

## Integrated chlorine dioxide technology

### Low cost production of $\text{ClO}_2$ without importing sodium chlorate

The Chemetics integrated chlorine dioxide process offers a low cost method of producing chlorine dioxide without the requirement to import feedstock chemicals.

By making chemicals in-situ, our process offers a reliable supply and avoids a dependence on the market, while eliminating the costs, uncertainty, safety issues and administration in importing and storing large quantities of sodium chlorate, sulphuric acid, methanol, and ion peroxide.

Since the only inputs are chlorine (typically from an on-site chlor-alkali plant), power, and water – our proven process offers the lowest cost method to produce chlorine dioxide, with no salt cake for disposal.

Chlorine dioxide solution with a low chlorine content is produced by our modern  $\text{ClO}_2$  generation process, for use in producing ECF-grade bleached pulp.

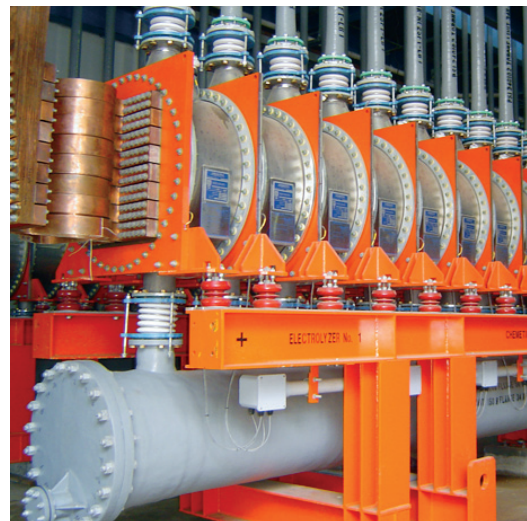
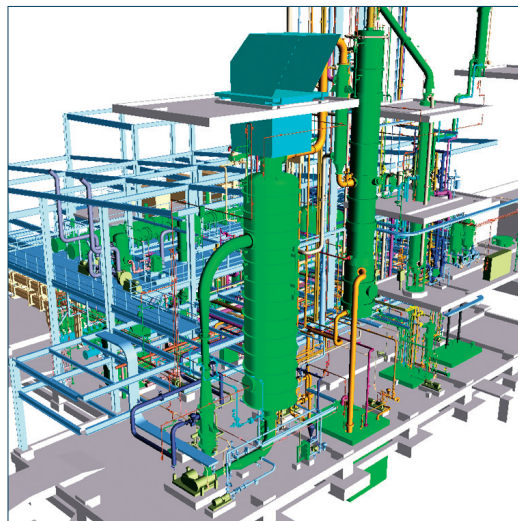
With over 30 references, our integrated chlorine dioxide technology has been adopted by world class pulp mills as a means to gain a production cost advantage to balance chlorine/caustic consumption, and/or to avoid the dependence on external chemical suppliers.

Our well-established and efficient process consists of three plant areas to produce sodium chlorate, hydrochloric acid, and chlorine dioxide, which are integrated into a single, efficient plant design with low maintenance requirements.

The Chemetics Integrated Chlorine Dioxide System has been continuously improved since the first installation in 1978, resulting in a design that is safe, reliable, efficient, and easy to operate.

Chlorine dioxide generator  
▶

Electrolyzer  
▶ ▶



### Overall process integration

As illustrated, the Chemetics Integrated Chlorine Dioxide System consists of three plant areas to produce the two intermediate products, sodium chlorate ( $\text{NaClO}_3$ ) and hydrochloric acid (HCl), and the final product, chlorine dioxide ( $\text{ClO}_2$ ).

Sodium chlorate is produced by passing an electric current through a solution that contains sodium chloride (salt) to make strong sodium chlorate liquor. The salt for this reaction is a recycled by-product from the chlorine dioxide production area. Hydrogen gas is co-produced with the sodium chlorate, and is used as a feedstock for hydrochloric acid production.

Hydrochloric acid is produced by burning chlorine gas and hydrogen gas. The hydrogen gas comes from the sodium chlorate electrolysis

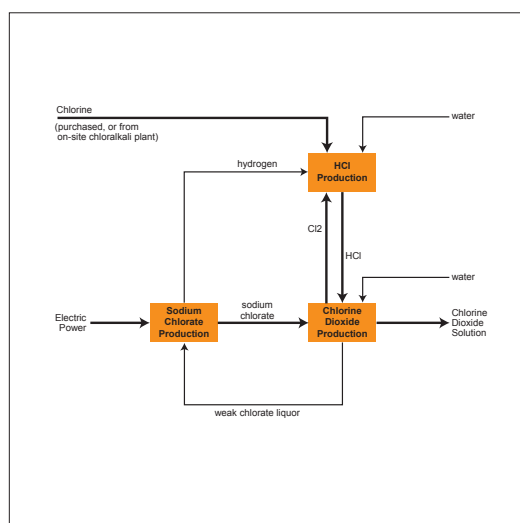
area. Make-up chlorine gas comes from the plant battery limits. Weak chlorine gas, a recycled by-product of the chlorine dioxide generation area, is combined with this chlorine make-up stream prior to being burned with the hydrogen gas.

Chlorine dioxide gas is produced, along with chlorine gas and sodium chloride (salt), by combining strong chlorate liquor and hydrochloric acid in the chlorine dioxide generator. The chlorine dioxide gas is absorbed in chilled water and then stripped with air to remove residual chlorine, to produce a high-purity chlorine dioxide solution for use in the ECF pulp mill bleach plant.

The liquor leaving the generator contains unreacted sodium chlorate and the by-product salt. This solution, called weak chlorate liquor, is recycled back to the sodium chlorate electrolysis area for reconcentration. The chlorine by-product (weak chlorine), which is not absorbed, is recycled for hydrochloric acid production.

As a result of the integration of these three plant areas, the key operating costs are for make-up chlorine, and for electrical energy that is consumed in sodium chlorate electrolysis area. With these relatively low-cost inputs, the integrated chlorine dioxide process offers much lower production costs than competing processes that require the purchase of sodium chlorate, acids, methanol, and/or hydrogen peroxide.

Chemetics' proven, low-operating cost process for the production of chlorine dioxide without sodium chlorate import. Inputs to the process are just water, chlorine, and electricity.



### Performance Data

#### $\text{ClO}_2$ Solution Specification

$\text{ClO}_2$ :	8 – 10 g/L
$\text{Cl}_2$ :	0.2 g/L
HCl:	0.5 – 1.0 g/L

#### Consumption per tonne of $\text{ClO}_2$

Raw Materials:	Chlorine 0.7 tonne
Power:	Power 8,500 – 9,500 kWh D.C.

### Features:

- Lowest production cost
- High purity (low chlorine product)
- No purchased chlorate, acid, methanol, or peroxide is required
- Security of supply for feedstocks
- Improves the balance of pulp mill chlorine/caustic consumption
- No solids handling
- No salt cake for disposal