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Examination of the Reasons for the Formation of Red Oil in Spent Caustic from Olefin Plant

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Abstract : Due to the complexity of olefinic plants, various environmental pollutants exist such as NO_x, CO₂, Tar Water, and most importantly Spent Caustic. In this paper, instead of investigating ways of treating this pollutant, we evaluated the production in relation to plant’s variable items. We primarily discussed the factors affecting the quality of the output spent caustic such as impurities in the feed of olefin plant, the amount of injected dimethyl disulfide (DMDS) in furnaces, variation in feed composition, differences among gas temperatures and the concentration of caustic solution at the bottom of the tower. The results of the laboratory proved that in the formation of Red Oil, 1,3butadiene and acetaldehyde followed free radical and aldol condensation mechanism respectively. By increasing the injection rate of DMDS, Mercaptide amount increases in the effluent. In addition, pyrolysis gasoline accumulation is directly related to caustic concentration in the tower. Increasing naphtenes in the liquid feed augments the amount of 1,3butadiene, as one of the sources of Red Oil formation. By increasing the oxygenated compound in the feed, the rate of acetaldehyde formation, as the main source of Red Oil formation, increases.

Keywords : olefin, spent caustic, red oil, caustic wash tower
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