

1. INTRODUCTION

One of the structural solutions for increasing safety of sodium-water steam generators is the application of designs with sodium inside the tubes and water at the shell side.

Models of inverse steam generators of 2 to 3 MW thermal power have been designed, manufactured and tested in an equal conditions in the past, Ref.[1]. Further development on inverse designed steam generators as well as theoretical or experimental studies on their characteristics in water into sodium accidents have not been reported.

The experience gained from the long term operation of sodium-water steam generators in the world demonstrated that water into sodium leaks may not be fully excluded independently of the steam generator single wall design. If a leak in the tube wall occurs in the steam generator of the traditional concept (sodium at the shell side, water inside the tubes) damage of adjacent tube and self-damage of defective tube initial immediately. The burn-through of the adjacent tube wall manufactured from a ferritic steel may result in few tens of seconds [2] at the leak rate of 1 gramm per second.

To avoid transition of a small into a large leak the steam generator has to be equipped with an effective isolation system that enables to isolate both reagents, sodium and water, in a very short time.

An extensive theoretical and experimental programme has been performed together in Russia and Czechoslovakia from

1975 to 1987 to obtain sufficient data on inverse steam generator characteristics in water into sodium leak situations. The programme resulted into a general establishment the concept of inverse steam generator guaranties more safety than the traditional one at water into sodium leak accidents.

Therefore two steam generators of the inverse type have been developed, the first, a micro module inverse steam generator (MMISG) and the second, a module inverse steam generator (MISG). The MMISG and MISG were manufactured in Czechoslovakia (The First Brno Engineering Company, Divison Trebic) and are being tested in Russia at BOR 60 facility (Research Institute of Atomic Reactors, Dimitrovgrad).

A comparison of design and operational characteristics as well as analysis of experiance gained during the long term operation of the MMISG and MISG at BOR 60 reactor are main aims of this technical report.