Weisend II *EPJ Techn Instrum* (2021) 8:14
https://doi.org/10.1140/epjti/s40485-021-00071-w

EPJ Techniques and Instrumentation

EDITORIAL Open Access

Instrumentation and control of large helium cryogenic systems

J. G. Weisend II*

*Correspondence:
JohnG.WeisendII@ess.eu
Lund University, European Spallation Source ERIC, P.O. Box 176, SE-221 00 Lund, Sweden

Large-scale cryogenic plants, typically producing a mixture of helium refrigeration and liquefaction, are a vital part of many scientific facilities. These plants, which may provide up to 10 kW of cooling at temperatures as low as 1.8 K, cool the superconducting magnets and superconducting radiofrequency cavities that are at the heart of modern particle accelerators; such as the Large Hadron Collider (LHC), the European X-Ray Free-Electron Laser (European XFEL), the Spallation Neutron Source (SNS) and the European Spallation Source (ESS) and fusion reactors such as ITER and SPARC. Almost all of the proposed large scale accelerators and fusion facilities require such cryogenic plants.

Reliable and preferably near-autonomous operation of these cryogenic plants are important requirements and this is where their control systems become significant. The control system must reliably maintain the plant's proper operation under changing conditions. Alarm notification, data logging and connection to the broader accelerator or reactor control system are also required. There is no one single way to accomplish these requirements. The control systems may be provided by the cryoplant supplier, by a third party vendor or entirely provided by the scientific facility in which they are located. In some cases, community wide standards such as EPICS may be used.

The goal of this topical collection is to provide an overview of the status of the control of large-scale helium cryogenics plants. It includes details and experience from existing facilities: Spallation Neutron Source (SNS), LHC and the Beijing Electron Positron Collider (BEPCII) as well as from facilities under construction such as ESS and the Shanghai High repetition rate XFEL and Extreme Light Facility (SHINE). Care was taken to solicit papers from around the world and the collection has contributions from the USA, Europe and Asia.

These papers show the complexity of reliable control systems for large-scale cryogenic plants. The time and resources required for such systems should not be underestimated in project planning.

It is hoped that this issue will provide readers with valuable lessons learned, possible options and references for any future cryogenic plant control system that they may wish to implement.

Acknowledgements
None provided.

Authors' contributions
The section EiC is the sole author. The author(s) read and approved the final manuscript.

Funding
None.

Availability of data and materials
There are neither data nor other materials associated with this article.

Declarations

Competing interests
The author declares that the author has no competing interests.

Published online: 17 August 2021

Publisher's Note