



## Corrosion Test System Designed and Constructed for Geothermal Power Plant

By Cliff Moore

A project to test the corrosion resistance of several alloys to be used in a geothermal power plant was recently completed. Six different alloys of carbon steel were to be evaluated for their performance in four process chemistry and temperature environments from hot brine straight out of the well to cool brine for reinjection into the formation.

A test system was designed and built that emulated the four process environments; hot brine directly from the well containing dissolved gases, hot brine after gas stripping, cool brine after energy transfer to the secondary heat exchangers and cool brine with the acid gases re-dissolved and ready for reinjection.

Samples of each of the six alloys were fabricated into weight-loss coupons and electrodes for monitoring corrosion rate directly with Linear Polarization Resistance (LPR) instrumentation. The coupons and

electrodes were installed directly in test locations corresponding to the four process scenarios.

The corrosion rates were measured and data logged on a four-hour interval throughout the 30-day testing period. The weight-loss coupons were removed at the conclusion of the test period, cleaned, weighed, visually inspected and the 30-day corrosion rates calculated. The logged data from the LPR instruments was downloaded, graphed and analyzed at the conclusion of the testing.

The data from the two measurement techniques was used to assess the corrosion resistance of the materials to the very different sets of process conditions. The information obtained from the testing was used to provide our client with recommendations for the most corrosion resistant alloys for piping and vessels to be used in constructing the power plant.

The other day, a client called because he had an RFP request for testing he'd never heard of before. He said, "I knew I should call Schiff because you guys do 'weird science.'"

He was right.

We did the testing and fulfilled our client's need for "weird science." However, most of our clients don't know the breadth of services we perform.

Geotechs think of us as the "Dirt People." Civil engineers think of us as the "Cathodic Protection Dudes." Paint contractors think of us as an inspection firm. Attorneys just think of us when stuff breaks.

In our 50 year history, we have accumulated a variety of unique capabilities and projects. We decided to publish this quarterly newsletter to give you a view into our world of Technical Minutia.

Don't worry, this is not your average newsletter. Through it all, we inject our sense of humor in order to break up the monotony of battling the Second Law of Thermodynamics, and remind ourselves that there is no hurry in life - after all, corrosion is a slow process.

We hope you enjoy. If you have suggestions or comments, keep them to yourselves. I mean, please e-mail them to me.

-Dr. Graham Bell  
President & Principal

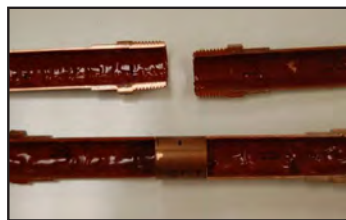
## New Equipment Brings Progress Into Focus

by Eduardo Hernandez

Quality control of surface preparations and coatings applications can be difficult to perform at times, due to the small tolerances involved. Schiff Associates' VHX microscope from Keyence provides the necessary tool to verify and quantify if a job was performed per specifications.

As part of Schiff's construction support services on a copper relining project, verification was made of the surface preparation and coating dry film thickness using the VHX microscope.

To the naked eye, the coating appeared satisfactory with minor signs of dust, but upon closer inspection



of a pipe sample cross-section at 200X magnification with Schiff's VHX microscope (see Figure 1), it became clear that the pipe surface had not been prepared in accordance to the specifications and that spent abrasives were not removed before applying the internal coating system.

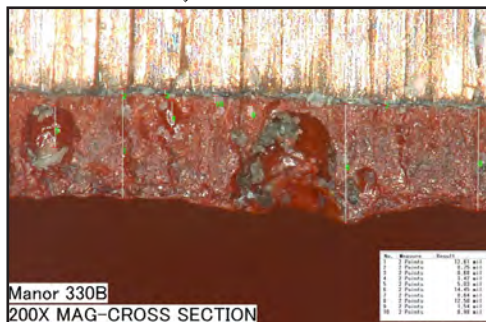
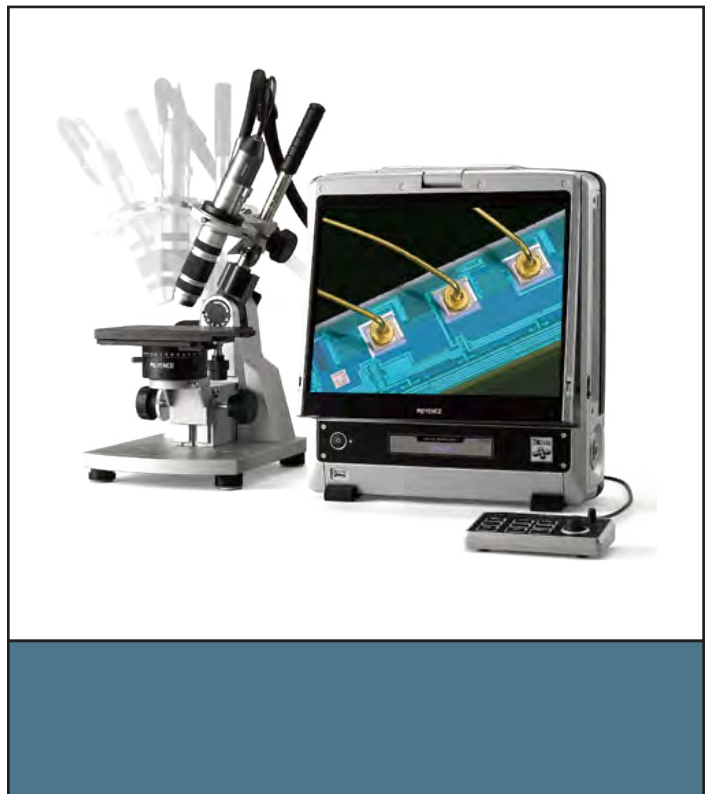


Figure 1

These microscope images left the contractor with only one option - to remove and reinstall the coating system.

Schiff's VHX microscope also serves our failure analysis team in examining metal microstructures, pit depths, surface profiling, intergranular corrosion, and microscopic dimensioning.

Best of all is the ability of the VHX to record images at various focal lengths then combining them into one image with all depths in focus providing a large depth of field.



## ASCE Hosts Southern California Conference for Industry Leaders

by Kaylyn Arnold

From August 15-19, 2009, the American Society of Civil Engineers held their annual Pipeline Conference at the Sheraton San Diego Hotel & Marina. Sponsored in part by Schiff Associates, the conference drew a crowd that surpassed last year's attendance by over 15 percent.

The conference, titled "Infrastructure's Hidden Assets," boasted assorted workshops, guest speakers, and panel discussions. Topics included pipeline durability, operation and maintenance, infrastructure assessment

and monitoring, planning, risk management, hydraulic design, and specialty area construction.



Schiff's participation in the conference not only included a "platinum" level sponsorship, but also the organization of an afternoon social for all event attendees. At Schiff, we value our partnership with ASCE, and look forward to working together on future endeavors.

If you would like more information about any of these topics, or if you'd like to stop receiving free issues of *Weird Science*, please contact Kaylyn Arnold at [karnold@schiffassociates.com](mailto:karnold@schiffassociates.com)