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Inservice Inspection of Steam Generator and Secondary Sodium Pipe Line Welds of FBTR Using Ultrasonics

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Abstract

Fast Breeder Test Reactor (FBTR) is a 40MWt/13.2MWe, mixed carbide fuelled, sodium cooled, loop type reactor. Its main aim is to generate experience in operation of fast reactors and sodium systems and to serve as an irradiation facility for development of fuels and materials for fast reactors. The heat produced in the core of the reactor is removed by two primary sodium loops, which in turn transfer the heat to two secondary sodium loops through intermediate heat exchangers. Each secondary sodium loop has been provided with two once through serpentine type steam generator modules where heat is transferred to steam water system.

FBTR technical specifications for operation stipulates volumetric examination of secondary sodium pipe line weld joints and steam generator shell weld joints as part of In Service Inspection (ISI). Ultrasonic testing technique has been selected for volumetric examination of weld joints due to geometry and site conditions of the components.

Material of construction for secondary sodium system pipelines is austenitic stainless steel. Steam generator modules are once through type and about 90m long in the form of triple "S" bends. High temperature sodium flows through shell side and water/steam through seven tubes inside the shell. The material of construction is 2.25Cr - 1Mo low alloy steel.

This paper details the experience and observations made during the ultrasonic inspection carried out on the weld joints. The ISI carried out so far revealed that secondary sodium and steam generator boundaries are in healthy condition thus generating confidence for further operation of the reactor at high power. The experience gained has also been useful in formulating ISI programme for prototype fast breeder reactor, which is proposed for construction in the near future.