

# Decommissioning Experience in the IEA-R1 Research Reactor

Wednesday, 25 May 2016 09:00 (9 hours)

## ABSTRACT

The IEA-R1 reactor is a pool type research reactor moderated and cooled by light water, using graphite and beryllium reflectors. The reactor is located in the Institute of Energy and Nuclear Research (IPEN-CNEN / SP), in São Paulo, Brazil. The first criticality of the reactor was obtained on 16 September, 1957. Since the beginning of the reactor operation, the facilities have undergone a decommissioning process on two occasions: one in 1978, when the lining of the pool (tiles) was replaced by stainless steel, then, in the end of 2013, when parts of the cooling primary circuit were substituted. This paper describes these two events.

### 1. INTRODUCTION

During the IEA-R1 reactor operating time, changes were made at the facility, enabling safer operation as well as longer lifetime of the reactor use. These changes began by doubling the cooling system, changing the control desk, the pool lining and part of the primary cooling circuit. The last two items allowed us to gain experience in decommissioning nuclear facilities.

### 2. POOL LINING CHANGE coating e lining são revestimento; verifique se tem uso especial para reator ou use os dois, para evitar repetição

After almost twenty years since the first criticality of the reactor occurred, water leak from the primary refrigerating circuit and through the tiles that lined the pool of the reactor were identified by the reactor operation personnel.

As it would be unfeasible to replace only some tiles, since the identification of each piece would be impossible, the total exchange of the coating was decided, based on the experience gained in other reactors and stainless steel was the material chosen.

After a great load of work and effort, the complete removal of the original tiles and subsequent replacement by a coating of stainless steel plates was carried out. (Fig.1)

The irradiated or contaminated material removed from the reactor pool was dry stored in drums and sent to the Radioactive Waste Laboratory (LRR), located at IPEN-CNEN / SP.

Fig. 1

### 1. REPLACEMENT OF PART OF THE COOLING PRIMARY CIRCUIT

In July 2013, a high degree of corrosion on the pipe supports of the primary circuit of the reactor cooling system was verified. There was, also, corrosion in the flange bolts. (Fig. 2)

In principle, corrective actions were taken to replace the pipe supports and flange bolts. New supports were designed and replaced those which were old; however, when switching the screws it was necessary to use a blowtorch and hard strength, which caused the appearance of microcracks in the welding of the flanges.

The problem was discussed in the reactor internal security committee together with the Nuclear Engineering Center team. In view of the situation, the partial exchange of the piping, improved shelter and re-sizing of the shield showed to be necessary. (Fig. 3)

All piping withdrawn from the section affected was internally contaminated. As the extension of the pipe stretches was long, the pipeline was cut into pieces of 50 cm; after decontamination, some tubes were discarded as scrap and those, whose decontamination was not possible, were transferred to the Radioactive Waste Laboratory (LRR), located at IPEN-CNEN / SP.

### 2. CONCLUSION

The reactor upgrade that was carried out and it is still ongoing allow us to have a projection of operation over the next 10 years. The procedures allowed the reactor operating staff to gain experience in decommissioning nuclear installation and equipment.

It is very important to discuss the possibility of the reactor shutdown in the future and the need to have a decommissioning plan, which should offer the possible options as well as the skilled labor and the necessary funds required.

### 3. REFERENCES

Frajndlich , R., IEA-R1 RESEARCH REACTOR: OPERATIONAL LIFE EXTENSION AND CONSIDER-

**Country or International Organization**

Brazil

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**Session Classification:** Session 4A - Poster

**Track Classification:** Technical and Technological Aspects of Implementing Decommissioning Pro-  
grammes