Spallation Neutron Source sees first target replacement

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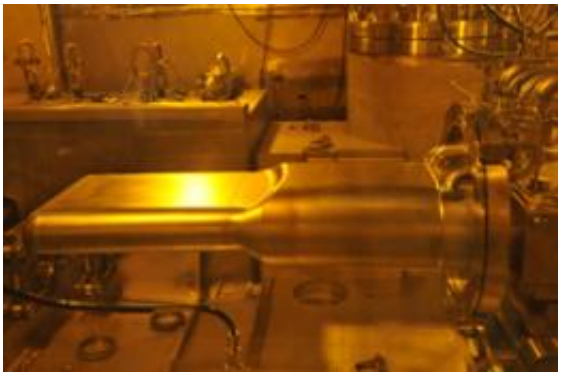

After three years of service, the Spallation Neutron Source's target module has been replaced after exceeding all expectation of service life.

Having outlasted all expectations of its service life, the original mercury target of the Spallation Neutron Source (SNS), the Department of Energy Office of Science's record-setting neutron science facility at Oak Ridge National Laboratory, is being replaced for the first time.

SNS operators are taking advantage of a planned maintenance outage to replace the old target, which has been in service since the SNS's startup on April 28, 2006.

"We were anticipating this operation as far back as the summer of 2008, and the fact is that the target received nearly twice the cumulative beam as its projected lifetime limit. In the meantime, neutron scientists have

been reveling in the beam intensities the SNS is already providing," said ORNL Director Thom Mason, who directed the SNS before becoming laboratory director.

The mercury target is the first of its kind. A proton beam generated by the SNS's linear accelerator strikes the target 60 times per second with a force comparable to bursts from a large-caliber machine gun, "spalling" neutrons from the circulating mercury inside.

Eventually, the wear and tear of those forces were expected over time to damage the stainless steel of the target and render it unusable. The target is modular: It can be changed out whenever necessary. Some researchers estimated the first change would become necessary a year ago.

One reason for the target's longer than expected life could be the decision to run the SNS at lower power--and step up the SNS's power more slowly--to give experiments that are already being conducted more stable beam time. Replacing the target during the maintenance outage avoids interruptions of experiments.

With a maximum design beam power of 1.4 megawatts, the SNS has been routinely operating at just under 500 kilowatts. Already the world's most powerful neutron source, every time power is stepped up, a new record is established.

"Even at these power levels, our scientific users have been ecstatic with the results they are getting from their experiments," said SNS Director Ian Anderson.

The SNS team has already operated the facility at close to megawatt levels. Recent tests verified that the linear accelerator and accumulator ring--two vital components that supply the proton beam pulses--are meeting and exceeding the 1.4 megawatt design criteria.

The replacement operation entails decoupling the target module and retracting it from the beam line area after draining the mercury--approximately 20 tons of it--from the vessel. Then the new module is put into place, returned to the target station and then refilled with the mercury. The entire process is performed with remote manipulators by operators working in a control room adjoining the target bay--a procedure that will be repeated each time the target is changed, which ultimately at full power could occur several times a year.

The old target will be studied to gauge how three years of proton bombardment have affected its materials.

More information: More information on the Spallation Neutron Source is available at neutrons.ornl.gov .

Source: Oak Ridge National Laboratory (news : web)