# THE DESIGN OF THE OMEGA DT FILLING AND CRYOGENIC TARGET HANDLING SYSTEM*

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General Atomics is designing and building the Cryogenic Target System for the OMEGA laser at the University of Rochester's Laboratory for Laser Energetics. The purpose of this system is to deliver millimeter-sized polymer shell targets containing an inner ~100 μm thick layer of DT ice to the center of the target chamber. Prior to insertion, these targets are filled to pressures as high as 1500 atm with hydrogen isotopes (DT), the gas is cryogenically condensed, and the condensed material layered to form a uniform inner shell. Testing with prototype equipment has demonstrated the successful $D_2$ filling with plastic targets to 1100 atm, cooling, and cold transport.

Based on the prototype testing[1] and a strong emphasis on design simplicity, the cryogenic target process and equipment have changed significantly from the original conceptual design.[2] Equipment has been relocated into one tritium laboratory, the number of process steps has been reduced by process simplification, and the equipment has been optimized from an operational and human factors viewpoint.

The DT fill and transfer functions are now located in one glovebox in the tritium laboratory, keeping all major tritium inventories in one work area. An entire transfer cryostat system has been eliminated by combining the functions of previously separate subsystems into one cryostat. The main DT fill cryostat was redesigned based on a similar cryostat in use at Los Alamos National Laboratory. This simplified the maintenance operations greatly and eliminated the need for cryogenic indium seals. The high pressure cryovalves have been replaced with one room temperature valve, reducing the penetrations into the vessel and simplifying maintenance. The high pressure DT cell has been simplified, using an integral actuator that eliminates a separate cryogenic wrench, and reduces the operational steps significantly.

Overall, these changes have resulted in a streamlined process that will decrease cycle times and reduce operational costs.

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[1]Goodin, D.T., et al., "Testing of the Cryogenic Target Handling System for the OMEGA Laser," Proc. 19th Symp. on Fusion Technology, Lisbon, 1996 to be published.

[2]Fagaly, R.L., et al., "High Pressure Fill System for the Omega Upgrade ICF Laser," Proc. 5th Topical Mtg. on Tritium Technology in Fission Fusion and Isotopic Applications, Lake Maggiore, Italy (1995).