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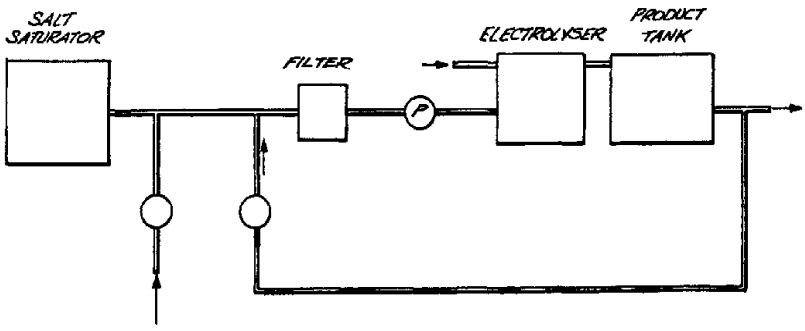

(57) Abstract

A chlorination system in which brine is converted to sodium hypochlorite by an electrolyser. Brine (1) fed to the electrolyser (3) is passed through a filter (2) which is capable of adsorbing bromine or hypobromous acid. Some of the sodium hypochlorite produced in an electrolyser (3) is fed back to a point in the brine feed upstream of the filter (2) such that any bromide in the brine is oxidized to bromine or hypobromous acid and therefore adsorbed by the filter (2).

BROMIDE REMOVAL

The present invention relates to a method and apparatus for removing bromide from an electrolytic chlorination system.

It is well known to produce sodium hypochlorite from sodium chloride brine by converting the brine to sodium hypochlorite in an electrolyser. Sodium hypochlorite is used to treat potable water. Unfortunately, if the brine includes traces of bromide, the electrolyser causes the conversion of the bromide by oxidation to bromate. It is desirable to produce bromate-free sodium hypochlorite for the treatment of potable water as experiments have indicated that bromate may be carcinogenic.

It is an object of the present invention to provide a method and apparatus for removing bromide from an electrolytic chlorination system so as to obviate or mitigate the problem outlined above.

According to the present invention, there is provided a method for removing bromide from an electrolytic chlorination system in which brine is converted to sodium hypochlorite in an electrolyser, wherein the brine is fed to the electrolyser through a filter containing a medium capable of adsorbing bromine or hypobromous acid, and sodium hypochlorite is fed back from the electrolyser and mixed with the brine feed upstream of the filter to oxidize any bromide in the brine to bromine or hypobromous acid.

The present invention also provides an electrolyser for converting brine to sodium hypochlorite, means for feeding brine to the electrolyser, a filter through which the brine is fed to the electrolyser, the filter being capable of adsorbing bromine or hypobromous acid, and means for mixing sodium hypochlorite from the electrolyser with the brine upstream of the filter such that bromide in the brine is oxidized to bromine or hypobromous acid.

Preferably hydrochloric acid is mixed with the brine upstream of the filter to maintain a low pH and thereby ensure effective oxidation of the bromide.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawing which illustrates a bromide removal system incorporated into a conventional on-site electrolytic chlorination system.

The illustrated electrolytic chlorination system comprises a salt saturator 1 in which brine is prepared. The saturator 1 may have a capacity of, for example, 15 cubic meters. Brine flows from the saturator 1 through a filter 2 to an electrolyser 3, the brine flow being maintained by a brine transfer pump 4. A flow rate through the pump 4 of 51.5 liters per hour may be established. The electrolyser 3 is of conventional form and is effective to oxidize the brine to sodium hypochlorite. The contents of the electrolyser are mixed with dilution water supplied through line 5 at a rate of 540 liters per hour, the resultant sodium hypochlorite being transferred to a product tank 6 with a capacity of 13 cubic meters.

With the exception of the filter 2, the components shown in the drawing and described above are entirely conventional. With the operation of such a conventional system, however, traces of bromide in the brine flow are converted to bromate and reach the product tank 6. This is undesirable as the content of the product tank 6 is delivered via line 7 to a treatment plant (not shown) in which the contents of the product's tank is mixed with a supply of potable water.

In accordance with the present invention, sodium hypochlorite from the product tank 6 is fed back through line 8 to a point upstream of the filter 2. The flow of hypochlorite is maintained by a hypochlorite transfer pump 9. Hydrochloric acid is also delivered to the brine flow upstream of the

filter 2 via line 10, the flow of hydrochloric acid being maintained by a pump 11. In the illustrated system the flow of sodium hypochlorite was 1 liter per hour and the flow of hydrochloric acid was 1 liter per hour. The supply of hydrochloric acid is controlled to maintain a low pH in the brine flow upstream of the filter 2. Typically the acidity will be controlled to approximately 4 pH. At such a low pH, bromide in the brine flow is rapidly converted into bromine and hypobromous acid which is adsorbed by the filter 2. By appropriate selection of the stoichiometry and reaction time the further oxidization of the hypobromous acid to bromate can be minimized or substantially eliminated. Accordingly, providing the filter is capable of adsorbing bromine or bromine released by the reduction of hypobromous acid, substantially no bromine compounds reach the electrolyser and accordingly substantially no bromate reaches the product tank 8.

Appropriate materials for the filter 2 are activated carbon zeolites and insoluble reducing agents, for example calcium sulphite.

Throughout this specification and the claims, the words "comprise", "comprises" and "comprising" are used in a non-exclusive sense.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An electrolytic method of obtaining hypochlorite from a brine solution containing bromide, comprising the steps of:

oxidizing bromide in the brine solution to produce bromine-containing species;

removing the bromine-containing species by filtering the brine solution through a medium capable of sorbing the bromine-containing species; and

reacting the brine solution in the electrolyzer to produce hypochlorite.

2. The method of claim 1, wherein the bromine-containing species is selected from the group consisting of bromine and hypobromous acid.

3. The method of claim 1, wherein said oxidizing step includes adding hypochlorite to the brine solution.

4. The method of claim 3, wherein said adding step uses hypochlorite that is produced in said reacting step.

5. The method of claim 1, wherein said oxidizing step includes the step of lowering the pH of the brine solution.

6. The method of claim 5, wherein said step of lowering the pH includes the step of adding hydrochloric acid to the brine solution.

7. The method of claim 1, wherein the medium capable of sorbing the bromine-containing species comprises a substance selected from the group

consisting of activated carbon, zeolites and insoluble reducing agents.

8. An electrolytic system for producing hypochlorite from a brine solution containing bromide, comprising:

a brine solution;

an electrolyzer capable of converting said brine solution to a solution containing hypochlorite;

a means for feeding said brine solution to said electrolyzer;

an oxidizing agent for oxidizing bromide to other bromine-containing species; and

a filter capable of sorbing said other bromine-containing species.

9. The system of claim 8, wherein said other bromine-containing species are selected from the group consisting of bromine and hypobromous acid.

10. The system of claim 8, wherein said oxidizing agent comprises hypochlorite.

11. The system of claim 8, wherein said oxidizing agent comprises the solution containing hypochlorite produced in said electrolyzer.

12. The system of claim 8, further comprising a means for diverting some of said solution containing hypochlorite from said electrolyzer to said brine solution.

13. The system of claim 8, further comprising a means for lowering the pH of said brine solution.

14. The system of claim 13, wherein said means for lowering the pH comprises hydrochloric acid and a means for adding said hydrochloric acid to said brine solution.

15. The system of claim 8, wherein said filter comprises a sorbing media selected from the group consisting of activated carbon, zeolites, and insoluble reducing agents.

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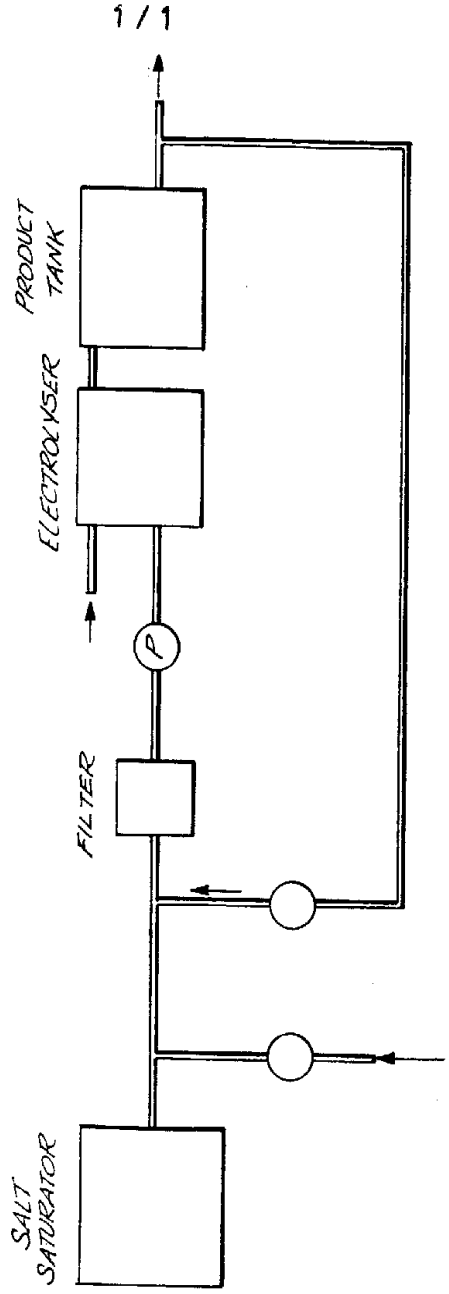
PRODUCT TANK
ELECTROLYSER
P
FILTER
SALT SATURATOR