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The SF6 Gas Handling and Storage Plant of the MITICA test facility

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The ITER Neutral Beam Injector (NBI) is designed to deliver 16.5 MW of additional heating power to the plasma, accelerating Deuterium or Hydrogen negative ions up to -1 MV with a current as high as 46A (for H2) . To prove the feasibility of the NBI system and demonstrate the achievement of the very demanding performance, a dedicated test facility is under construction in Padova, Italy, named PRIMA (Padua Research on ITER Megavolt Accelerator). PRIMA will host a full-scale prototype of the injector, the so called MITICA (Megavolt ITER Injector Concept Advanced) experiment. The main power supply of the MITICA injector is the Acceleration Grid Power Supply (AGPS), which provides the power to the acceleration grids of the injector. The AGPS is a special power supply with high rated power (about 55 MW), extremely high dc output voltage (-1MV dc) and long duration pulses (up to 1 hour). The AGPS output stage is composed by high voltage equipment such as step-up insulation transformers, diode rectifiers and filters. The diode rectifiers are connected in series at the output side in order to increase the dc voltage up to the required value (-1MV for Deuterium, -870kV for Hydrogen). A -1MV dc transmission line, about 100m long, connects the diode rectifiers to the accelerator via a high voltage bushing. Auxiliary services, such as the cooling water and injector gas, are provided to the injector through the Transmission Line itself.
Due to the high voltage level (1MV dc), the high voltage equipment is designed for pressurized SF6 gas insulation. Diode rectifiers, filters and the transmission line are enclosed within stainless steel tanks to be filled with SF6 gas at 0.6 MPa. Due to the huge size of the installation, and the consequent required amount of gas (about 30 tons), the high voltage equipment is divided into nine separate SF6 gas compartments. The management, handling and storage of the SF6 gas requires a properly designed Gas Handling and Storage Plant (GHSP) which must be able to fill, recover and store the gas at the required pressure from the compartments within a specified time.
This paper describes the design, installation and commissioning of the MITICA SF6 GHSP, currently being procured by DILO gmbh company (Germany). Being a plant for very peculiar and high challenging experimental activity, it can be expected that the SF6 GHSP be operated relatively often during the lifetime of the facility for maintenance and troubleshooting. Considering the above mentioned peculiarity of the installation (big size and need for rather frequent use), the adopted solution relied mostly on flexibility and cost effective off the shelf components to ensure reliability and maintainability, while the layouts of the distribution pipes and of the storage tanks have been customized to the requirements of the site installation, maintenance and operation of the MITICA facility.

Eligible for student paper award?

No

Author: Dr ZANOTTO, Loris (Consorzio RFX)

Co-authors: Dr BOLDRIN, Marco (Consorzio RFX); Dr BRAGULAT, Eduard (Fusion For Energy); MEGLIOLI, Anna (DILO Armaturen und Anlagen GmbH); Dr PAOLUCCI, Francesco (Fusion For Energy); SVENSSON, Lennart (ITER Organization)

Presenter: Dr ZANOTTO, Loris (Consorzio RFX)

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