COOLING WATER CONDITIONING AND QUALITY CONTROL FOR TOKAMAK*

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Designers and operators of Tokamaks and all associated water cooled, peripheral equipment, are faced with the task of providing and maintaining closed-loop, low conductivity, low impurity, cooling water systems. Most of these systems must provide large volumes of high quality cooling water at reasonable cost and comply with local and state government orders and EPA mandated national pretreatment standards and regulations. The primary reason for supplying low conductivity water to the DIII–D vacuum vessel, coils, power supplies and auxiliary heating components is to assure, along with a prescribed length of rubber hose, sufficient electrical resistance and thus an acceptable current-leakage path to ground at operating voltage potentials. But as important, good quality cooling water significantly reduces the likelihood of scaling and fouling of flow passages and heat transfer surfaces. Dissolved oxygen gas removal is required in one major DIII–D cooling water system to minimize corrosion in the ion sources of the neutral beam injectors. Currently, the combined pumping capacity of the high quality cooling water systems at DIII–D is approximately 15,000 gpm. Another area that receives close attention at DIII–D is the chemical treatment of the water used in the cooling towers. The water from the towers is used to cool equipment and components critical to the project, e.g., motor generators, helium compressors, vacuum pumps and all heat exchangers that extract energy from the vacuum vessel and its coils, power supplies, and all auxiliary plasma heating components and equipment.

This paper discusses the DIII–D water quality requirements, the means used to obtain the necessary quality and the instrumentation used for control and monitoring. Costs to mechanically and chemically condition and maintain water quality are discussed as well as the various aspects of complying with government standards and regulations.

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