

After studying various mechanical installations, the Société Hellénique decided to install an automatic cable-railway with buckets suspended from a rail which operates independently of the den and conveys the materials to the farthest silos. The buckets travel above the buildings and are tipped automatically by coming into contact with a tripper which is placed according to the requirements of the dens. The capacity of the bucket is about 1 ton and that of the stores about 40,000 tons. Electricity is controlled by a central control panel which by means of electrical relays ensures perfect safety in such a manner that even with less experienced workmen the running of the installation is assured. After a lapse of several months it is possible to confirm the efficiency of the installation, its simplicity of operation, its assured running and the soundness of this modern transport system.

4. Bagging of Fertilisers.

Appreciable progress has also been made in this field. In view of the fact that the wear and tear of fertiliser bagging machines is mainly due to the influence of dust, it has been our aim to replace mobile bagging machines by stationery ones. As a matter of fact, instead of driving the machine to the pile of Super it is the material which by means of Payloaders is transported to the stationery dispatch posts.

The American Sturtevant machines have shown an outstanding robustness in this respect. At a convenient distance from the pile they ensure a continuous operation and have gradually attained an hourly production commensurate with dispatch. Hence, fertilier storage in bags has been reduced to a minimum.

5. Loading.

A big loading bridge consisting of conveyor belts was put into operation at the beginning of 1952. The fertiliser bags either paper or jute are taken from the bagging machine by an inclined rubber belt conveyor to the level of the transport bridge.

After having been automatically placed lengthways on the principal belt-conveyor, 1 metre in width they travel a distance of 240 metres up to the loading wharf. Here they are lowered by conveyors with lateral supports running at a reduced speed down to the holds of the ships. The speed of transport is geared to the speed of bagging and ensures a loading of 30 to 60 tonns per hour.

SUPERPHOSPHATE SIMPLE OBTENU PAR DEUX PROCEDES

1951. PROCEDE MILCH
1952. PROCEDE BROADFIELD