CONTINUOUS DISTILLATION
OF FATTY ACIDS*

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There has been up to the last ten years very little development or change in the method of distilling fatty acids, over that which has been employed for the last hundred years. The method employed, as you all doubtless know, has been the use of the large pot still heated by direct fire, and distilling under a vacuum, with live steam being used to agitate fatty acids during the process. In recent years considerable study has been given to the improvement of these methods, these attempts being directed towards refining and improving the batch method of operation as is illustrated by the new Lurigi Still, to which have been adapted high modern vacuum equipment as well as improved methods of heating. This, however, is still a batch type of operation and inherently has certain definite objections.

The Wecker process type of still which was described to you by Mr. R. W. Perry, and published in Oil and Soap, January, 1933, was an attempt to get away from the batch type into the continuous type of operation, and a number of units of this kind have been erected for the practical operation of this method. This paper will describe the development of a new type of continuous apparatus for distillation of fatty acids developed in the Wilson-Martin Company at Philadelphia, the patents and rights being controlled by the New Process Fat Refining Corporation, and covered by American Patent No. 1,551,241, pending patent applications, English Patents Nos. 498,117 and 408,184, Belgian Patent No. 397,715, Canadian Patents Nos. 340,785 and 344,747, and French Patent No. 773,635.

History of This Development

Several years ago the authors of this paper in considering the distillation of fatty acids and possible improvements, decided to develop a continuous system, if possible. The development of this was carried through in a regular development method. First, a number of small laboratory units were built to determine the difficulties as regards temperature, times, metals and other factors, which could be determined on a small scale. After several years of experimentation on this basis where many difficulties as regards distilling valves, piping and heating were encountered and overcome, a small semi-manufacturing unit was designed capable of distilling from one to two barrels of fatty acids per day, and from the figures obtained upon this semi-manufacturing unit as to the temperature, vapor velocities, and capacity, the first plant scale unit was designed with a capacity of thirty-five to forty thousand pounds per day finished distillate. This first commercial unit was built and put into operation a little over two years ago and was so successful in increasing the yields and quality of product, that a second unit has been built by the Wilson-Martin Company and is now in operation with equal success to the first unit. As a matter of fact, in some ways the results as to quality and yields have been improved in the new unit so that the descriptions of this still are based upon a finished commercial unit successfully operated.

The results obtained in the first plant unit were considerably better than any of the results which have been obtained in the semi plant scale equipment both as to quality of product and yields, and the general results indicate that a flash heating of the fatty acids as they are accom-
Illustration No. 1 shows the original installation which has now been in successful operation for over two years, with very satisfactory results, and also shows the operating board for No. 2 unit.

Illustration No. 2 shows the receiving end of No. 2 unit showing the heat exchangers, the receivers, and final condensers. From these two illustrations, a very good idea can be gotten as to the general appearance and arrangement of the plant.

Illustration No. 3 is the flow sheet of the operation (see page 28).

From this flow sheet it would be seen that the fatty acids are pumped into the partial condenser which is practically a heat exchanger and go out of them at about 350° F. From there they go into the heat exchanger supplied with high temperature superheated steam and enter the tower at the second plate at a temperature of 475° F., and from that point work their way down through the bubble plates to the bottom counter current with superheated steam entering at the bottom at 750° F. At the bottom of the tower there is approximately 24” of vacuum, at the top of the tower 26”, on the separator 28”, and the final receiver 30”. The temperature of the fatty acids as they go over the top of the still is about 435° F. and then pass through the partial condenser.

The general system has been so laid out that 90 per cent of the distilled fatty acids are obtained in an absolutely dry finished condition and are cooled down under a vacuum so that the high quality of the distillate is not affected as it is now in the separation of the condensed water from the fatty acids. One important development which has been brought out in the operation of this still is that it is possible to switch from one raw material to another with very little mixing of the two raw materials in the finished distillate, there being at any time less than 1,500 lbs. of material in the system. Our general results can be summarized in this way, that in a single distillation in this equipment, we have produced fatty acids of a color equal to double distillation previously, and further, the fatty acids are deodorized almost completely in the operation so that fatty acids produced in this still have been used successfully in the manufacture of light colored, delicately perfumed toilet soaps. Another important development which was not foreseen, and which has been of very great advantage is the fact that the fatty acids in the press room are very much easier to handle, a much improved yield of stearic acid has been obtained, both as to color and quality.