ESS Cryogenic System Process Design

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Abstract - The European Spallation Source (ESS) is a neutron-scattering facility funded and supported in collaboration with 17 European countries in Lund, Sweden. Cryogenic cooling at ESS is vital particularly for the linear accelerator, the hydrogen target moderators, a test stand for cryomodules, the neutron instruments and their sample environments. The paper will focus on specific process design criteria, design decisions and their motivations for the cryoplants and on auxiliary equipment. Key issues for all plants and their process concept are energy efficiency, reliability, smooth turn-down behavior and flexibility. The accelerator cryoplant (ACCP) and the target moderator cryoplant (TMCP) in particular, need to be prepared for a range of refrigeration capacities due to the intrinsic uncertainties regarding heat load definitions. Furthermore questions regarding process arrangement, 2K cooling methodology, LN2 pre-cooling, helium storage, helium purification and heat recovery will be addressed.

Keywords (Index Terms) – European Spallation Source, ESS, cryoplants, helium, refrigeration.