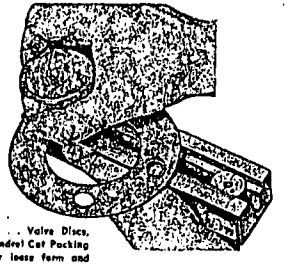


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Baytown refinery after only [illegible] service. The failure resulted [illegible] from attack by wood-destroying [illegible] It was found that this attack was occurring in essentially all of the Baytown towers, and also that the continuously flooded members were undergoing [illegible] rect attack by chemicals. Complete failures of cooling towers have occurred in 11 to 18 years; the average life of the fill or packing has been only 11.5 years. Similar experience at other plants resulted in the initiation of a number of studies for the purpose of mitigating the problem. The available information is presented in this paper along with fundamental background material as a basis for the development of firm recommendations for the design, operation and maintenance of cooling towers.

The factors which affect the rate of chemical attack are alkalinity, temperature and severity of chlorination. The factors which affect the rate of fungal attack include air, water, food and temperature conditions. The two forms of attack are not entirely independent, both have been observed to predominate on the same wood members at different periods as conditions in the towers change.

Directions for ordering papers on p 176

The rate of lignin removal from wood members appears to increase as alkalinity increases, as would be expected. Rapid delignification has been observed where chlorination has not been controlled within close limits. It is normal for the upper level of cooling-tower packing, which is exposed to the hot water, to require replacement before the packing in the lower levels; this is to be expected on the basis that there is usually a twofold increase in the rate of reaction for an 18 F increase in temperature. Minimum chemical attack can be expected when the pH is maintained below 7.5 and when chlorine requirements are minimized by proper sanitation practices.

Exposure of redwood to alkaline water also decreases its resistance to attack by fungi. Decay is negligible at wood temperatures above 105 F. When the wood members are saturated with water to the extent that air accessibility is limited, fungal attack is limited to the surfaces and the rate of attack is less critical. If water and temperature conditions are in favorable ranges for rapid fungal attack and cannot be modified, the use of pressure-treated wood to replace the decayed wood is a possible solution to the problem. The life of existing structures

