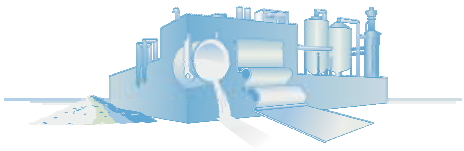
Detection and Control of Deposition on Pendant Tubes in Kraft Chemical Recovery Boilers

Immediate Benefits Will Be Derived Through the Reduction and Control of Recovery Boiler Pluggage

The chemical recovery boilers used in kraft pulp processing are large and expensive. Since it is not cost-effective to increase their capacity in small increments, their original size may limit the capacity of the entire mill. The effective burning capacity of boilers could be improved, however, by reducing the deposition of particulates on their heat transfer surfaces and the resultant plugging of gas passages. On-line sensing methods that detect and control build-up of these deposits could help extend the intervals between boiler shutdowns and reduce deposit formation.

Researchers are exploring several sensing technologies for monitoring deposition in kraft boilers. These technologies, coupled with computers that conduct multi-point data processing, should be capable of accurately detecting and measuring materials that are deposited on pulp boilers. A successful deposition-monitoring system will decrease boilers downtime and increase boiler capacity by reducing pluggage and its related problems. For a modest capital investment, the pulp and paper industry could achieve substantial economic savings.



Benefits for Our Industry and Our Nation

- Increases boiler productivity
- Reduces pluggage-related problems such as slag-falls
- Increases boiler capacity
- Enhances environmental compliance
- Prevents pendant tube leaks and their respective safety hazards
- Improves operator confidence

Applications in Our Nation's Industry

If successful, this technology will be commercialized by Combustion Specialists, Inc.(Maple Valley, WA), and transferred to the industry within the next 15 years. Widespread use of the technology will increase the production capacity and efficiency of the entire kraft pulping industry.

Project Description

Goal: To develop a sensing system for detecting deposits on the pendant tubes of a kraft chemical recovery boiler, and to demonstrate the system's usefulness in extending the time between boiler shutdowns and in ameliorating other deposit-related problems.

Three objectives were identified for this project: (1) To identify a method of directly monitoring the deposition of fume and carryover particles on recovery boiler pendant tubes; (2) to develop and test the chosen method of directly monitoring the deposition of fume and carryover particles on recovery boiler pendant tubes; and (3) to use the information, in conjunction with simultaneous gas temperature measurements, to develop an effective control scheme for these deposits. Seven tasks were performed during this project, which is scheduled to run for nearly three years (through the second quarter of 2001): (1) Electromagnetic properties survey, consisting of a literature review and a simple modeling effort; (2) detection technology survey, to determine the most economic method for detecting deposits; (3) device selection and packaging so it will withstand the recovery boiler environment; (4) boiler data acquisition, using the packaged system in an operational recovery boiler to obtain images of deposit formation; (5) data processing definition/ implementation, to obtain a small number of relevant parameters; (6) prototype (proof-of-concept) system assembly, using data collected previously in the field; and (7) pluggage control demonstration, using the proof-of-concept system in conjunction with on-line gas temperature measurements.

Pathways and Milestones

All major objectives of this project have been achieved. The project has resulted in a first commercial product that will be used to realize some of the energy savings projected. This product is called the Boiler Inspection Camera (BIC). This product is a hand-held camera intended for use in performing periodic inspections to identify plugged regions in the recovery boiler. It is battery powered and includes a flat panel video display at the rear of the camera body. The lens tube also includes an adjustable iris and a manual focus adjustment.

Project Partners

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Maple Valley, WA

Weyerhaeuser Company
Tacoma, WA

DanzCo
Tenino, WA

Electrophysics Corporation
Fairfield, NJ

Orca Photonic Systems
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A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

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