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Overview of process control strategies for typical helium cryogenic warm compression stations at CERN

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Helium cryogenic systems are extensively used at CERN under several configurations for CERN accelerators and detectors. The Warm Compressor Station (WCS) is the primary component of the helium cryogenic systems. The basic controls structure mainly depends on the bypass, charge and discharge valves configuration ensuring the nominal flow and compression ratio. This paper presents three studied methods for the WCS process control systems covering all transient and operational requirements: the PI(D) Control approach, the Fuzzy Logic Control approach (FLC) and the Internal Model Control approach (IMC). The paper emphasises on simulation results of the different control strategies using Ecosimpro software associated to the CERN CryoLib library. Advantages and limitations of each method are presented.

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