

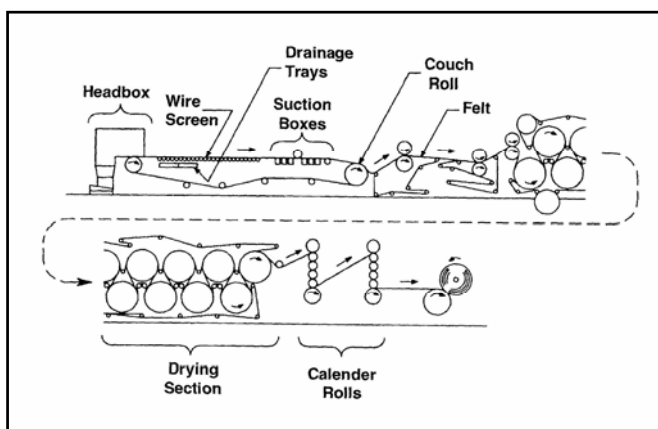
Chlorine Dioxide - within the Pulp & Paper Industry

Meeting requirements ecologically and economically.

The key to running a successful pulp and paper plant is to minimise costs without compromising production quality or quantity. Reclaiming "whitewater" is one of the best ways to do this. Roughly 30% of pulp stock ends up as whitewater.

A modern pulp and paper plant can use vast amounts of fresh water to produce one tonne of paper. It is imperative that plants recycle as much whitewater as possible. Many paper plants are forced to find water from a variety of sources—reclamation, rivers, streams...etc. This creates a high demand for microbiological control and sanitation. Chlorine dioxide provides a fast and effective solution.

Implementation of cleaner production processes and pollution prevention measures will yield both economic and environmental benefits.



Chlorine dioxide has been used in the pulp and paper industry since the mid 1940's.

Chlorine dioxide has been called the "ideal biocide". It has a far greater efficacy than traditional products such as chlorine.

The latest catalytic technology offers continuous, effective and straightforward production of chlorine dioxide, which can be delivered to a multitude of locations within the pulp and paper production process. This is the most efficient and cost effective treatment available.

Benefits of Chlorine dioxide within the pulp and paper industry include:

- ◆ Chlorine dioxide does not react with cellulose.
- ◆ It will retain an effective residual concentration under operating conditions.
- ◆ It is not pH sensitive.
- ◆ It is effective against aerobic and anaerobic residual bacteria with no potential immunity development via mutation.
- ◆ Chlorine dioxide offers a cost effective, safe generation technology.

Sulphite Reducing Bacteria (SRB's)

SRB's in process pulp lead to increased levels of Hydrogen Sulphide.

Many treatments have failed to control SRB proliferation. Hydrogen Sulphide levels can increase to >15 ppm as Sulphide.

These levels are both highly toxic and obnoxious. The Hydrogen Sulphide lowers the pH within stock solutions necessitating pH correction.

The reduction in pH leads to a stock that will be aggressive to steel work and subsequently dramatically increase the corrosion potential to the stock preparation system and the paper making machine.

The continuous dosing of Chlorine Dioxide will lead to a significant reduction in Hydrogen Sulphide levels. (< 1 ppm)

Chlorine dioxide has a great affinity to all Sulphide materials. Between pH 5 to 9, an average of 5.2 parts by weight of chlorine dioxide will instantaneously oxidise 1 part by weight of Hydrogen Sulphide.

Effective control of SRB's, and Hydrogen Sulphide levels, will significantly reduce the risk of microbiologically induced corrosion, thereby reducing maintenance costs for the Paper Mill and minimising loss of production and paper machine downtime.

Effective microbial control of pulp is maintained with no adverse impact on the product or the environment.

Water . Air - Water . Air - Water . Air - Water . Air

Chlorine Dioxide - within the Pulp & Paper Industry

Organic Pollution, Suspended Solids and Effluent

The most common organic pollutants in effluents are lost cellulose fibre, carbohydrate, starch and hemi-cellulose (or the organic acids resulting from their breakdown).

The levels of these pollutants are measured by the B.O.D. (Biological Oxygen Demand) or C.O.D. (Chemical Oxygen Demand). C.O.D. discharges can typically range from 25 to 125 kilos per tonne of pulp.

This oxygen demand of effluent pollutants depletes the amount of oxygen that is available to fauna and flora, thus damaging wildlife near to, and downstream from effluent discharges.

Pulp and Paper companies, together with chemical suppliers in North America have worked together to overhaul production practices and prevent further emissions of unwanted by-products. Innovation has provided solutions to many of these issues, especially a solution to eliminating dioxins.

The key to this success has been the increased use of Chlorine Dioxide.

Chlorine dioxide bleaching has been so successful that the US Environmental Protection Agency (EPA) has proposed rules designating Chlorine Dioxide as *"Best Available Technology"*.

In fact, according to the EPA, Chlorine Dioxide can *"virtually eliminate all dioxin discharges to rivers and other surface waters"*.

In over 90% of US mills, dioxins cannot be detected in mill effluent. In addition, dioxin levels in fish have declined so rapidly that 13 states have lifted 17 fish advisories downstream from pulp and paper mills and the EPA predicts the remaining few will be lifted when mills complete the process of change adopting Chlorine dioxide.

In reviewing the studies on Chlorine dioxide use in the pulp and paper industry, Professor Don Mackay, Institute for Environmental Studies, University of Toronto and former Advisory Board Member, has said it's *"an excellent example of enlightening industrial response to an environmental concern and should be embraced by the environmental community"*.

The latest technology for Chlorine dioxide generation, "Catalytic", takes an even greater step towards eco-friendly generation, with an "ultra-pure" chlorine dioxide offering greater performance, improved biocidal efficiency, reduced by-products (chlorite and chlorate), improved health and safety, combined with cost effective generation costs.

Benefits of Chlorine Dioxide within the Pulp and Paper Process

Chlorine dioxide does not react with cellulose

It will retain an effective residual concentration under operating conditions

It is not pH sensitive

It is effective against aerobic and anaerobic residual bacteria with no potential for immunity development via mutation

It will disinfect gas spaces

Chlorine dioxide will penetrate the slime and biofilm layers eliminating the nutrient source for pathogens to colonise.

Offers a highly effective treatment for handling Sulphite Reducing Bacteria (S.R.B's), including odour destruction

Chlorine dioxide will not survive the drying section of the machine, so that no odour or taste is imparted to the final paper product

It will not accumulate

Catalytic Chlorine dioxide production offers a cost effective, safe generation technology

The simplicity of Catalytic Generation allows Chlorine dioxide delivery to be sited at various locations providing optimum dosing levels to meet the specific demands of the paper machine production processes



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