Dynamic modelling of a Condenser with the ThermoSysPro Library

Baligh El Hefni **Daniel Bouskela**
EDF R&D
6 quai Watier, 78401 Chatou Cedex, France
baligh.el-hefni@edf.fr daniel.bouskela@edf.fr

The condenser is a **two-phase** shell-and-tube heat exchanger. The feedwater flows inside the tube bundle, while the steam and condensate flows outside of those tubes located inside the cavity. In the condenser, there are two zones: the desuperheating zone and the condensation zone.

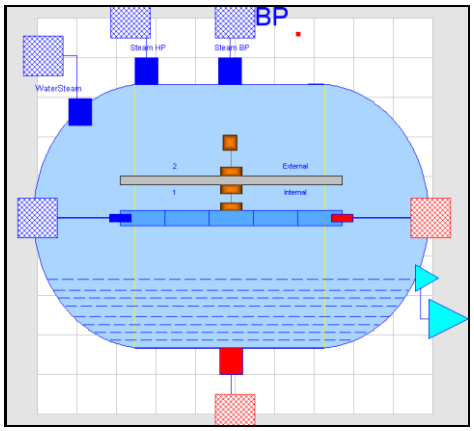
The condenser is an important device for the operation of power plants in particular for pressurized water reactors. Undesirable transients may lead to the automatic shutdown of the power plant.

To simulate the complex dynamic physical behaviour of the condenser, a dynamic model has been developed using Modelica. The component model is meant to be used for power plant modelling and simulation with the ThermoSysPro library developed by EDF and released under open source license.

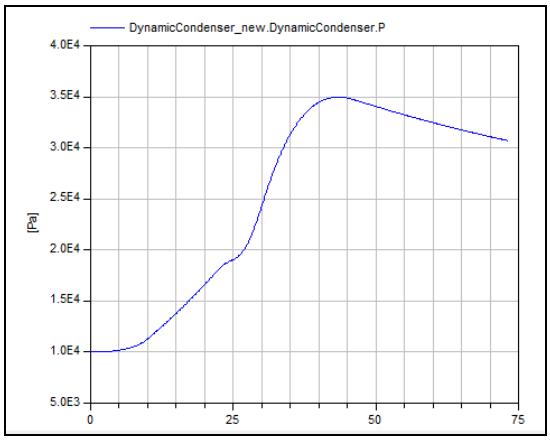
The transient most unfavorable to keeping the integrity of the condenser vacuum is the loss of the cold source pumps followed by a turbine trip and a missed islanding (house load operation).

The objective is to study the evolution of the pressure of the condenser for this kind of transients. During the transiernt, the condenser pressure should be always less than 5e4 Pa.

The present paper describes in detail the condenser model: hypothesis, governing equations, correlations and the test-case (structure of the test model, the parameterization data and the results of simulation).



Icon of the component model



Evolution of the pressure inside the condenser

References

[1] Collier J.G., and Thome J.R., 'Convective Boiling and Condensation', Mc Graw-Hill Book Company (UK) limited, 1972 Clarendon Press, Oxford, 1996.

[2] Patankar S.V., 'Numerical Heat Transfer and Fluid Flow', Hemisphere Publishing Corporation, Taylor & Francis, 1980.