

DISSOLVED OXYGEN REDUCTION IN THE NEUTRAL BEAM ION SOURCE COOLING SYSTEM*

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Neutral Beam Ion Sources (NBIS) are critical components for the Neutral Beam operation. In the DIII-D Tokamak NBIS must be cooled with 800 gpm of de-ionized and de-oxygenated water to protect the molybdenum sources from overheating and failure. These ion sources are currently irreplaceable. Since molybdenum will oxidize in water almost instantaneously in presence of dissolved oxygen (DO), de-oxygenation is important in the NBIS water system. Under normal beam operation the DO level is kept below 5 ppb. However, during week nights and weekends when neutral beam is not in operation, the oxygen level is maintained between 15 to 5 ppb by periodic recirculation with a 100 HP pump, which consumes significant power. Experimental data indicated evidence of continuous oxygen diffusion through non-metallic hoses in the proximity of the molybdenum source(s). Because of the intermittent flow of the cooling water, the DO concentration at the ion source(s) could be even higher than measured downstream, and hence the concern of significant localized oxidation/corrosion. A design solution, to be implemented in the summer, is proposed to significantly reduce the peak and the time-average DO levels in the water system and to consume only a fraction of the power.

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