JOINT ICTP-IAEA WORKSHOP ON PHYSICS AND TECHNOLOGY OF INNOVATIVE NUCLEAR ENERGY SYSTEMS FOR SUSTAINABLE DEVELOPMENT
29 AUGUST - 2 SEPTEMBER 2016, MIRAMARE-TRIESTE, ITALY

Group Activity-II

Invent a Passive Shutdown System

Author: Chirayu Batra & Vladimir Kriventsev

1 INTRODUCTION

In order to enhance the inherent safety of Fast Reactors, innovative reactivity control systems have been proposed for intrinsic ultimate shut-down instead of conventional scram rods, to cope with the potential consequences of severe unprotected transient accidents. Inherent and passive safety features are especially important when active systems such as the SCRAM-systems for reactor shutdown are not functioning properly.

Inherent safety means that the reactor design is such that the plant remains in a safe condition solely on the basis of the laws of nature; these laws ensure that all performance characteristics remain within safe bounds under all conceivable circumstances. The definition of passive safety is broader, and implies that no human intervention, no triggering signals and no supply of external energy are required for the reactor to remain in a safe condition. [1]

One such example is **Lithium Injection Module (LIM)**(Figure: 1.1), in this system if the core outlet temperature exceeds the melting point of the freeze seal, Li^6 is injected by a pneumatic mechanism from the upper into the lower region to achieve negative reactivity insertion and reactor becomes subcritical. [2]

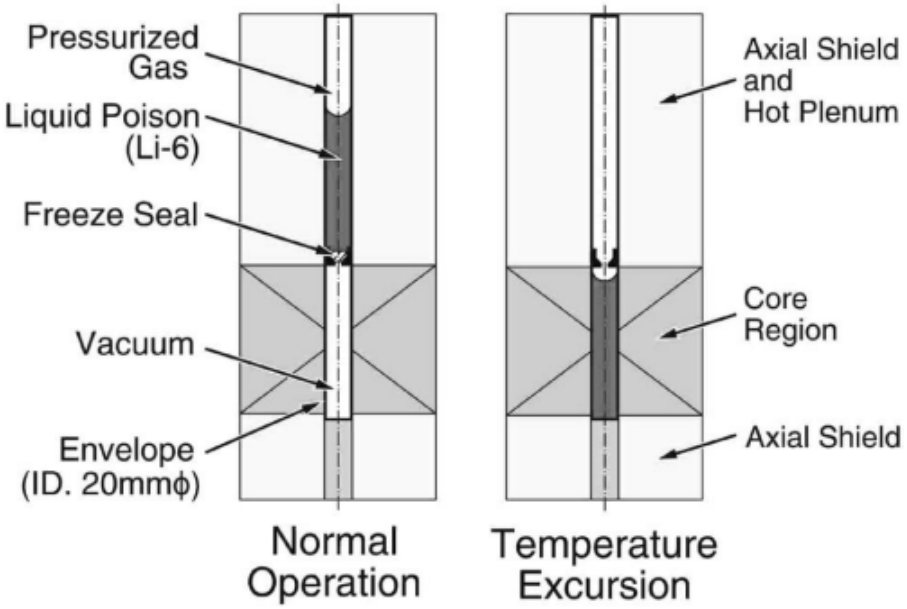

Figure 1.1: Lithium Injection Module (LIM)

2 Exercise Description

Based upon the information given in Section 1, invent a passive shutdown system for a Fast Neutron System.

References

[1] S. Monti, C. Batra *Meeting Report of Technical Meeting on Passive Shutdown Systems for Liquid Metal Cooled Fast Reactors* , International Atomic Energy Agency, Vienna, Austria, 2015.

[2] Kambe, Mitsuru *Fast reactor passive shutdown system: LIM*, 7th International Conference on Nuclear Engineering, Tokyo, Japan, 1999.