Status of the R3B GLAD Magnet Cryosystem

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The superconducting GLAD magnet will be one of the major components of the R³B experiment to be installed at FAIR at the experimental area. Within the year 2013 we expect the full magnet, as described elsewhere in this report, to arrive at GSI in Cave C for field measurements and first commissioning experiments. To install and run the magnet in Cave C the magnet has to be provided with liquid Helium and therefore a new cryogenic system has to be installed at GSI target hall.

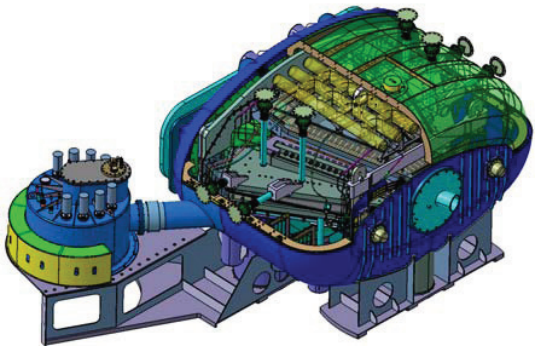

Figure 1: R3B Glad magnet with cold mass inside cryostat [1].

The GLAD magnet will be provided with Helium by a used TCF 50 Helium liquefier (year of manufacture 1986) which was used before for cooling magnets at DESY. The Cryoplant was moved to Darmstadt in June 2012.

The liquefier is currently refurbished and upgraded in collaboration with the Linde Kryotechnik company. These activities comprise, that the liquefier will be equipped with a new compressor, valves, temperature sensors, oil removal system, gas management panel, helium buffer, transfer lines, and control system.

The compressor will be installed outside the target hall on the west side in a 20 feet container. The coldbox and the oil removal system will be located in the target hall next to the Helium liquefier of former FOPI experiment (see figure 2).

Another part of this project is the relocation of the Helium buffers of the FOPI and HADES cryogenic systems and their connection to the R³B Helium Buffer. This is necessary in order to free the space needed to access the construction area, where FAIR site preparations for the HESR will be initiated soon, at the east site of the target hall.

After the successful disassembly and transportation from Hamburg to Darmstadt, oil contaminations stemming from the compressor were detected inside the coldbox. These contaminations resulted in the necessity to perform an extensive cleaning process of the coldbox as small amounts of hydrocarbons on the ppm level are sufficient to cause damages or a drop of cooling power in the system.

To remove the oil, 700 litre of acetone where pumped through different pathways in the coldbox using a special membrane pump at enhanced safety measures. Thus, the oil could be dissolved and eventually removed from the pipes.

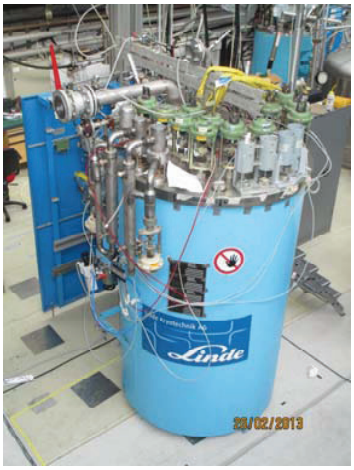

Figure 2: Linde TCF 50 Coldbox.

The full cryogenic system for the GLAD magnet will be equipped with a novel automation. In the course of the refurbishing and upgrade process, sensors and actors will be exchanged. The CERN build Framework „UNICOS“ is being used for the new control and data acquisition system. This can be seen as preparatory work for novel control systems to be established for the FAIR systems. We will use this to gather experience for this Control System, which will serve as basis for FAIR Automation. The GLAD Magnet cryogenic system will be the first system at GSI which will be controlled by UNICOS. The refurbishing will be used to test sensor and actor types for later use in other FAIR cryogenic systems.

Outlook

The delivery of the compressor container is expected for May 2013 and the delivery of the magnet for October 2013.

References

[1] P. Graffin et al., 22th International Conference on Magnet Technology, September 12th - September 16th 2011, Marseille