

Cold Facts Visits DH Industries, Stirling and CryoZone



On September 23 we visited Eindhoven, The Netherlands, and the facilities of CSA Corporate Sustaining Members DH Industries, Stirling Cryogenics and CryoZone. We were first welcomed at Stirling Cryogenics by Edo Oliemans, General Manager, and Erik Haenen, Senior Research Engineer. Later we also spent some time with Owner and Group Director Ronald den Heijer.

situations. There are four basic helium-filled cryogenerator types. Their products are sealed systems reaching 20-30K using gaseous helium cooled by an internal helium loop.

CryoZone delivers custom-made cryogenic solutions that are ready for use as functional hardware. This makes their products and systems ideally suited for OEM system builders. The motto of CryoZone is commitment to getting the job done, and the same commitment is expected from clients in return. They are convinced that a working relationship with clients based on a high level of communication and cooperation is the basis for their success.

DHI is a system integrator of these two suppliers' components. In the US and Canada, DH Industries USA Inc. is the official supplier for both Stirling Cryogenics and CryoZone.

Stirling Cryogenics' primary business serves the artificial insemination, cryobiological and dairy industries as well as providing equipment for the storage of blood samples for HIV research. Another market is manufacture of space simulation chambers, which right now is seeing considerable growth.

The company provides both open and closed systems for use in High Temperature Superconductivity (HTS) applications. As Haenen discussed in a paper presented at an evening session on cryocoolers held at EUCAS/ISEC/ICMC, the company is also getting involved in providing cryogenic cooling solutions for power transmission and storage using HTS materials.

The proposal in the

paper was that using HTS, compact underground stations can be located within power grids at some distance from the source. The skill needed is to achieve low temperatures and to keep it there.

Reliability is of the essence. Haenen said that Stirling and CryoZone have the ability to contribute to the commercialization of reliable HTS power grids—at this point over small distances, but with longer distances possible in the future.

According to Haenen the demand for HTS is growing. The physical area available for power infrastructures is typically limited and HTS is a solution, as it can achieve ever smaller footprints. Fault current limiters will combine with HTS cables to serve energy transmission and storage. He believes that actually very few people understand what happens when things get cold. Stirling does; they are experts in the process of getting cold and keeping it cold as efficiently as possible.

The company also serves the space industry. Space simulation chambers need well-distributed cold. DHI provides cooling solutions for simulation chambers for testing space machines and systems. They can build the first stage economically and expand the capacity of helium liquefiers by precooling gas.

Of interest is a technical paper, "Recirculating Liquid Nitrogen System for Operation of Cryogenic Pumps," presented at the 32nd International Electric Propulsion Conference by A.W.



From left, Erik Haenen, Senior Research Engineer; Ronald den Heijer, Owner and Group Director, and Edo Oliemans, General Manager, with Cold Facts. Behind them is a map showing their worldwide sales reach.

Stirling Cryogenics was founded in 1990 as a spinoff of Philips. In the late 1990s den Heijer got full ownership of the company and founded DH Industries. DH Industries is a full-range cryogenic service provider. Therefore DH Industries is comprised of three different companies, all with their own cryogenic expertise:

Stirling Cryogenics: design and production of Stirling cycle based cryogenerators and customized closed loop cryogenic cooling systems.

CryoZone: creative cryogenic experts specializing in the control and circulation of cryogenic fluids and gases, such as LN₂ and GHe, to cool and heat applications.

Combined Technologies: responsible for corporate technology research into new applications and machines.

Stirling Cryogenics supplies highly reliable, modular cryocoolers of varying capacity. Stirling's standard products can be customized and adapted to existing



Fabrication area.

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Stirling's final test area.

Kieckhafer and M.L.R. Walker of the Georgia Institute of Technology. It describes a system manufactured by Stirling Cryogenics and handled by DH Industries USA.

The authors say that “cryogenically pumped electric propulsion facilities (EP) achieve very high pumping speeds through the use of multiple pumps simultaneously operated within the same vacuum chamber. Cryopumps are ideal for EP use as they have high pumping speeds, can be mounted at any location in a vacuum chamber, contain no oils or greases which may contaminate the thruster or cathode, and can achieve extremely low base pressures. A very high pumping speed is required in EP research in order to maintain a low facility pressure while the thruster operates, which is required for accurate performance and plume measurements.”

Cryopumps of course require a constant supply of LN₂, often provided by use of bulk storage tanks. The paper, however, found that “the addition of the Stirling SPC-8 cryogenerator system...proves that there is a closed-loop LN₂ alternative to costly and inconvenient bulk storage tanks.” Not only did the Stirling equipment meet the cooling needs, but the system “is fully automated and can be left active for long periods of time with no operator interaction.”

The authors concluded that “the advantages of a closed-loop LN₂ system

justify the extra expense of installation and the long cooldown times...it pays for itself...A closed-loop system with a nominal storage tank always has LN₂ available for delivery...No energy is wasted cooling nitrogen that is already a liquid. The cryogenerator system removes the cost and logistical issues associated with LN₂ supply to a cryopump radiation shroud, and replaces them with a nearly unlimited LN₂ supply available at the push of a button.”

Other projects the company has been involved with include supplying the detector system for neutrinos at SNOLAB, where they cool to 74K in a former nickel mine. SNOLAB is a Canadian underground physics laboratory at a depth of 2 km in Sudbury, Ontario. The original Sudbury Neutrino Observatory experiment has ended, but the facilities have been expanded into a permanent underground laboratory.

DHI also worked on the detector cooling system for the Large Binocular Telescope (LBT), an optical telescope for astronomy located on 10,700-foot Mount Graham in the Pinaleno Mountains of southeastern Arizona, and is a part of the Mount Graham International Observatory.

The LBT is currently one of the world's most advanced optical telescopes; either of its mirrors taken alone would be the largest optical telescope in continental North America.

Stirling Cryogenics successfully designed and built the cooling system for the ICARUS project, which is being carried out by the INFN in Italy. This fully self-controlled system of twelve 4 kW cryogenerators is built to cool 400,000 liters of liquid argon to exactly 94K for at least 10 years. The ICARUS experiment detects neutrinos from the sun in order to determine their physical properties. See a video at www.youtube.com/watch?v=Lp8S3iGS-EU.

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