**Turoski, Victor, ed. *Chlorine and Chlorine Compounds in the Paper Industry*. Chelsea, Michigan: Ann Arbor Press, 1998.** (Reviewed by Aimee Furber)

The book contains short articles written by experts about chlorine in the paper industry. The articles are divided into five sections: current and proposed bleaching alternatives, analytical and environmental aspects, public perceptions, regulatory aspects, and toxicology and mechanisms. The book also provides an overview of history of pulp bleaching and its relation to the environment.

The main source of pollution from mills that manufacture white paper or sell bleached pulp is the bleaching process. To make paper, a certain amount of the lignin in the wood must be removed. The rest, left to preserve strength, has a brownish tint. This is bleached to make white paper products. Around the turn of the century a single stage-hypochlorite treatment was used to bleach the pulp. Later a two stage process was used. The use of chlorine gas as a bleaching agent was the next major advance in bleaching technology. Later chlorine dioxide was found to work better. However, both bleaching processes produce untreated effluents that contain about 5kg of AOX per ton of pulp. The use of oxygen as a bleaching agent has been found to reduce the quantity of mill effluent by 50 percent. Another option is using an elemental chlorine free (EFC) bleaching process.

Studies of high-substitution and EFC bleaching mills have shown that the effluent has little effect on the water quality or aquatic life. However, there have been changes in populations and demographics of fish, but it is not known if this is related to the pulp mill or to other sources.

**Critique**

Examining the history of pulp mill pollution and ways to mitigate the pollution in the future is crucial. Paper and pulp production has long been an important industry in the Willamette Valley, and one of its most polluting. It is important to know the history of pulp mill pollution to be able to determine possible effects past pollution might have on the environment today. It is also important to develop ways to produce pulp without harmful effluents and to be able to implement the new procedures.

*Chlorine and Chlorine Compounds in the Paper Industry* provides a good overview of pulp mill pollution and discusses many was that pollution can be mitigated or eliminated all together. Although the book does not address the Willamette specifically it provides important information about some of the sources of pollution affecting the Willamette today.

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