SCHOTT Electrical Penetration to safeguard Sweden's Nuclear Power Plant Forsmark 3

SCHOTT's electrical penetrations, based on glass-to-metal sealing, withstand even higher pressures and offer the highest safety standards world-wide

The international technology company SCHOTT is supplying its glass-to-metal sealed electrical penetration assemblies (EPAs) to the Swedish Nuclear Power Plant Forsmark 3 which is undergoing renewed investment to improve its safety and reliability. SCHOTT especially developed a new type of EPA to meet the safety requirements of the Swedish Nuclear Power Plant.

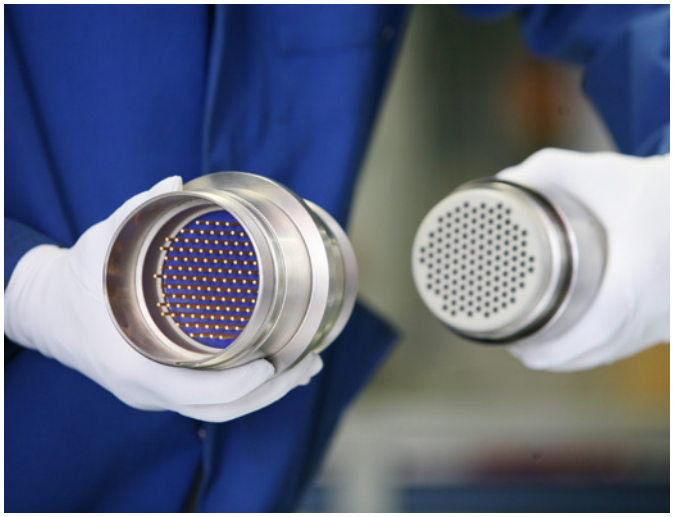
"EPAs are important safety equipment at nuclear power plants", states Thomas Fink, General Manager Nuclear Safety Division of SCHOTT. "Our electrical penetrations are already being used in more than 50 active nuclear power plants throughout the world: They are all uniquely and exclusively based on the unparalleled robustness of our glass-to-metal seal technology which provides considerable advantages over organic epoxy seals. For Forsmark 3, we designed a new generation EPA which can withstand latest Severe Accident (SA) requirements."

This became necessary as the operator of the power plant had defined new and modified safety scenarios, i.e. the EPAs have to be designed to withstand submerged conditions under 13 meters of water for at least 30 days together with pressures of up to 8.3 bar and temperatures up to 185 °C. In addition, the radiological exposure of the penetration during the SA amounts to 1.7 MGy at a dose rate of 2360 Gy/h. The use of inorganic sealing material like SCHOTT glass for the pressure boundary of the EPA minimizes the effect of high radiological exposures.

"For these higher requirements, we designed our new optimized EPAs. They are ready to undergo a complete equipment qualification process, witnessed by TÜV Nord. This includes endurance tests simulating a lifespan of 30 years as well as simulations of Design Based Accidents (DBA) and Severe Accidents (SA) such as flooding and earthquakes"; Fink adds. Once the testing is completed, SCHOTT will be able to offer these high-tech EPAs to other operators of nuclear power plants as well.

Electrical penetration assemblies are the vital conduits for power, control, and instrumentation circuits in nuclear power plant reactor pressure vessels. Their performance is critical to running core functions within the reactor, and their seals must be strong enough to maintain the pressure boundary integrity of the containment vessel in all accident conditions.

SCHOTT's EPAs, designed with superior, redundant, and safer glass-to-metal seal technology, provide considerable safety advantages over organic epoxy seals to ensure the integrity of electrical penetration seals and containment vessels by incorporating inorganic, non-aging glass seals with significant heat- and radiation-resistant properties.



Forsmark Plant

Vattenfall is conducting the most extensive modernization program in the history of Swedish nuclear power at its Forsmark Plant in Sweden, consequently implementing higher safety specifications.

At SCHOTT's own request, their glass-to-metal sealed EPA underwent stringent testing at Wyle Laboratories in Huntsville, Alabama (USA) in 2012 The SCHOTT EPA successfully passed an extensive qualification test program per IEEE Standards 317 and 344, including full survivability in conditions analogous to an earthquake reaching a magnitude of 12 on the Richter Scale.

SCHOTT glass-to-metal sealed electrical penetrations are already protecting nuclear reactors worldwide and are qualified for 60 years of use. The performance range of these electrical penetrations is staggering, having withstood over 400 bar (5,800 psi) and 400 degrees Celsius (752 degrees Fahrenheit) in previous tests.

In contrast, epoxy seals may break down under extreme temperatures and pressures, such as experienced at the Fukushima Daiichi nuclear power plant disaster. While electrical penetrations using organic polymer seals, such as epoxy, meet the current design basis specifications for electrical penetration assemblies in first and second-generation nuclear power plants, nuclear experts have voiced concern that the effects of severe accidents which have exceeded the design basis conditions could compromise the integrity of the seal.

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