TITLE: **NOVEL CORROSION SENSOR FOR VISION 21 SYSTEMS**

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ABSTRACT

Objectives

The overall objective of this proposed project is to develop a new technology for on-line corrosion monitoring based on an innovative concept. The specific objectives and corresponding tasks are to: (1) develop the sensor and electronic measurement system; (2) evaluate and improve the system in a laboratory muffle furnace; and (3) evaluate and improve the system through tests conducted in a pilot-scale coal combustor (~1 MW).

Accomplishments to Date

The task for the first year is completed, i.e., the development of the probe and the measurement system in the laboratory. The completed work included the re-design of a corrosion probe, on which the corrosion sensor can be mounted. The initial probe, which is slightly smaller in diameter, was redesigned with improvements to accommodate ceramic connectors for electrical connection. The probe temperature measurement and control was selected based on our experience, in addition to a probe temperature control system that was already available. The new controller is more portable and rugged, suitable for operation at ambient temperatures in a power plant environment. The probe temperature, or the temperature of the sensing element, is controlled with compressed air cooing. The electronic measurement with computer data acquisition was also developed in the laboratory. The data acquisition software was developed to allow the user to select data logging rate, the temperature for the sensor, and options for

various measurement sequences. It can also automatically log and save the data for days or weeks without the need for operator intervention.

The task for the second year is on-going. An experimental setup in the laboratory was developed and a muffle furnace is used to simulate the high temperature combustion environment. The experiments included the measurement of the probe temperature fluctuation under air cooling and temperature control, and data acquisition and file saving functions of the software. The laboratory development and improvement iteration will continue through the end of the second year as originally scheduled.

In addition, more experience is gained at coal-fired power plants through the interaction with plant people and visits to power plants. Such interactions had a direct impact on the design of the sensor and measurement system, with the information on the practical constraints during the operation of the system in a plant environment. As a result of such activities, we may propose to add power plant trials in the final phase of the project. Power plant testing of the system developed in this project was not proposed in the original research plan. However, adding power plant tests to this project could accelerate the pace to bring the technology to practical application. The plan to add plant tests in this project will be further assessed in the future, when the system is proved in the laboratory and pilot furnace environment.

The project progressed according the original plan and schedule. The next phase of the project is to complete the system in a laboratory furnace. It is expected that the project should progress well according the original plan.

Future Work

(1) Continue the laboratory evaluation and improvement of the system using the muffle furnace to prepare the system to be tested at the pilot-scale furnace and possible power plant sites.

(2) Test the system at a pilot-scale furnace and possibly in the coal-fired boiler to ensure that (a) the system works in a combustion environment, (b) the results can be confirmed by direct metal-loss measurements, and (c) the system is rugged enough for the plant environment.

List of Paper Published

Li, Z.P., Lin, B.C., and Ban, H., A Novel Sensor for Fireside Corrosion Monitoring, The Proceedings of the 20th Annual International Pittsburgh Coal Conference, 2003.

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