



Institute of Paper Science and Technology

Technology Transfer Fact Sheet

Corrosion and Materials Engineering Assistance

CONSULT IPST'S EXPERTS TO MITIGATE EXPENSIVE CORROSION PROBLEMS

A significant portion of corrosion-related and material-failure-related costs – amounting to hundreds of millions of dollars annually for the US pulp and paper industry – could be avoided by using appropriate corrosion mitigation technology. Total materials- and equipment-failure-related costs include direct costs (e.g., equipment replacement, labor, maintenance materials) as well as indirect costs (e.g., lost productivity, safety-related issues).

IPST's personnel and facilities, through the Corrosion and Materials Engineering Unit, offer member company mills assistance in selecting mitigation strategies for various materials- and corrosion-related applications. This assistance includes:

In-Situ Monitoring

A major focus of the Unit's current research efforts is on the kraft recovery boiler. Strategies differ for each area of the boiler depending on the materials and the environmental conditions. For instance, certain areas of the lower furnace corrode at higher rates than others. In-situ monitoring carried out in a number of boilers in high- and low-corrosion areas has enabled IPST's experts to characterize the problem (see

Figure 1). Identification of the gaseous environments responsible for the high corrosion rates has allowed them to develop new insights into the mechanisms involved and to develop robust mitigation strategies.



Figure 1. In-situ monitoring of high-corrosion areas.

Stress Corrosion Cracking

The Corrosion and Materials Engineering Unit is collaborating with Oakridge National Laboratories to identify conditions that promote stress corrosion cracking in the stainless steel layers of composite floor tubes during recovery boiler shutdowns (see Figure 2). As a direct result of this research effort, IPST's experts can provide member company mills with operating guidelines to help avoid stress corrosion cracking in floor tubes in the future.

Stress-Assisted Corrosion Cracking

Stress-assisted corrosion cracking (SAC) of waterwall tubes from the waterside of the recovery boiler is another serious corrosion problem that IPST is currently able to help member companies address. Generally, these types of failures are associated with the attachment welds where structures are connected to the waterwall tubes.



Figure 2. Stress corrosion cracks in stainless steel in dilute wash water.

Digesters, Auxiliary Equipment, and Storage Tanks

Other continuing problems IPST is actively addressing include corrosion of digesters, auxiliary equipment in contact with liquors, and storage tanks. IPST's materials experts can assist you in all of these areas. These experts can also provide assistance with material selection to improve the performance of plant equipment.

Assistance Available

IPST's corrosion control capabilities, through the Corrosion and Materials Engineering Unit, can assist member company mills with material selection through field and laboratory testing, corrosion monitoring using in-situ sensors, corrosion mitigation, failure analysis, and characterization of local corrosive environments in equipment.

Benefits

Benefits include substantial capital savings, reduced maintenance costs, increased productivity, and improved safety.

Facilities

IPST's Corrosion and Materials Engineering Research Facilities include:

- corrosion testing
 - aqueous corrosion
 - electrochemical tests
 - high-temperature gaseous corrosion
 - molten salt corrosion
 - stress corrosion cracking
 - corrosion fatigue
 - heat-treatment facilities
- mechanical testing of engineering materials
- failure analysis equipment
- metallography and microscopy
 - specimen mounting and polishing facilities
 - optical microscopes
 - Jeol JSM 840 scanning electron microscope (SEM)
 - Jeol JSM 35X SEM with EDS

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