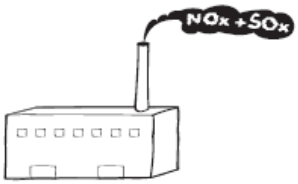

EMISSIONS TO AIR

EFFECTS OF DECREASED RELEASE OF CHLORINATED COMPOUNDS ON EMISSIONS TO AIR

Emissions Associated with Pulp Bleaching

Chemical pulp mills have shifted away from chlorine bleaching with a resulting increased use of oxygen and chlorine dioxide in the bleaching sequence. Greater use of these chemicals has led to increased emissions of carbon monoxide, a by-product of bleaching with oxygen or chlorine dioxide. Furthermore, because some chlorine dioxide is made using methanol as a reducing agent, increased use of chlorine dioxide leads to higher methanol emissions from chlorine dioxide manufacturing, methanol storage, and from bleaching operations.

Progression of bleaching sequences toward enhanced elemental chlorine free (ECF) and totally chlorine free (TCF) sequences opens up other opportunities for increased emissions. These are associated with oxygen delignification and water conservation measures that drive recirculation of mill process streams. These emissions include an array of hazardous air pollutants that are subject to emission controls. Methanol is principal among them.

ECF mills that seek to reduce water use by recycling a portion or all of their bleach plant effluent may also find substantial increases in gaseous hydrochloric acid (HCl(g)) emissions (Adams 1994). This is due to increased chloride accumulation within the kraft recovery cycle and the subsequent release of chloride associated with HCl(g) emissions from the recovery furnace. The prospect also exists that mills that recover the pulp and bleach plant filtrates jointly may find increased emissions of combustion-related dioxins (Paper Task Force 1995). (Note that dioxins originating in combustion processes have greater degrees of chlorine substitution and are thus up to 1,000 times less toxic than the TCDD species most often associated with molecular chlorine bleaching, discussed elsewhere within this section of the Tool.)

Mechanical pulp bleaching and recovered fiber brightening systems typically use chemicals such as hydrogen peroxide, sodium hydrosulfite or, for recycled pulps, formamidine sulfinic acid (FAS) or hypochlorite. Of these, sodium hypochlorite is the only chemical that contains chlorine. Chloroform is the only important chlorinated compound known to be generated and emitted when hypochlorite is used for brightening. The use of peroxide, hydrosulfite, or FAS in place of hypochlorite for recovered fiber brightening would eliminate the production of chloroform.

The most prominent emissions generally associated with pulp bleaching are, therefore

- chlorine and chlorine dioxide,
- carbon monoxide,
- chloroform,
- methanol, and
- other miscellaneous hazardous air pollutants.

Within the United States, emissions of chlorine, chloroform, methanol and other designated hazardous air pollutants (HAPs) are regulated to a level consistent with the application of Maximum Achievable Control Technology (MACT). Carbon monoxide emitted from bleach plant sources would be subject to scrutiny during site-specific permitting, unlike carbon monoxide emissions from mill combustion sources that are subject to criteria pollutant emission standards.

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