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# Design and Development of Stroke Limiting Device for Control & Safety Rod Drive Mechanisms (CSRDMs) of future FBRs

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The core degradation due to Anticipated Transients Without Scram (ATWS) has to be practically eliminated as the fast reactor core is not in its most reactive configuration during normal operation. The ATWS events can lead to early and large release of radioactivity. Deterministic demonstration of dispersal of fuel to avoid further core compaction after initiation of large scale core damage is almost impractical. Hence the following are the important decisions related to shutdown systems for next generation SFRs to facilitate practical elimination of core degradation due to anticipated Transients Without Scram. i) Strengthen the first two shutdown systems by addition of passive/active features. ii) Introduce an additional shutdown system, which is completely diverse, independent, passive & confined within core sub-assembly. This shall come into action on failure of first two systems. In this paper design augmentation of first Active Shutdown system by addition of a safety device is discussed.

The first shutdown mechanism of future FBR is Control and Safety Rod Drive Mechanism (CSRDM). A Stroke Limiting Device (SLD) is provided in CSRDM of future FBR to prevent inadvertent withdrawal of Control & Safety Rods beyond a pre-set level and thereby limit the consequences of inadvertent control rod withdrawal event well within limits even with the failure of other safety actions. SLD limits the consequences of inadvertent withdrawal of CSR by physically limiting the withdrawal stroke length of CSR to 20 mm.

Two different concepts of SLD have been conceived, manufactured and standalone endurance tested. One of them has also been integrated with CSRDM and tested. Based on the above, Mark-II design of SLD with some additional design improvements is being developed. The final design of SLD (Mark - II) will be adopted in CSRDM for future Fast Breeder Reactors. The details of two concepts developed, testing carried out as part of design validation and design improvements being incorporated in Mark-II design are presented in this paper.

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