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## **C3Po1A-09 [16]: Simcryogenics: a Library to Simulate and Optimize Cryoplant and Cryodistribution Dynamics**

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In many fields of engineering, conception and operation teams need to perform simulations in order to design systems fulfilling the user requirements and to operate the systems efficiently. To simulate a cryogenic plant and its distribution to the end-users, a large number of commercial or homemade tools are nowadays available. However, there is a lack of available solutions for quick dynamic simulations for both control with model-based design and design optimization through parametric studies. This article presents the Simcryogenics library that has been developed at the CEA Cryogenic Engineering Department for several years. This library aims at generating model-based control schemes for cryogenic plants that are subject to high disturbances (such as the pulsed heat loads in fusion reactors or particle accelerators). The library is based on Simscape, the modelling language extension of the Matlab/Simulink software suite, which is very flexible and well documented. This paper introduces how Simcryogenics works, how to use it, and it provides examples of applications such as the modelling of warm compression stations and cold boxes, the simulation of the cooling of superconducting magnets and RF cavities, the generation of control schemes, the debugging and validation of the process logic control.

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