

The role of chemical loop in removal of hazardous contaminants from coke oven wastewater during its treatment

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1. Introduction

Coke oven liquor is one of the most toxic and contaminated liquid stream generated by the coal processing industry. It is a mixture of refractory, toxic and eutrophication leading compounds, thus its proper treatment and utilization is crucial for sustainable and environmentally neutral plant operation. After preliminary processing, coke oven liquor becomes a coke oven wastewater, also called phenolic wastewater. The plant is operated using technological arrangement usually comprised of chemical and biological loops. The effluent from the plant is either utilize to coke quenching purposes or deposited to municipal sewage system or discharged directly to the environment.

2. Experimental

Within the research a detail role of chemical department operated within coke oven wastewater treatment plant has been recognized and described. It has been found that the chemical treatment is usually made using iron based coagulants (either ferric or ferrous ones), the main role of which is to chemically bind cyanides and sulphides. The proper operation of the chemical loop is crucial, as both compounds are well recognized toxicants and inhibitors of activated sludge processes, especially its part dedicated to ammonia nitrification.

3. Results and Discussion

It has been recognized that the removal of cyanides is a two-step process, comprising firstly of contaminant complexation followed by its precipitation or chemisorption by coagulant flocks, while the elimination of sulphides is a single stage precipitation. Among available iron based coagulants both, ferric and ferrous salts can be used, however the authors research indicate, that ferrous coagulants are more suitable for cyanides complexation, whereas ferric coagulants are suitable for complexation and precipitation, but need to be dosed very carefully due to significant pH affection. The department should be equipped with settling tank or flotation unit in order to eliminate formed solids/flocks, as they cumulate within activated sludge structure, what may cause poisoning of microorganisms and inhibition of biological processes.

4. Conclusions

The main goal of the current research was to demonstrate the crucial role of chemical department in proper treatment and management of coke oven wastewater. It was found, that regardless of a coagulation applied in the process, its main role was to chemically bind toxicants harmful to activated sludge microorganisms, i.e. cyanides and sulphides. Iron based coagulants should be used, and both, ferric and ferrous based salts can be involved. The process should be followed either by settling or flotation in order to separate solids and flocks containing toxicants.

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