HATCH

IRON & STEEL

APPLICATION OF SPECIALIZED ANALYSIS TO THE DESIGN OF FUME CONTROL SYSTEMS

Fugitive emissions and secondary fume control are ongoing challenges for the steel industry. High emissions are generated during scrap charging, refining, and tapping operations. Increased production rates and continually changing scrap quality have made it more difficult to meet exposure limits for contaminants and maintain a clean plant environment. Achieving these criteria requires that particular attention be paid to the design of fume control systems.

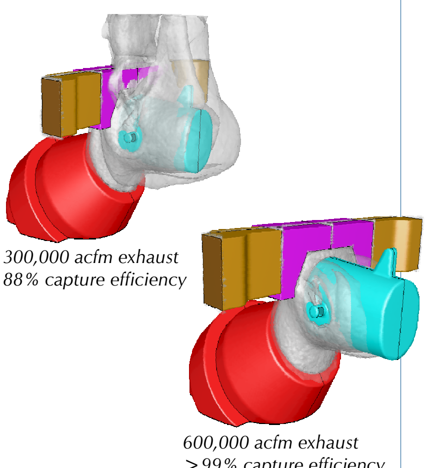
Traditionally, empirical calculations and physical scaled models have been used to design fume control systems. These methods are valid for a narrow range of conditions and are subject to scaling issues. Computational fluid dynamics (CFD) modelling simulates more accurately the dynamic release and distribution of fume in the full-scale environment. Using CFD modelling to supplement traditional methods has several advantages:

- Plume deflection by obstructions or cross-drafts are fully considered
- The full-scale environment is simulated, thus avoiding scaling errors
- The impact of the hood arrangement, exhaust flow rate, and other parameters can be evaluated relatively quickly
- The time and cost associated with CFD modelling are now less than those required to build and run physical scaled models

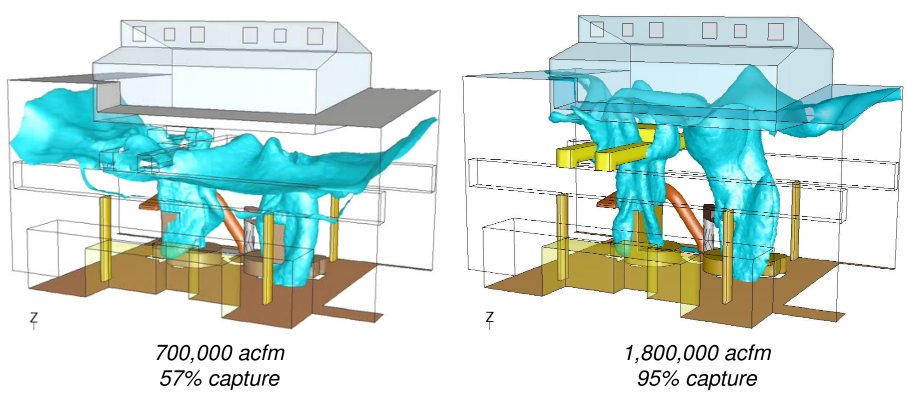
Hatch has extensive experience applying CFD modelling techniques to assist in the design of fume control systems for BOF, EAF, and blast furnace operations. Clients benefit from our unique ability to apply this advanced technique within the context of a team of process and operations experts.

CFD is used as a tool to optimize the hood arrangement and the exhaust flow rate to ensure good fume capture while minimizing the capital and operating costs. In one successful project, the modelling results showed that the exhaust flow rate could be reduced by 100,000 acfm without compromising fume capture. The capital cost savings to the project is estimated at US$3,000,000.

Typical fume burst emitted during scrap charging of an EAF.



The effect of exhaust flow rate on fume capture of a secondary hood during charging of a BOF.



The effect of canopy hood exhaust flow rate on fume capture in an EAF meltshop during simultaneous refining and charging operations.

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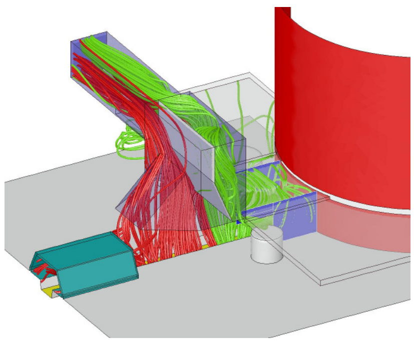
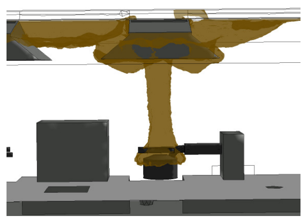


By adding an internal baffle, fume capture achieved by the hood was improved without increasing the exhaust volume.

SOME OF OUR RECENT PROJECTS

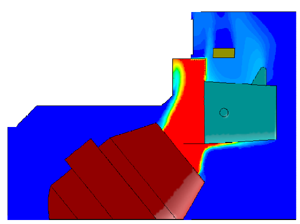
BOF Shop Secondary Emission Control Upgrades, Severstal, Dearborn MI

Detailed engineering for a new BOF secondary emission control system consisting of new tapping, charging hoods and a 1,000,000 acfm baghouse. CFD modelling was used in the design of both hoods.



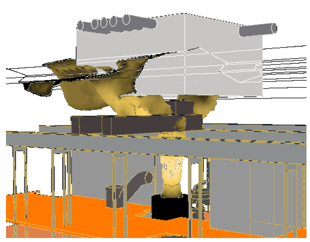
Meltshop CFD Modelling, AK Steel, Butler PA

EAF meltshop analysis to determine the impact of increased production on shop air quality, the optimal use of existing equipment, and what improvements could be realized with new equipment.



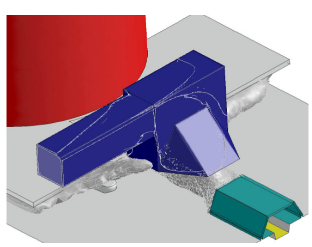
BOF Emissions Control, Mittal Steel, Sparrows Point MD

Concept design for a new secondary emissions control system to control charging and tapping emissions. The system concept was refined using CFD modelling techniques.



Noise and Air Pollution Control Study, Iscor Long Steel Products, Vereeniging, South Africa

CFD modelling was used to assist in the design of a deep storage canopy hood for the control of secondary emissions released during EAF meltshop operations.



Blast Furnace Casthouse Emission System – Conceptual Engineering, U. S. Steel, Kosice, Slovakia

CFD was used in the concept design for a new hood to capture emissions during drilling, tapping, and mudding operations.