

Severstal's Internal Heat Management: CFD Modeling

Moffitt

The Client

Severstal is one of the world's leading steel producers. With numerous facilities all over the globe, they produced millions of tons of steel a year. Located in Mississippi, Severstal-Columbus is home to one of the newest and most advanced electric arc furnace facilities in the world. This facility produces high-quality, flat-rolled carbon steel products for use in a variety of applications including automotive, appliance, container, etc.

The Problem

Severstal-Columbus is a massive steel-casting facility that produces millions of tons of steel each year. As with any steel production process internal heat management and ventilation are top priorities. Production equipment lead internal temperatures to rise to 140 degrees F at the 50 foot high caster deck, making it uncomfortable and dangerous for workers.

The heat within the facility had made it hard for the workers to even be in the same room as the production assembly, let alone work. Out of desperation, the metal wall panels were removed from the side of the building. This process helped vent the heat, but missing a wall meant it was a temporary solution at best.

They needed a ventilation system that could control the temperatures at the floor level, while still maintaining the necessary environment for steel production at the work level. They wanted to implement a Natural Ventilation system for their facility, but while Natural Ventilation has been used in steel mills for decades, it can be hard to accurately plan.

Utilizing roof vents and wall louvers, internal building temperatures can be managed using natural air flow and gravity. The movement of hot air up and out through the roof allows cool air to enter at floor level and helps the building stay at a comfortable temperature. However, determining the proper placement of roof vents and wall louvers can be a challenge. Incorrect placement can result in little improvement in temperatures or even make internal conditions worse in some cases.

Management sought out a company that could make a Natural Ventilation system that could maintain safe internal temperatures, illustrate how the process would work, and take care of their new ventilation system from start to finish

Natural Ventilation and CFD Modeling

Severstal's Internal Heat Management: CFD Modeling

Published on Industrial Maintenance & Plant Operation (<http://www.impomag.com>)

The management at this Columbus steel mill chose Moffitt Corporation to design a Natural Ventilation system for their facility. Providing steel mills with natural ventilation for over 50 years gave Moffitt experience that could be relied on.

Moffitt utilized Computational Fluid Dynamics (CFD) to design the right Natural Ventilation system for this facility. CFD is a computer process that can predict air flows and transfer of energy within a building and identify heat sources by using thermal imaging.

Analyzing process heat output, facility dimensions, and other factors, Moffitt was able to create an effective model of how Natural Ventilation would cool the facility. Vividly showing where the heat would rise to the ceiling and how air would flow into the building through wall vents, the Moffitt CFD model showed how effective Natural Ventilation would be for this project. In fact, the CFD model actually showed that the ventilation system would work without using a single fan, bringing temperature down significantly. With the proper placement of roof vents and wall louvers, the building could be ventilated effectively using only Natural Ventilation.

Once the system was designed, Moffitt then manufactured and installed the custom roof vents. Utilizing Moffitt CRV Monovents and Moffitt Labyrinths, Moffitt ensured the vent openings were of sufficient ventilation area while still being completely weatherproof. Furthermore, to ensure that there was proper intake air flowing into the building, Moffitt installed ninety-degree adjustable louvers.

After the vents were installed the interior of the caster deck felt cooler right away. The final temperature at the 50 foot caster deck was an amazing 98 degree F, a full 42 degree decrease in temperature from before. This change was even more than management had originally hoped.

"In my past 20 years of steel mill construction and being around the steel mills" said facility Construction Manager Jim Bell, "I haven't put in anything besides Moffitt Ventilators."

Source URL (retrieved on 10/01/2014 - 3:41am):

http://www.impomag.com/articles/2012/06/severstals-internal-heat-management-cfd-modeling?qt-recent_content=0