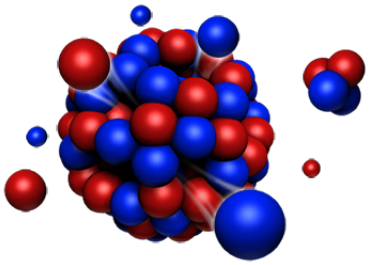

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Solving Process Instrumentation Challenges for the ESS Target Safety System

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The European Spallation Source (ESS) will be a 5 MW neutron spallation research facility where an energetic proton beam incident upon a helium-cooled tungsten target is converted to neutron beams. From a radiation safety perspective, the helium cooling system, the tungsten wheel rotating system and the vacuum in the monolith vessel containing the tungsten wheel concentrate the most critical parameters. Helium gas mass flow, pressure and temperature will be supervised for the cooling system. In addition, the rotating speed of the tungsten wheel and the pressure inside the monolith vessel will also be supervised. Each of these parameters are instrumented in the Target Safety System (TSS), a defense-in-depth, level 3 safety interlock system designed to protect the public and the environment from a release of radioactive material from the facility.

Selecting field instrumentation to supervise these process parameters and meet the requirements of the safety system design comes with several challenges. Inherent to the monitoring of the helium process is the need to select suitable equipment for combining the necessary process information needed to calculate the mass flow (static pressure, dynamic pressure over a venturi tube, gas temperature, and data on helium density at different temperatures). In addition, instrument location options are limited and the instrumentation environment is often harsh. Finally, diversity requirements for the safety system design mandate that the instruments monitoring pressure in the monolith and helium systems must be technically different.

This paper will describe the details governing the selection of the field devices needed for the target safety system, TSS, along with the environmental qualification process for the chosen devices.

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