



Design and Application of Cryogenic Valves 8
Fermilab Celebrates 50th with 10,000 Guests ... 18
Advanced Cryogenic Machining Technology 28

Tissue Engineering with 3-D Cryoprinting 32
Elective Freezing of IVF Embryos 35
2017 Nobel in Chemistry Honors Cryo-EM 36

Cold Facts

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NASA Completes SLS Core Stage Hardware | 30

Volume 33 Number 5

CERN Focuses on Developing Pressure Relief Safety Tool

Over the past couple of years, CERN has focused its R&D in the field of cryogenic safety on addressing the excessive pressure hazard—and consequent sizing of pressure relief devices—associated with low temperature cryogenics. From that effort, researchers have developed a new project with the aim of gathering experimental data to improve the current state-of-the-art sizing approach for pressure relief devices.

The data is analyzed in Kryolize Professional, a new software tool designed for sizing the pressure relief devices that protect cryogenic vessels against excessive pressure (beyond mechanical limits), preventing rupture, collapse or even explosion. It's a new CERN technology, tailored for the LHC, but with a wide range of potential applications.

The software implementation and methodologies are based on International (ISO), European (EN) and American (API) standards and literature publications, absorbing the best state-of-the-art approach from each standard, according to Andre Henriques, project leader for Kryolize.

Researchers originally conceived Kryolize in response to specific needs at CERN to develop safety devices for use at the very low temperatures of liquid helium. There are some 120 tons of liquid helium in use at the LHC, cooling 36,000 tons of superconducting magnets to just 1.9°C above absolute zero.

“Kryolize fills a very important niche,” says Henriques. “There are standards in industry, but they are not fully tailored to the very low temperatures we work with. The unique benefit of Kryolize is that you can use it for any kind of cryogenics, from liquid helium to liquid argon or nitrogen.”

Kryolize is supported by the Knowledge Transfer (KT) group at CERN and funded in part by a grant from the facility's KT Fund. Major goals for the project include experimental verification

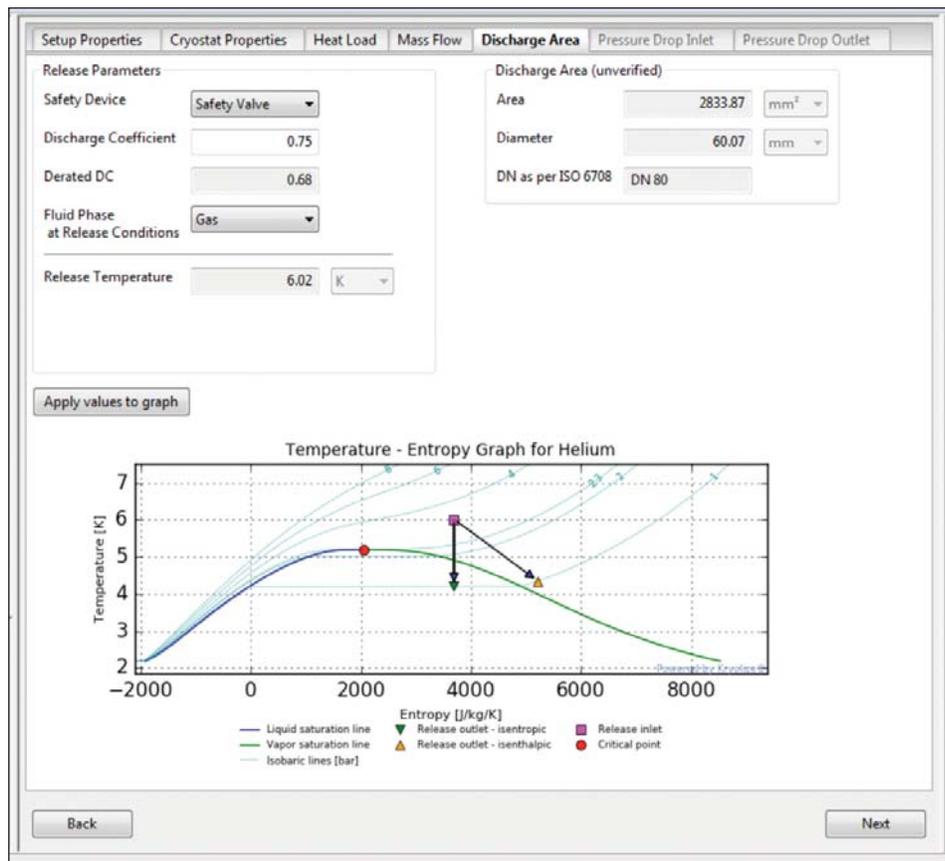


Figure 1. Screen capture of Kryolize software. Image: Andre Henriques/CERN

of the cryogenic parameters used within the tool and continuous software development and harmonization of the graphical user interface. Henriques says excellent progress has been made on both fronts, the former via collaboration with the Karlsruhe Institute of Technology (CSA CSM) in Germany.

In 2014, the CERN KT group sought trademark protection for the Kryolize name and since 2015 the tool has been increasingly distributed both at CERN and through licenses to other research laboratories and industry partners. The software is currently available as version 1.0.1, but Henriques anticipates the release of a new version by the end of the year that will address user feedback and demands. “We continue to receive ideas for further improvements and features, and by the end of 2017 we aim to release a new version that also covers

the sizing of relief devices for vacuum vessels.”

Henriques expects the project to expand, covering additional applications in the cryogenic and superconductivity domains. Many of those applications were discussed in September 2016, when some 120 experts in cryogenic safety came to CERN for a cryogenic safety seminar, the first offered at the facility. For three days, participants discussed research and challenges, mulling over regulatory frameworks and visiting cryogenic installations at CERN.

Henriques says the event could be the first in an international series, helping ensure that safety is fully factored into any new project from the beginning. “The event just shows that cryogenic safety is every bit as important as the development of new cryogenic technology.” <https://kt.cern>, Nick.Ziogas@cern.ch. ■