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Laser Welding Facility

Located at Chalk River Laboratories, CNL's Laser Welding Facility (LWF) is used for precision welding and cutting, gamma spectrometric scanning of low activity samples, and the maintenance and testing of Travelling Flux Detector (TFD) electronics. The space within the LWF is also used as an assembly area for instrumented rigs for in-reactor and out-reactor tests, as well as for the drilling and cutting of oxide pellets and metallic fuel.

Laser welding and cutting employs a small precisely-focused spot, which leads to a small heat affected zone and produces minimal welding distortion in the metal. The laser welding equipment is therefore used primarily in a group of components for in-reactor assemblies and irradiations, instrumentation of experimental apparatus, and assembly of atypical fuel elements and fuel element simulators.

There are two laser welders within the LWF: a Lumonics welder and cutter and a Korad welder. The Lumonics welder has a positioning controller which allows users to produce linear and circumferential welds employing computer control for precision and uniformity. The Lumonics welder has 400 W maximum average power, and 55 J maximum pulse energy. The Korad welder produces a maximum pulse energy of 50 J and is primarily used for spot welding to hold parts in place before using the Lumonics welder to complete a full weld. A pressure vessel equipped with a sapphire window is used to permit small capsules to be pressurized up to 2,500 psi and then sealed using the Lumonics laser welder.

The gamma spectrometric scanner systems within the LWF are capable of one-dimensional scanning of up to four assemblies simultaneously. The assembly lengths can be up to 1 m and the diameter can be up to 100 mm. The LWF also has access to radioactive material sources, mainly Cobalt-60, Cesium-137, Barium-133 and Europuim-152 gamma sources, which permit efficient calibration of the gamma spectrometers. The TFD can measure thermal neutron fluxes over a range of several orders of magnitude.

The gamma scanning apparatus has been used to measure flux wires irradiated during initial reactor start-up, fissile material distribution in targets, and prototyping and setup of gamma scanning apparatus for use in hot-cell experiments on irradiated fuel. The TFD system is used for in-core flux measurements in operating reactors.

The technologists in the Laser Welding Facility are experienced with laser welders, spot welders, gamma spectrometers, gas pressure systems and other equipment including furnaces and data loggers. The LWF has been used by CNL for industrial jobs, as well as partnering with industry and universities. The Laser Welding Facility would be interested in expanding partnerships, and providing neutron flux scanning services using the Travelling Flux Detector.