

DIII-D WATER-COOLING SYSTEM UPGRADES THROUGH MODELING AND POWER SAVING PROJECTS

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The DIII-D water cooling system for the fusion facility at General Atomics consists of the vessel and coil cooling water systems (DIII water), components cooling water systems (power supplies, ion-sources, diagnostics and gyrotrons), and heat rejection system (cooling tower and heat exchanger) for the operation of the fusion facility. Since 2005 the water-cooling systems have undergone major upgrades, resulting in average power savings of over 50%. The water-cooling system is now capable of handling future heat loads for long pulse duration (10 seconds) while operating at lower cost.

This paper describes the design, installation and startup of energy efficiency upgrades which include:

- Installation of new cooling towers, and upgrades to primary and secondary heat exchanger loops
- Reducing power consumption of cooling water system by installing variable frequency drives (VFDs) for the cooling water pumps, implementing PLC monitoring of energy usage in the facility, systems modeling, and by automatic adjustment of system flow to better meet needs
- Changes to control logic by the identifying systems and flows, such as fast wave and ECH operations, that can be shut off or reduced depending on operational status
- Reducing parasitic power loss through pressure drop reductions in filters, strainer components, heat exchanger cleaning programs, and perform preventive maintenance for equipment to improve operating efficiency.

Modeling and thermal performance results of the upgraded DIII-D cooling water system will be discussed.

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