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THE USE OF A SULPHURIC ACID SPRAY IN THE NITROGEN OXIDES PROCESS.

By F. Salsas Serra .

The process for producing sulphuric acid with the aid of oxides of nitrogen, originally called the lead chamber process, has since the beginning of the century undergone important improvements, aiming at an increase in production per unit of volume of reaction chambers (chambers, towers, etc.)

One of the technical developments which has resulted in the most important improvement has been the use of a sulphuric acid spray in the lead chamber in place of the water spray. The spraying of sulphuric acid was suggested earlier by experts, particularly by Raschig, who saw in this method a means of avoiding the reversion of nitric oxides to an unoxidisable state. Especially in Spain, it has been developed on an industrial scale since 1920, according to two methods with widely different characteristics.

(A) The Gaillard process. This, after having been established in Spain, found application in many other countries. It is characterised by the use of turbo-dispersers, in cylindrical lead reaction chambers, which project on to the walls sulphuric acid of a practically constant composition and of which a small quantity is dispersed by the sudden impact on the wall.

(B) The process of S.A. CROS which, under the direction of Ferdinand MARTIN, was adopted in 1922 by this Company, where it has been progressively applied in about 30 lead chamber systems. This process is characterised by the use of centrifugal dispersion apparatus in the chambers in the form of cylinders or parallelepipeds, which produce directly a sulphuric acid mist of sufficient fineness, the composition of which is different in each chamber.

In Spain the number of installations functioning according to the Gaillard process is very limited, most of the installations which belong nowadays to S.A. CROS and its affiliated Company, Productos Quimicos Ibericos, having been altered by adopting the technique of our process.

Outside Spain this process has been very little developed until four years ago, when it was adopted in Italy for four lead chamber installations and for two Mills-Packard installations.

An unusual case of application of the sulphuric acid spray occurred in the works at Lérida of S.A. Cros, which we managed

from 1927 to 1936.

In this works there were used, as reaction chambers, granite towers originally intended for the manufacture of nitric acid by the arc process. These towers, of decagonal section have been fitted with lead tops and half emptied of their silex fillings, the acid being distributed partly by centrifugal sprays, and partly by stationery dispersers directly above the filling.

When applying the Kachkaroff process in France for the intensive manufacture of sulphuric acid, we have so utilised and improved the acid sprays in the steel reaction chambers as to permit a great reduction in the volume of the circulation acid, to simplify installations and to diminish initial costs of construction. Of the four installations functioning in France, two employ acid sprays in the reaction chambers, most of which are empty or only partly filled. The same thing applies to the new installations either functioning or in course of erection (seven in Spain and two in Italy).

Finally, in CEREA (Italy) we have applied, for the first time, a combination of the lead chambers and the steel reaction chamber with acid sprays, thereby augmenting the production capacity three times, with very low installation costs and very interesting results from the point of view of production, cost of manufacture and stability.

The conception and the improvement of this technique are based on two factors:

(1) Progressive improvement of acid sprays.

(2) Increased knowledge of optimum conditions of the chemical process.

CENTRIFUGAL ATOMISERS. The first experiments with acid sprays in lead chambers were conducted with the Kestner atomiser used in washing Superphosphate gases. We became aware immediately of the necessity to increase the fineness of the droplets, and to avoid a large proportion of the acid being projected on to the walls of the chambers. As SO_2 is oxidised principally in the liquid phase, every increase in surface should be favourable.

The first apparatus for centrifugal atomisation which we installed, and which is still employed in the Spanish installations, is shown in the form of a diagram, fig. 1 (See appendix). The acid enters through the cone-shaped hopper a, impinges on the disc b, and is successively propelled on to the surfaces c, d, e forming the bell, which is joined to the axis of rotation by the wheel f. The maximum volume which can be conveniently atomised by means of this apparatus is 500 litres per hour.

Later, in order to obtain an additional atomising of the acid projected by the last bell, we have added a stationery circular sprocket wheel with teeth, arranged in such a fashion as to produce, by an orthogonal incidence of the acid, the annulation of its driving force, and a more pronounced atomisation of one portion of the acid (See figure 2, appendix). This device was employed as from 1927 in the installation of Lerida, where the partial filling of the towers was able to receive without difficulty the acid which had not been atomised by the last impact.