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Parallel Finite Element Approach for large Thermal Problems Applied to Glass Bending Furnace

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Abstract **-** In this paper, iterative sub-structuring methods are applied to an FEM discretized model of an industrial glass thermoforming furnace. The FEM-based model is dubbed the component interaction network (CIN) and has been previously used in many thermal problems modelling. Applying iterative sub-structuring methods to CIN led to the creation of multi-CIN, used for large heat problems, in particular the glass thermoforming furnace problem. The substructures are then simulated simultaneously using the same direct thermal solver used for the general problem. Multiprocessing technology was exploited for parallel solving of the sub-structures, while a coupling algorithm handled interfacial coupling. In addition, a time-marching scheme was developed, including a coarse numerical problem solving for stabilization phases and adaptive time stepping for stable repetitive phases. The model was compared to the experimental measurements. The results were met with good reproduction of the thermal behavior of the components and acceptable accuracy.

Keywords**:** Domain decomposition, Energy optimization, Heat transfer, Numerical modelling