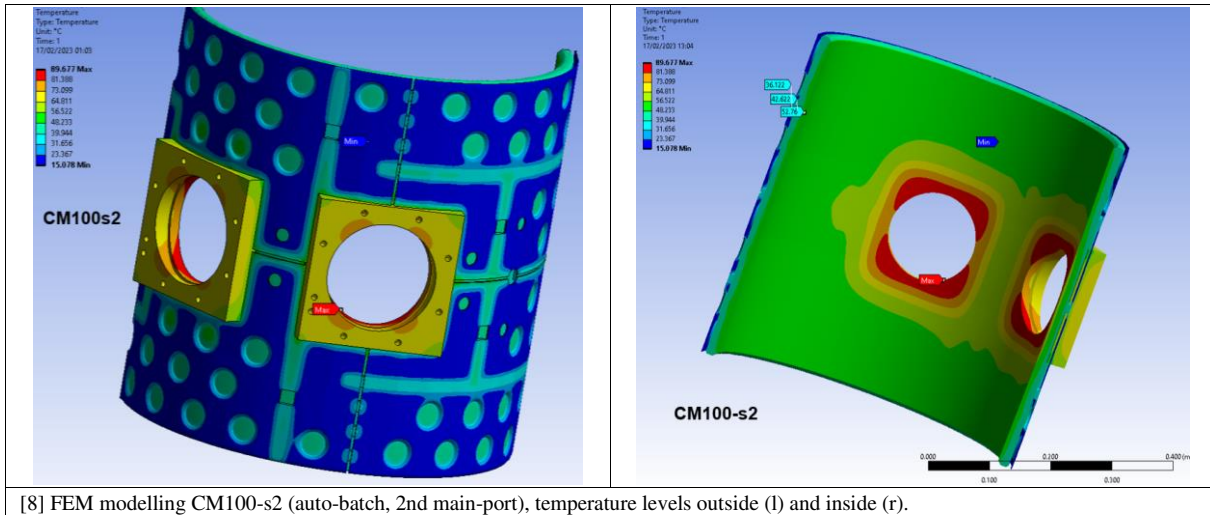


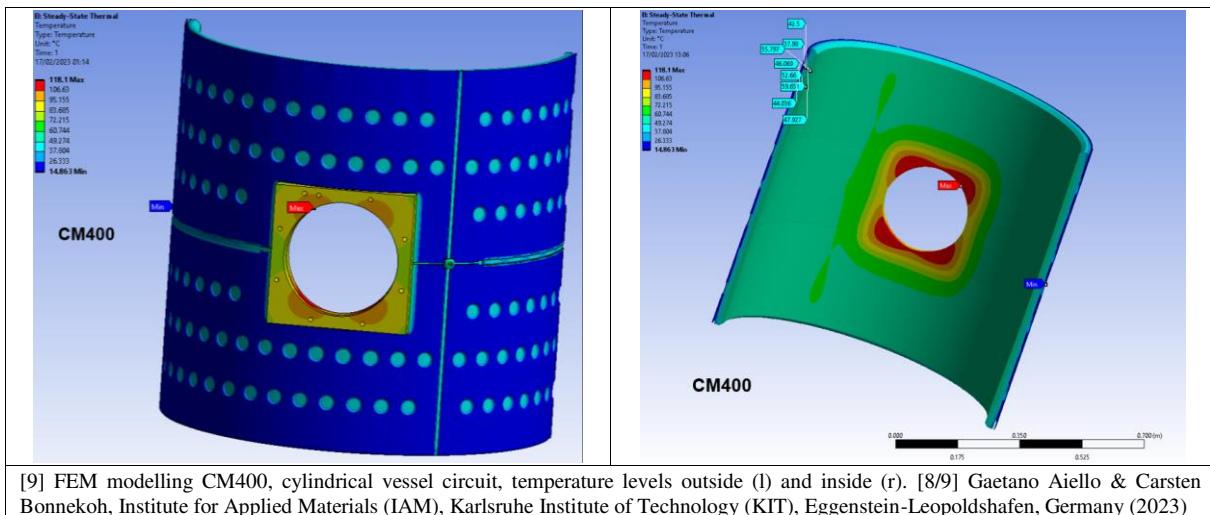
HKP in the Simoloyer®

Heating vs. Cooling at Scale-up, FEM analysis CM100/400

To further confirming predictions under [7], a comparative FEM-study was performed on CM100 vs. CM400 scale. In result, the critical outer cooling jackets of the vessel cylinder, where most heat is generated, do show appropriate functionality. The super-critical main-port frames, that are not directly cooled, are approved within a temperature range of <80°C at CM100 and <100°C at CM400 respectively.



On the inside cylinder surfaces, peak-values of 50-60°C remain within the estimated range for both, CM100 and CM400. However, the inside faces of main-port frames, at CM100 scale is identified close to maximum at 89.7°C peak, which is just acceptable. As for CM400 scale, handling tolerance is exceeded at a given peak-value of 118.1°C. The deviation CM100 vs. CM400 at 24% higher temperature level at the no-cooling sectors approximately confirms the deviation calculated under [7] in a good match.



In result, CM400 vessel will be equipped with a separate blind-lid cooling for each of the main-ports, which for batch-operation under open atmosphere appears ultimate. For processing under vacuum or inert gas, the continuously installed drain-grating with adapted air-lock provides suitable heat transfer. For the protection of human and hardware, an additional cooling circuit, built into the shield-plates of each drainingrating is to be considered, further measurement in progress.

