

Industrial Case Study (Dynalabs, Poland – Heat Exchanger)



Dynalabs, Krakow, Poland is a consulting company specialized in the designing of energy efficient heat exchangers as well as the vibration and noise reduction devices.

When ATS Stahlschmidt & Maiworm Aluminum Wheels Foundry (part of the Uniwheels Group) needed to reduce the production costs, Dynalabs presented their bid for the design and construction of a heat exchanger for continuous recovery of waste heat for one of the foundry's 1,6 MW furnaces. By using NEi Fusion - NEi Software's 3D CAD modeler with NEi Nastran FEA - in conjunction with Femap, Dynalabs was able to meet and exceed the expectations of its client in less than 30 days and under budget.

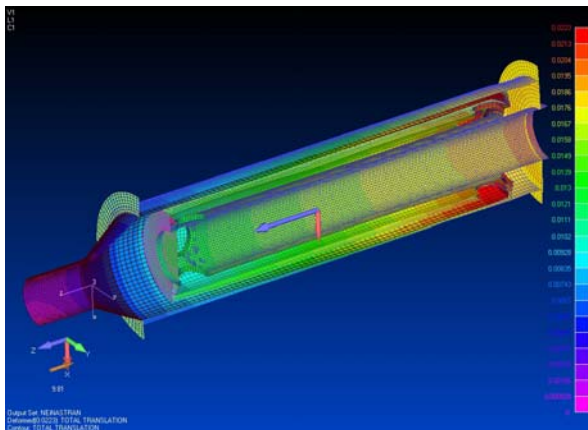
This project presented a dual challenge: space restrictions and reduced energy costs. The diameter of the heat exchanger needed to be less than 1.2 m. However, the area of heat exchange needed to be large enough to allow exhaust gases and a large volume of air to flow through. The heat exchanger operates 24 hours per day, 7 days per week and the temperature of the air leaving it is 400 C, so thermal load and stresses are quite large. Usually, this kind of 'tube and ribs' heat exchanger would be almost 15 m long to emit gas at 400 C. The final design ended up being only 4.5 m long.

A number of calculations of heat exchanged by successive stages of the heat exchanger were performed. Calculated for each step were the temperature of the exhaust gases and air, heat transfer coefficients, and temperature of the walls separating the media.

Using the results of the preliminary heat flow calculations, two simulations were carried out using NEi Nastran: heat transfer simulation, in order to determine the temperature field across the heat exchanger, and structural simulation, in order to determine the stresses and strains caused by thermal elongation.

With the installation of the heat exchanger for continuous recovery of waste heat for one of the foundry's furnaces, Aluminum Wheels Foundry now:

- Saves about 38% of gas consumed by the furnace
- Reduced CO2 emissions by 800 tons per year
- Increased the amount of melted aluminum by 200 kg per hour



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