
EFFICIENCY OF STAINLESS-STEEL SATURATOR

© **S.A. Kravchenko**, Ph.D. in technical sciences, **S.V. Chaplianko**, Ph.D. in technical sciences, **S.V. Sukhorukova**, **A.V. Rogozhyn**, **A.A. Kogtin** (STATE ENTERPRISE "STATE INSTITUTE FOR DESIGNING ENTERPRISES OF COKE OVEN AND BY-PRODUCT PLANTS" (SE "GIPROKOKS"), 61002, 60 Sumska str., Kharkiv, Ukraine)

When developing the scientific and technical documentation for the reconstruction of coke production at one of the domestic metallurgical plants, the economic efficiency of implementing an improved technical solution of SE "GIPROKOKS" – a stainless steel saturator – was calculated. In a stainless-steel saturator, all parts are made of stainless-steel, except for the saturator cap, gas inlet fitting, support ring and stiffeners of the support part and roof, which are made of carbon steel. The body and bottom are protected by an internal lightweight lining. The efficiency was assessed by calculating aggregated costs over a certain period when comparing performance of saturators made of carbon steel and stainless one.

Making a saturator of stainless-steel has the following advantages: the productivity of the coke oven gas purification process increases (due to increase in the working volume by means of decrease in the lining thickness) by 5 thousand m³/h, and the production volume of commercial products (ammonium sulfate) by 0,23 t/h; the standard service life is increased by 5 years (due to greater stability of steel); the duration of construction and assembly works is reduced.

It is shown, that the estimated cost of purchasing equipment and performing construction and installation work for a stainless-steel saturator is 30,7 % higher than the similar costs for a carbon steel saturator. However, the estimated construction cost of a stainless-steel saturator over 15 years of equipment operation is 12,9 % less than a carbon steel saturator. Over 15 years of operation of the stainless-steel saturator, the cost of capital repairs will be 9,7 %, and the current repair and maintenance of equipment will be 40,1 % of the construction cost. For a carbon steel saturator, these indicators are 6,9 and 38,2 %, respectively. In general, the total costs of construction and capital and current repairs of stainless-steel saturator over the estimated period of equipment operation are 10 % lower than those of a carbon steel saturator.

Due to the increase in production of ammonium sulfate when the saturator is made of stainless steel, the annual profit (revenue) from the sale of commercial products increases by 6,7 %, and the additional profit for the entire regulatory life of the equipment – by 1,07 times.

The design of the saturator made of stainless steel with an internal lightweight lining could not be implemented in the customer's conditions. However, thanks to successful scientific and technical concepts, this project was successfully implemented in the sulfate department of one of the foreign enterprises during the development of scientific and technical documentation for the reconstruction of by-product recovery plant with the combination of coke oven gas flows of four coke batteries.

Keywords: coke oven and by-product production, economic efficiency, saturator, stainless-steel, carbon steel, estimated construction cost, profit.

Corresponding author: S.V. Chaplianko, e-mail: chaplianko_sv@ukr.net
