ANALYSIS OF CONJUGATE HEAT TRANSFER IN STEEL REHEAT FURNACES WITH FOCUS ON DETERMINATION OF RADIATIVE FLUX

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Heat Transfer has been analyzed in a simplified steel reheating furnace with Open Source tools. First, the furnace geometry is constructed and hexahedral meshing is done with Salome[1]. The differential approximation to the method of spherical harmonics (P1) is utilized to model radiative transfer, where the participating gaseous media is modeled as a Weighted Sum of Grey Gases and as a k-Distribution[2]. These two models were implemented in OpenFOAM[3], and the P1 method was modified to work with such global absorption emission models. The simulation is performed with a steady-state heat transfer solver for buoyant, turbulent flow of compressible fluids, including radiation - buoyantSimpleFoam. The flow field and temperature distribution are finally computed and the radiative flux is scrutinized which leads to further work.

In both WSGG and k-Distribution models, the weights for emissivity and absorptivity are allowed to depend on wall and gas temperatures. The weights for WSGG were evaluated from curve fit parameters proposed by Smith *et al.* [4], while the parameters for k-Distribution have been taken from Modest *et al.* [5].

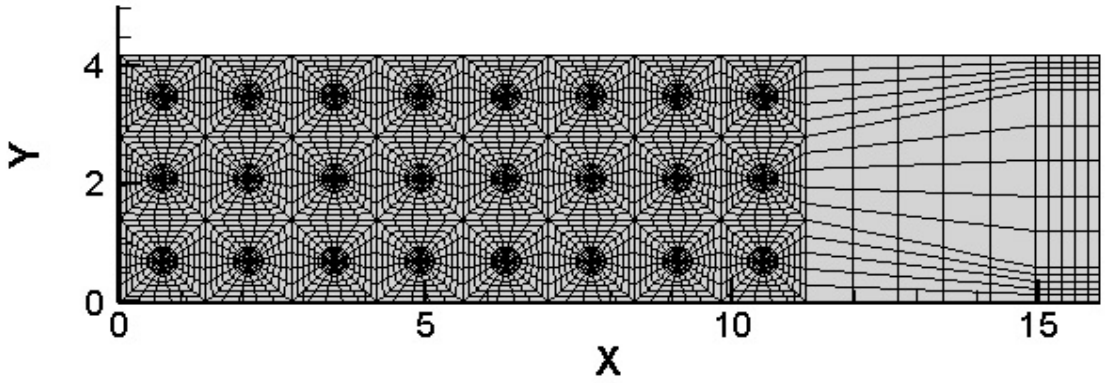

Figure 1. Mesh of the furnace, with 39,750 cells

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