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Son, The Netherlands – April 4, 2011

Cooling systems for large scale HTS projects

Proof of concept for HTS cooling requirements

Anticipating the high reliability & low maintenance requirements of the developing HTS market, DH Industries in the Netherlands started designing novel skid-mounted cooling systems in 2007 based on their well proven SPC-4 cryogenerators. The 20-30 kW @ 77K systems are intended for use in large scale HTS projects and are completely pre-assembled and tested with tanks, heat exchangers, pumps and piping.

Smart design and redundancy allow for large scale 24/7/365 refrigeration guaranteeing continuous cryogenic cooling of HTS cables and avoidance of burnouts.

Proof of concept can be found in Italy where NLGS INFN studies neutrinos by means of the ICARUS project. A 600 tons high purity liquid Argon vessel is used containing the neutrino detector with a maximum heat load of 30kW at 89K. The system is cooled with a liquid nitrogen loop. As the project needs to operate non-stop for approximately 10 years and is located in a confined space (cave), reliability and redundancy of the cooling system is of vital importance. These very strict and challenging requirements closely resemble the demands for HTS applications.

The system is equipped with a modern self learning artificial intelligence system operating each component individually and thereby meeting the demands of the moment and running highly reliably without the need for continuous supervision.

Moreover, the design engineers at Stirling Cryogenics and CryoZone incorporated the possibility to decouple each single component without any interruption of the required cooling power and without need for bulk supply backup. The result is a fully redundant and independent system.

At the time this article is published the system has been in continuous operation for more than a year and has proven to perform flawlessly even after a dramatic high intensity earthquake occurring in the region.



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Further information / press contact

Stirling Cryogenics BV
Norman Quast
Science Park Eindhoven 5003 – 5692 EB Son (The Netherlands)
Tel.: +31 40 2677 330
Fax: +31 40 2677 339
E-Mail: n.quast@stirlingcryogenics.com
www.stirlingcryogenics.com