HATCH

AIR QUALITY TECHNOLOGIES

APPLYING SPECIALIZED ANALYSIS AND SIMULATION TO THE DESIGN OF FUGITIVE EMISSIONS CONTROL SYSTEMS

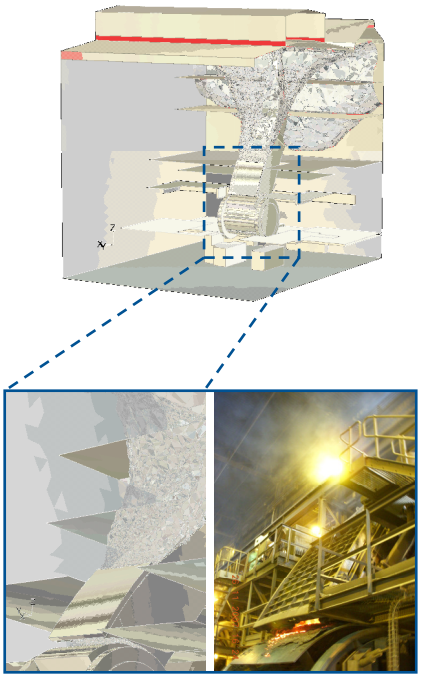
Fugitive emissions control is an ongoing challenge for the metallurgical industry. High emissions are generated during charging, refining, tapping, and other processing operations. Increasing production rates and varying furnace feed material have made it more difficult to meet exposure limits for emissions and maintain a clean work place environment. Achieving these criteria requires that particular attention be paid to the design of the ventilation system for control of fugitive emissions.

Traditionally, empirical calculations and physical scaled models have been used to design the ventilation 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:

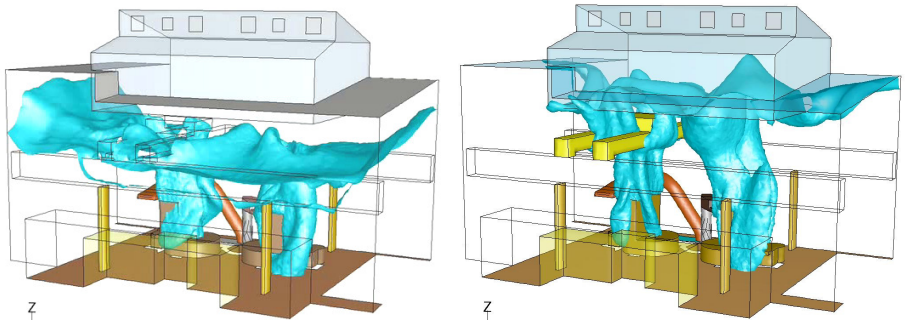
- Plume deflection by obstructions or cross-drafts are fully considered
- The full-scale environment is simulated, thus avoiding scaling errors
- The impact of the hood arrangement, exhaust flow rate, and other parameters can be evaluated relatively quickly
- The time and cost associated with CFD modelling 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 fugitive emissions control systems for a variety of metals processing 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 ventilation exhaust flow rate to ensure good emissiosn capture while minimizing the capital and operating costs.



Secondary emissions escaping from the emission control hood are compared with those observed on site at the Lonmin Platinum Smelter.



700,000 acfm
57% capture

1,800,000 acfm
95% capture

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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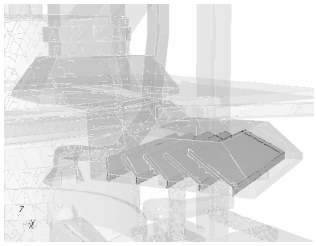
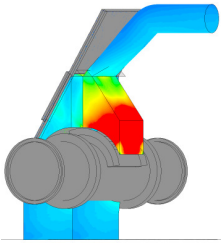


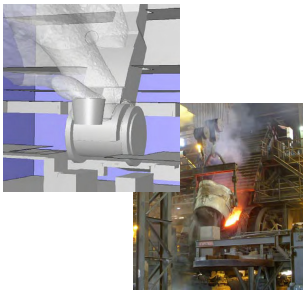
By adding internal vanes, fume capture achieved by the hood was improved without increasing the exhaust volume.

SOME OF OUR RECENT PROJECTS



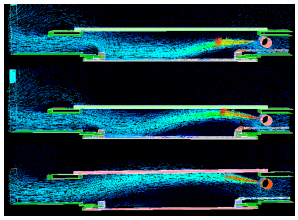
Converter Fugitive Emission System – Xstrata Nickel Smelter, Sudbury

CFD modeling of the converter hoods was conducted in the conceptual phase to establish hood geometries and the required exhaust rate for each converter.



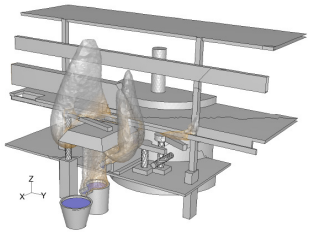
Converter Fugitive Emission System – Feasibility Study, Lonmin Platinum Smelter, Mooinooi, South Africa

Hatch was retained to reduce SO_2 and particulate emissions from the Lonmin Platinum Smelter. CFD was used to redesign the converter fugitive emission system, which was the main contributor to contaminant emissions.



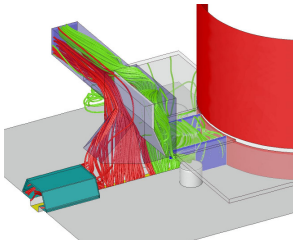
Electrowinning Cell House Push-Pull Ventilation System – VBNC, Vale Inco, Newfoundland

A preliminary design for the push-pull ventilation system was optimized using CFD to ensure complete exhaust of acid mist and to prevent the supply air jet from impinging on the process bath



Furnace Fume Control System – Conceptual Engineering, Assmang Cato Ridge Works, South Africa

CFD was used to assess and optimise the capture efficiency of the furnace fume control hoods. Modelling allowed for a variety of designs to be efficiently evaluated.



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.