FABIS
Fast Acting Boron Injection System

Fast injection of boron solution for diversified Reactor Shutdown in case of an ATWS

Reactor shutdown is normally performed by insertion of control rods in the core. If this measure fails, in a so called Anticipated Transient Without Scram (ATWS), a diversified system for reactor shutdown is required. Existing systems only ensure mid term subcriticality of the core by injecting boron into the Reactor Pressure Vessel (RPV) with common pumps. An alternative and faster way of boron injection is required to reach short-term subcriticality.

A high pressure nitrogen-driven tank filled with a boron solution is able to reduce the reactor power in less than 2 minutes. One tank of the Fast Acting Boron Injection System (FABIS) is able to inject the whole amount of boron needed to reach a subcritical state. The boron solution is directly injected into the bypass channels of the fuel assemblies (FA). Hence, the fission chain reaction is stopped almost immediately. The number of active components is minimized in a simplified design to reduce potential failures. The FABIS combines operating experience of a proven hydraulic Scram System design with a new, fast way to reach subcriticality inside the core.

Key features of scope
- Safety assessment and consulting
- System engineering
- Component design, scaling
- Procurement
- Installation
- Commissioning

References:
- Development of KERENA reactor
- Proven design comparable to existing Scram Systems
Safe and simple design

The nitrogen-driven tank has an immanent energy content for fast injection of the boron solution. The system is independent from AC power supply and can be actuated by the Reactor Protection System (RPS) or manually. It contains redundant valves to ensure a reliable opening and also to avoid a faulty opening. The number of active components is significantly reduced (e.g., no pumps). Even in case of loss of emergency power supply, the tank stays pressurized and remains ready for operation.

Your Benefits at a Glance

- Fast boron injection process to directly reach subcriticality of the core
- Fast diversified reactor shutdown to control an ATWS
- After initiation no power supply for boron injection required
- Required injection volume and time can be adjusted

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