# Exsys Case Study

CORALL – Corrosion Damage Diagnostics

Ontario Hydro Technologies - Kinetrics

Thermal power generating stations consist of many complex systems, with substantial costs occurring due to equipment downtime, replacement materials and maintenance personnel. The degradation of primary equipment components due to corrosion is the single largest source of forced outages in thermal power generating stations.
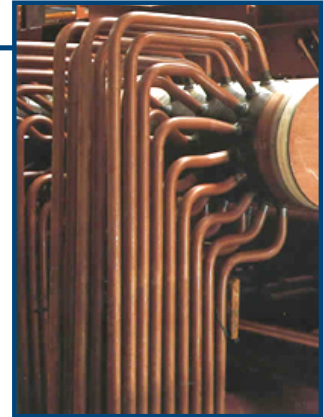
Each component of a complex power plant (steam power, gas combustion turbine or combined cycle) possesses unique corrosion problems including: attack by service environment, high temperature, aggressive gases and liquids, erosion, vibration, mechanical stresses, human error, and incorrect and inconsistent application of corrective measures.

The CORALL diagnostic systems built with Exsys® Knowledge Automation Expert Systems are used to improve efficiency in process equipment problem analysis and resolution. They assist electric utility and power plant personnel in recognizing basic causes of corrosion damage, correctly identify the damage mechanism and the root cause for a failure, and help determine proper corrective measures.

The CORALL program guides the user to the most likely damage mechanism(s) by asking simple questions, and the answers are analyzed by correlating data on the type of power plant, damage location, type of fuel, type of metal and from visual inspection of the damaged component.

Technical specialists in metallurgy, chemistry, combustion and power plant design frequently cooperate with the station staff in a failure investigation. These individuals rely on personal experience and a large amount of reports, theories, studies, private communications and investigations concerning the different failure modes and mechanisms.

The CORALL systems tap into this cumulative information and utilizes decades of accumulated plant operator knowledge, expertise and experience. CORALL is also based on reliable industry-standard information published in the public domain, which is accepted by practicing experts in the area of thermal power plant corrosion damage analysis, as well as instruction from EPRI manuals, the ASM Metals Handbook, and heuristic knowledge of the corrosion experts.

In a matter of seconds, a damage mechanism can be diagnosed with the same confidence as the best corrosion damage analysis specialists. CORALL combines three separate expert systems: COREXYS, CORAUX, and CORGAS to provide corrosion damage diagnostic systems for all types of fossil fuel power plants. The COREXYS expert system aids investigations into the cause of boiler tube failures, CORAUX contains information on causes of corrosion damages in steam turbine generators and auxiliary equipment, and CORGAS helps in determining the cause of corrosion damages in gas combustion turbines.

The finished system is distributed in English and was translated to Chinese for use in China.