

# TECH TOPICS

DEVELOPMENTS IN GAS APPLICATION TECHNOLOGY

*Oxygen in the extraction stage reduces chlorine dioxide or hypochlorite use downstream.*



## **OXIDATIVE EXTRACTION REDUCES POLLUTANTS AND LOWERS CHEMICAL COSTS OF BLEACHING**

Responding to tougher environmental regulations and increasing public awareness, bleached kraft mills are moving away from molecular chlorine to reduce dioxin and other chlorinated organic compounds found in pulp mill effluent. In its place, many

mills use a higher percentage of chlorine dioxide ( $\text{ClO}_2$ ), which forms one-quarter or less of the chlorinated organics produced by molecular chlorine. The cost of chlorine dioxide, however, can be as much as six times that of chlorine.

## OXIDATIVE EXTRACTION... THE ECONOMICAL SOLUTION

Faced with tough competition and tight margins, bleached kraft mills have found a way to both lower bleaching chemicals costs and meet stringent wastewater regulations by adding oxygen to the caustic extraction stage. Oxidative extraction or Eo is the solution adopted by the majority of bleached kraft mills worldwide which produce about 50 million tons of pulp annually.

### HOW IT WORKS

During a conventional caustic extraction stage, chlorinated and oxidized lignin from the previous step breaks down to become soluble and is removed through washing. Oxygen, when added to this stage, further oxidizes the residual and dissolved lignin fragments allowing them to be more easily removed in following stages. The oxidized lignin fragments react more readily with chlorine dioxide and sodium hypochlorite (NaOCl) in subsequent bleaching stages. As a result, less of these bleaching chemicals is needed to achieve the same results.

Effective mixing of oxygen and pulp is a necessary step to ensure maximum Eo benefits. A high shear mixer is one mixing method. A sparger, located at the discharge of a medium consistency pump, is another. A mill with a down-flow extraction tower requires an up-flow pre-retention tube leading to the top of the tower to provide the hydro-

static head needed to keep the oxygen dissolved in the pulp suspension. A retrofit is not necessary for a mill with an existing upflow tower, since it provides adequate pressure.

### BENEFITS OF Eo

#### ■ *Reduced Wastewater Pollution.*

Oxidative extraction reduces the levels of dioxin and other chlorinated organic compounds, helping kraft mills comply with water pollution standards. Additionally, Eo reduces bleach plant effluent color by an average of 20% and lowers chloroform emissions in mills where sodium hypochlorite is used.

■ *Chemical Savings.* Oxygen used in the extraction stage decreases lignin content by an average of two kappa numbers and further oxidizes remaining lignin for easier removal, reducing the amount of expensive chemicals needed in subsequent stages. As much as 12 lb of NaOCl and 8 lb of ClO<sub>2</sub>/T of pulp produced can be saved, depending on the existing bleach sequence.

■ *Better Pulp Properties.* Oxidative extraction produces brighter and cleaner pulp—two-to-four units of ISO brightness can be achieved even with reduced levels of subsequent bleaching chemicals. Moreover, there is often less brightness reversion. Oxygen makes shives more reactive towards bleaching agents, making a cleaner pulp that is 30-40% lower in shive count than a conventional extraction.

#### ■ *Shortened Bleaching Sequence.*

Often the improved brightness and delignification achieved allows a four- or five-stage bleach plant to convert to a three-stage plant. For greenfield bleach plants, this saves capital costs. For existing plants, it provides the potential to split flows and add capacity.

### THE AIRCO ADVANTAGE

As a leading supplier of oxygen to the pulp and paper industry, Airco has the experience to meet your needs associated with the oxidative extraction process. Some of the products and services Airco provides are

- Evaluation of the impact of oxygen on your process
- Economic analysis of potential savings
- Recommendations on required hardware
- Eo control panel to efficiently adjust the oxygen flow in ratio to the incoming pulp flow
- Oxygen safety training
- Participation in oxygen-related HAZOP reviews

### THE NEXT STEP

For more information about Airco's oxidative extraction system and other pulp and paper applications using nitrogen, oxygen, ozone and carbon dioxide, contact Airco's Commercial Development department, Pulp & Paper group, in Murray Hill, NJ; telephone (908) 771-1744. Or, contact the Airco Gases regional sales office nearest you.



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