

Super Absorber Melt Stabilization

Super Absorbing Polymers to significantly increase the resilience of NPPs against ex-vessel core melt scenarios

Prevent highly energetic fuel-coolant interaction, improve molten corium fragmentation & cooling, retain long-term corium debris coolability

Challenge

Improve resilience of plants without dedicated core melt stabilization system (e.g. core catcher) against beyond design base accidents with reactor pressure vessel failure and ex-vessel core melt scenarios. Reduce risk of highly energetic fuel-coolant interactions and improve fragmentation and coolability of molten core material in the containment.

Solution

Framatome's Super Absorber Polymer Melt Stabilization is a new technology for easy back-fitting of Gen II plants, or to complement other reactor designs, to significantly improve mitigation of ex-vessel core melt scenarios. Super Absorber Polymers are used for coolant conditioning to reduce risk of highly energetic steam explosions, significantly enhance corium fragmentation and coolability while retaining the long-term cooling function of the core material with the available cooling water.

- Water-absorbing particles absorb water of multiple times their weight
- Provide the cooling water bound in super-absorbing material
- De-risk the initial fuel-coolant interaction phase (quenching) to prevent highly energetic steam explosion reactions
- Enhance corium fragmentation and improve coolability of stabilized ex-vessel corium to ensure long-term removal of decay heat

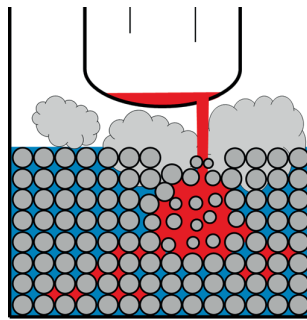
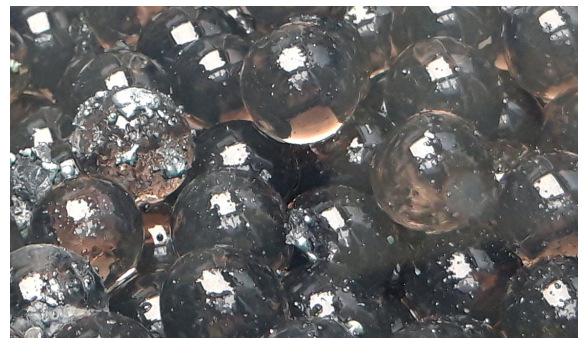


Illustration: Super Absorber Melt Stabilization



Water-saturated super absorber

Technical information

Framatome's Super Absorber Polymer Melt Stabilization:

Radically reduced risk of highly energetic fuel-coolant interactions and significantly enhanced melt fragmentation and cooling. Easy to implement and align with existing accident management strategies.

- Small in storage demand
- Fast absorption of water
- Volume increase by factor ~200
- Polymer in spherical shape

Super absorber beads provide water to quench released corium. Mechanisms leading to steam explosions are suppressed. Mechanical properties enhance corium fragmentation.

Customer benefits

- Dedicated feed and storage system
- Plant/reactor type customized
- Reasonable measure for lifetime extension
- Easy to implement with minimum storage volume requirements
- Plant protection in severe accident situations

Key figures

100 m³ e.g. reactor cavity pool

0.5 m³ storage volume for super absorber material

200x volume increase using super absorber material

Contact: integrated-systems@framatome.com
www.framatome.com

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