



Chemical and Corrosion Autoclave and Loop Test Facility

CNL's Chemical and Corrosion Autoclave and Loop Test Facility (CCALTF) are located at its Chalk River Laboratories. CNL has developed and used its CCALTF for testing materials degradation under a high-temperature aqueous system. The facility performs applied research and development to study the environmental degradation of engineering materials, particularly materials for nuclear reactors, as well as other commercial projects.

The facility combines high-temperature accelerated corrosion tests with electrochemical capabilities. One of the systems within the facility has impingement test capabilities, which allow high-temperature electrochemical measurements under controlled electrochemical corrosion potential, water chemistry and flow conditions. CNL has developed an instrumented test system capable of modelling steam generator crevices for both broached hole and lattice bar tube support plates under operating conditions. There are two high temperature, high pressure, refreshed autoclave systems used for crevice/corrosion chemistry studies and experimental probe testing. One is refreshed by the "once through method" and the other is refreshed by the "recirculating method".

Another system within the CCALTF is the H3-loop, which is a radioactive, high temperature and high pressure system used primarily to study two phase and single phase water conditions using radiotracing methods. A fourth system within the facility is the High Temperature Recirculating (HTR) Loop, which is used to perform a variety of studies under high temperature recirculating water and steam conditions. Two-phase boiling conditions for both loops are achieved using a large, electrically heated, serpentine heater. It is the use of radiotracers and the serpentine heaters which make the Chemical and Corrosion Autoclave and Loop Test Facility unique.

The staff in the CCALTF are experienced in high-temperature, high-pressure electrochemical analysis, as well as accelerated corrosion testing under controlled water chemistry and flowing conditions at temperatures as high as 320°C.





The CCALTF has developed many partnerships within the Canadian nuclear industry. Some of these partnerships include laboratory tests for obtaining the meaningful material improvement factors to support the probabilistic assessments on the long-term degradation behaviour of Alloy 800 steam generator tubing. Another study was conducted to examine the results from the reduction of sulphate impurity during - Steam Generator (SG) operation and wet layup in contributing to the degradation of the secondary side of SG tubing materials at low temperatures.

Another study currently under way in partnership with the partners from the nuclear industry is a study designed to support SG life management, by providing experimental evidence confirming whether copper or magnesium will enhance lead assisted stress corrosion cracking (PbSCC) of SG tubing materials and possibly determine if PbSCC is a key degradation mechanism limiting SG life.

THE AVAILABLE EQUIPMENT IN THE CCALTF INCLUDES:

1. Static Autoclaves
2. Once-through refreshed autoclave loops
3. Once-through refreshed flow impingement facility
4. Instrumented Steam Generator Crevice systems
5. Constant Extension Rate Tensile (CERT) tests Facility
6. Potentiostat/Galvanostat for electrochemical measurements
7. High temperature / High pressure recirculating loops

