



REDUCTION OF CHLORATE IN DIAPHRAGM CELLS
USED FOR THE
MANUFACTURE OF CAUSTIC SODA

A T H E S I S

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by

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ABSTRACT

The sodium hydroxide produced in the De-Nora type diaphragm cell at the Paranthan Chemicals Corporation, Sri Lanka, has 1.30-1.50g sodium chlorate per 100g of sodium hydroxide.

A pilot cell was constructed in the laboratory with a single carbon anode and a double steel cathode, in order to investigate the optimum conditions under which the electrolysis of brine would lead to the production of sodium hydroxide with a minimum proportion of chlorate.

Experiments were performed under four categories, (a) Normal electrolysis (b) Electrolysis with preheated brine (c) Electrolysis with replenishing of anolyte liquor (d) Electrolysis with preheated brine and replenishing of anolyte liquor.

Reduction of chlorate contaminant was achieved by using a lowered catholyte level and a consequential increased flow rate. This led to a decrease in the back diffusion of hydroxide ions and decreased subsequent formation of chlorate in the anolyte. This however, also led to a decrease in the hydroxide concentration. Experiments done with simultaneous replenishment of anolyte liquor and preheating of feed brine have yielded a reduction in anolyte chlorate and hence to a reduction in catholyte chlorate.

However, the pilot cell had not reached equilibrium conditions prior to experimentation.

These experiments were therefore repeated in the industrial cells at Paranthan Chemicals Corporation, in situ, at current loads of 3000A

under well defined equilibrium conditions. Significant chlorate reduction was once again observed in those experiments where simultaneous replenishment of anolyte liquor and preheating of feed brine was carried out.

Experiments were also carried out with increasing replenishing rates at a constant feed brine temperature of 55°C (328K) until there was no observable drop in anolyte temperature. Anolyte chlorate concentration was thereby reduced to 0.1-0.08g per 100g of sodium hydroxide. Finally, it is shown that replenished anolyte liquor could be recirculated to the cells via the saturators, thus eliminating the wastage of brine.