Cockcroft Institute Colloquium

Cryogenic System for the CEBAF -12 GeV upgrade at J-lab

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Tuesday 05th October 2010, 15:00
Walton Rooms A & B, The Cockcroft Institute

Abstract

The planned upgrade of JLab's electron accelerator (CEBAF) to double the beam energy from 6 to 12 GeV requires the addition of 10 cryo-modules (CM's) with four times the accelerating power of the original CM's. To support the additional CM heat load, the existing helium refrigeration system capacity must be doubled. That is, the refrigeration capacity (at 2.1 K) from 4.6 kW to 9.2 kW and the shield (35 – 55 K) from 12 kW to 24 kW. The original cycle on the existing plant has been changed to JLab's "Floating pressure - Ganni cycle" technology, to allow the input power to reduce in proportion to the load. It is anticipated that the power requirement for the new refrigeration system will be two-thirds of old refrigeration system with both supporting the 12 GeV operation and both using the floating pressure – Ganni cycle technology. The presentation will be centered on the planning of the JLab 12 GeV Cryogenic System and its present status. In addition, selected other projects in the US which have benefitted from this technology developed by JLab will also be explained.

Rao began his cryogenic engineering career in industry thirty years ago at CTI/Helix Process Systems which became Koch Process Systems (KPS). From KPS he was appointed as the head of the cryogenic engineering department at the SSC (Superconducting Super-Collider). After SSC, he joined the JLab Cryogenics Group where he is presently working as a deputy Cryogenics Group Leader. He is a Fellow of the CSA and has received a number of awards including DOE Office of Science Pollution Prevention and Environmental Stewardship P2 "Best in Class" award and the 2007 White House Closing the Circle Award. He is also providing thesis work advice and guidance to graduate students with research projects related to cryogenic systems engineering and design. He has delivered the CSA sponsored course "Design and Operation of Optimal Helium Refrigeration and Liquefaction Systems" at several Cryogenic Engineering Conferences (CEC).