

Acoustic Leak Detector in Monju Steam Generator

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ABSTRACT

Acoustic leak detectors are equipped with the Monju steam generators for one of the R&D activities, which are the same type of the detectors developed in the PNC 50MW Steam Generator Test Facility. Although they are an additional leak detection system to the regular one in Monju SG, they would also detect the intermediate or large leaks of the SG tube failures. The extrapolation method of a background noise analysis is expected to be verified by Monju SG data.

For the presentation at IAEA/IWGFR Specialists' Meeting on "Steam Generator: Acoustic/Ultrasonic Detection of in-Sodium Water Leaks", Aix-en-Provence, France, Oct. 1-3, 1990.

1. INTRODUCTION

Acoustic leak detectors are equipped with the steam generator of the Japanese prototype FBR, Monju. Although the hydrogenmeters are adopted as a small leak detection system in Monju, the acoustic leak detectors are installed as one of the R&D activities aiming at the adoption of that leak detection system to the future FBR plants. The acoustic leak detectors have been developed for years by PNC/OEC and the same type is installed in the Monju steam generator.

First of all, it is proposed to grasp the characteristic of the steam generator background noise (BGN) and to accumulate the fundamental data in order to estimate the BGN of the future FBR plants.

The Monju plant is now under construction on schedule, and the steam generators are already installed at the site of Monju. The wave guide rods of the acoustic leak detectors are attached on the steam generator.

The extrapolation method of the test results to Monju steam generator is mentioned by another papers; H. TANABE and M. KUROHA, "The Development of Acoustic Leak Detection System", at this meeting, so the installation of the acoustic leak detectors on the Monju steam generator is briefly described below.

2. INSTALLATION OF ACOUSTIC LEAK DETECTOR ON MONJU

The wave guide rod of the acoustic leak detector is made of stainless steel (JIS SUS304), its outer diameter is 16mm and its length is 180mm, tipping a screw. The accelerometer is fastened to the bottom of the wave guide rod by means of a screw. When the acoustic leak detector is out of use, the accelerometer is put off and the wave guide rod is covered with detachable insulator.

2.1 Installation on Monju evaporator

Three wave guide rods of the acoustic leak detectors are attached to an evaporator and they are lined up along the evaporator vessel wall longitudinally as shown in Figure 1. The upper one is located corresponding to the nucleate boiling region of the helically coiled tube. The middle one is located corresponding to the pre-boiling region. The lower one is located corresponding to the lower U-tube region. The circumferential location of them is set not to line with the radial support structure of tube bundle.

Bosses were welded on the evaporator vessel wall and Inconel was buttered on the bosses with post weld heat treatment at a factory. After evaporator was installed at the site of Monju, the wave guide rods were screwed on the bosses with sealing weld as shown in Figure 2.

2.2 Installation on Monju superheater

As the inlet steam to the superheater is about 30 degree of superheat, there is no BGN due to the state change of water. The sodium level of the superheater is controlled by cover gas pressure, not by sodium overflow system. So it is considered that the main BGN is due to the sodium flow of the superheater.

Three wave guide rods of the acoustic leak detectors are attached to a superheater. They are lined up along the superheater vessel wall longitudinally as shown in Figure 3. The circumferential location of them is corresponding to one of the sodium inlet nozzles of the superheater. The upper one is located corresponding to the sodium inlet and distributing region. The middle one is located corresponding to the lower helically coiled tube region. The lower one is located corresponding to the lower U-tube region.

Bosses were welded on the superheater vessel wall at a factory and after the superheater was installed at the site of Monju, the wave guide rods were screwed on the bosses with a weld as shown in Figure 4.

3. CONCLUSIONS

Six wave-guide rods of the acoustic leak detectors were attached to both one evaporator and one superheater divided equally, for one of the R&D activities aiming at the adoption to future FBR plants.

The BGN of the Monju steam generator are going to be accumulated in order to estimate the BGN of the future FBR plants.

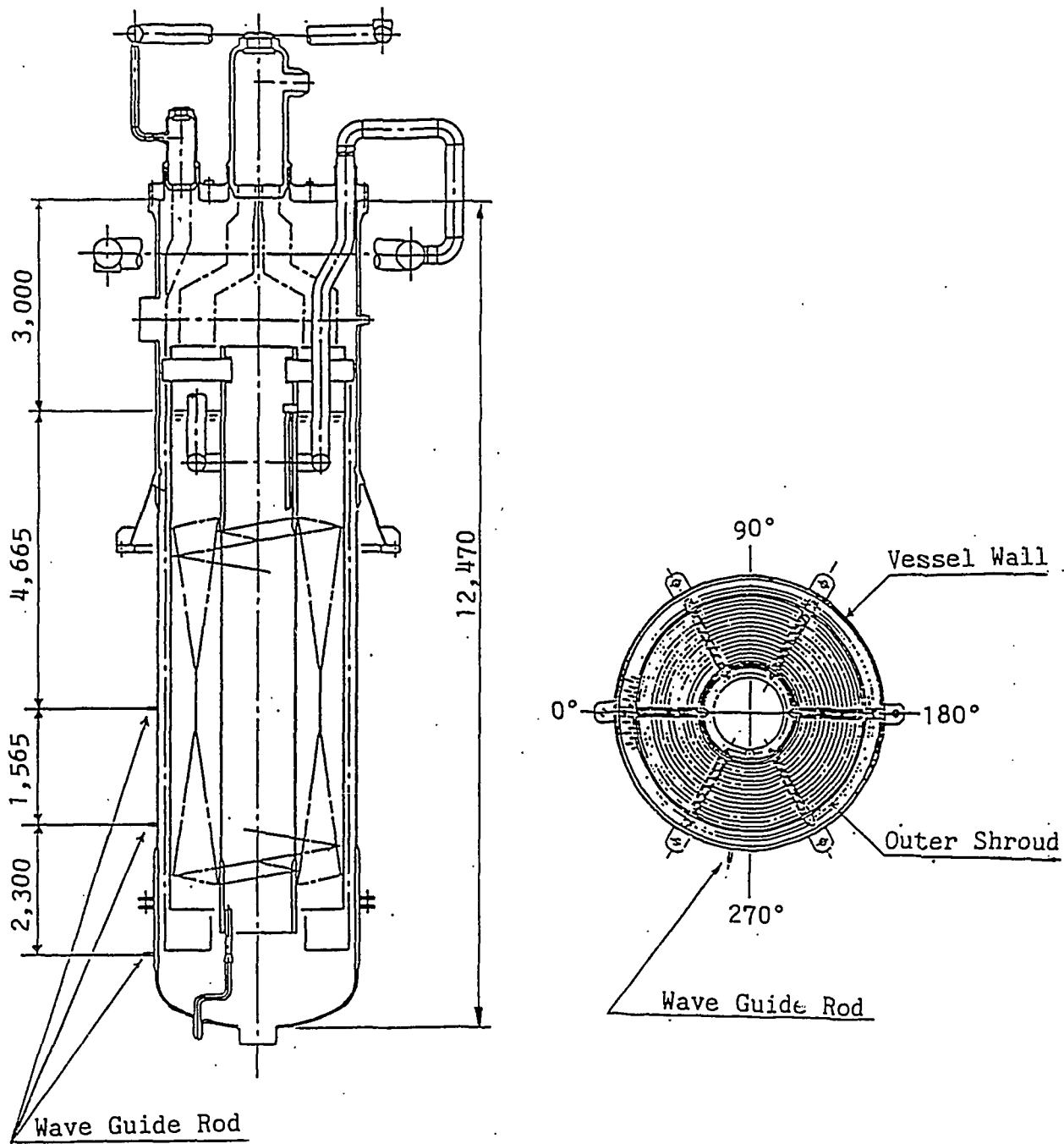


Fig. 1 Acoustic Leak Detectors Location in Monju Evaporator

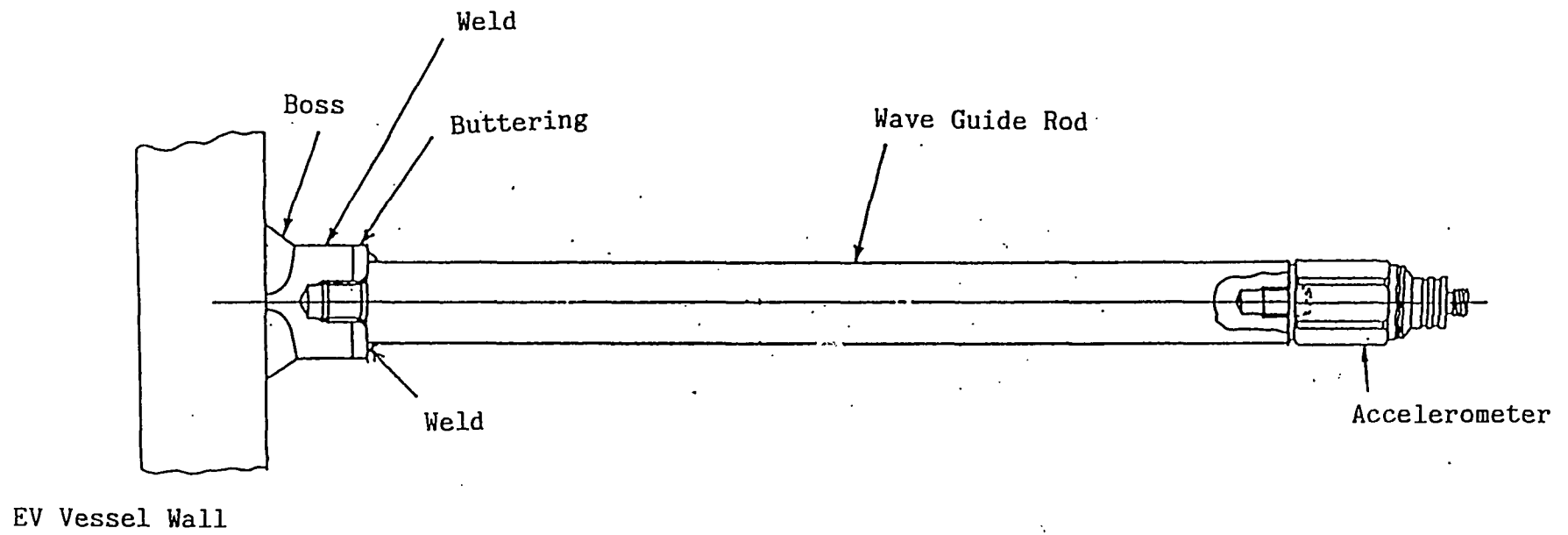


Fig. 2 Wave Guide Rod Mounting on Monju Evaporator

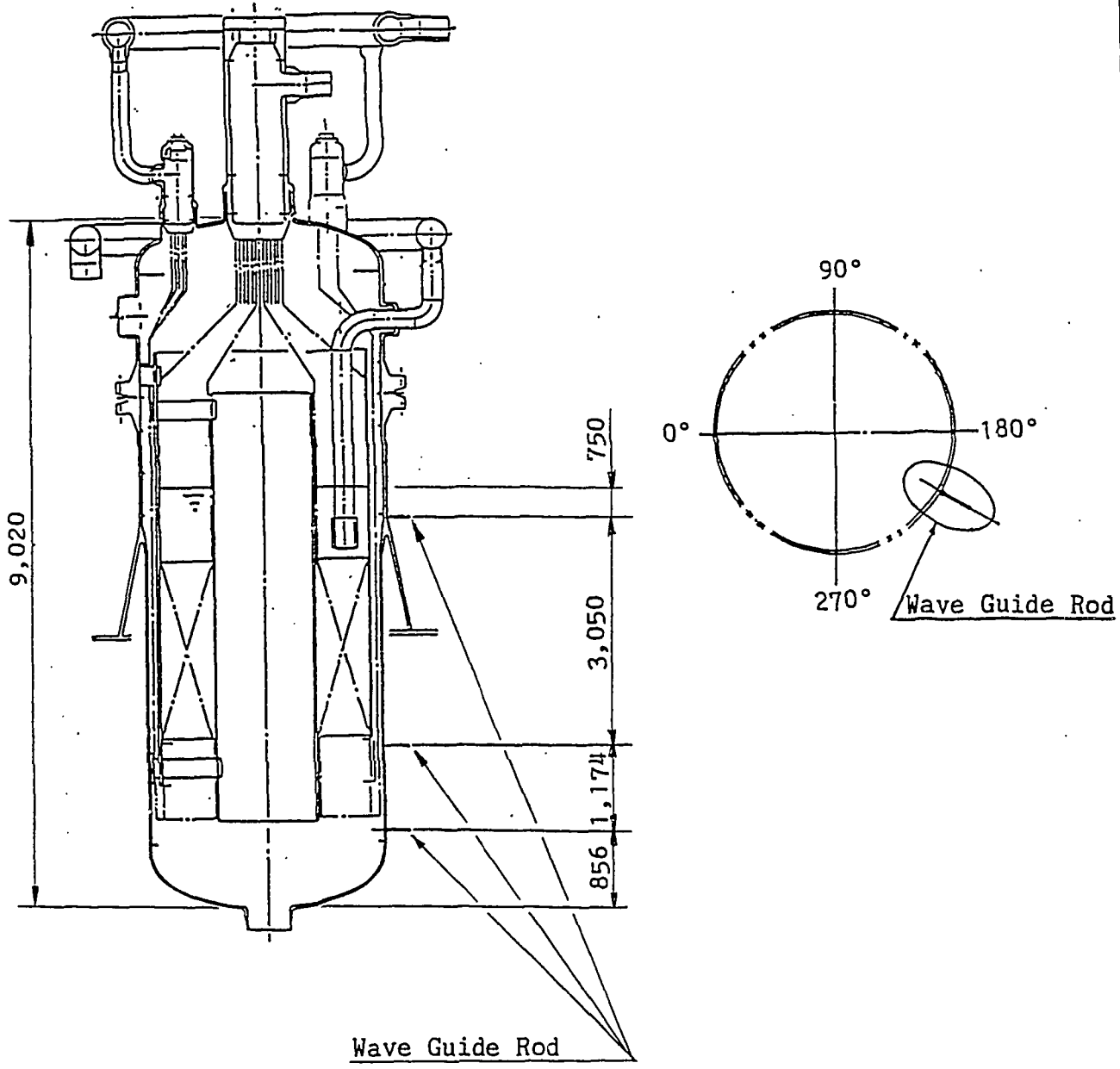


Fig. 3 Acoustic Leak Detectors Location in Monju Superheater

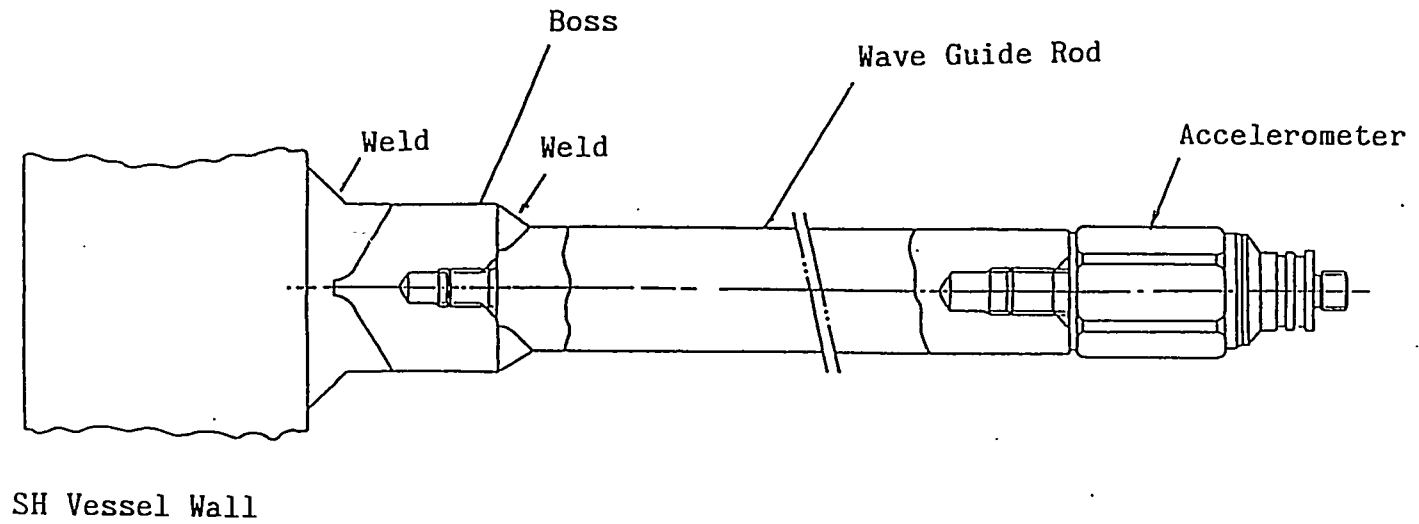


Fig. 4 Wave Guide Rod Mounting on Monju Superheater

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