Breathing Easier in the Workplace

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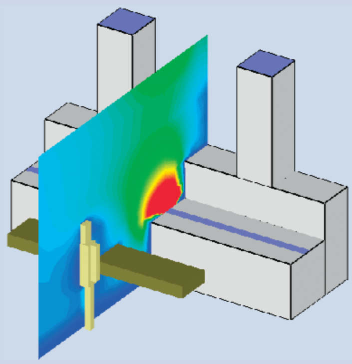
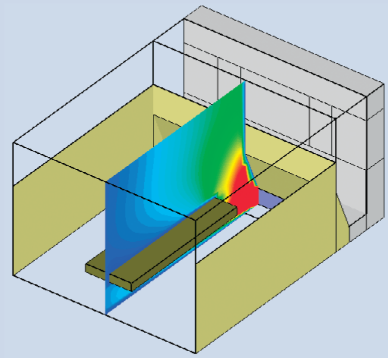
A worker in the process grinding area



The workstation layout before the analysis was performed, showing ventilation air velocity contours

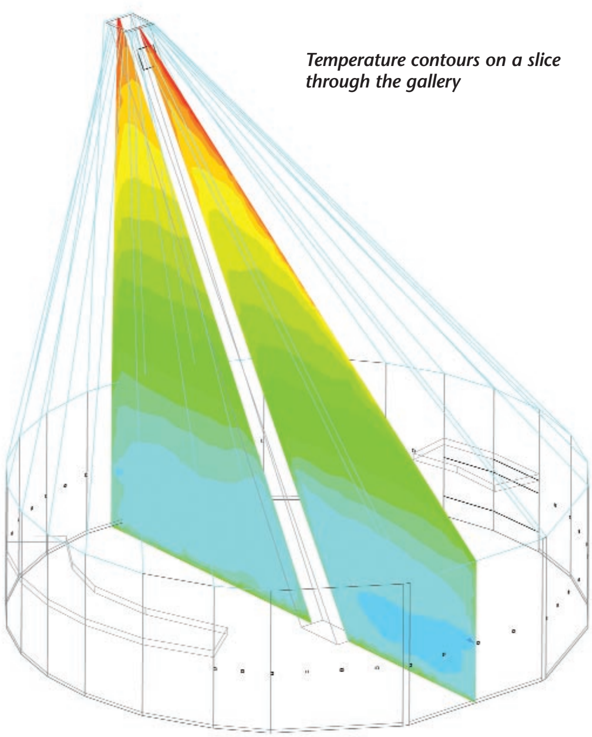


In the optimized workstation layout ventilation air velocity contours show increased velocity at the point of grinding; the absence of recirculation zones in this design minimizes the amount of dust entering the breathing zone of the worker, who stands on the side of the bench

Controlling worker exposure to dusts and fumes is a major concern at Wyman Gordon, a division of Precision Castparts Corporation, and a leading manufacturer of metal forgings for the aerospace and industrial gas turbine industries. In the Process Grinding Department at one plant, for example, side-draft exhaust benches are used to limit exposure to metal grinding dust. Airpak was recently used to compare the capture efficiency of these benches with other types of exhaust systems in order to determine the best approach to minimize the amount of dust in the worker's breathing zone.

Four different hood configurations were modeled during the project, along with various combinations of exhaust and supply airflow rates. These included the existing side-draft hood, and modifications to it, as well as three booth-type hoods, one with an open roof, the others with a partial and a full roof.

The final selected design was a modification of the existing hood that demonstrated the best combination of performance improvement and feasibility. Making use of existing fans and filters, the new design will cut worker dust exposure by up to 50%. Because the existing equipment could be utilized, construction cost savings of $250,000 for 10 workstations could be realized. Without Airpak, it would have cost at least $25,000 and up to a year of additional work to develop and test prototype hoods. As an added benefit, plant management has found Airpak model output very helpful in understanding why various project options were selected. ■



Temperature contours on a slice through the gallery

Reducing the supply air flow to 60,000 CFM achieved near ideal comfort conditions in the occupied zone (75°F), while allowing the skylight to stratify between 80°F and 115°F. A 40,000 CFM scenario was also analyzed, and showed overheating occurring in the occupied zone during peak summer design conditions. Using these results, Architectural Energy Corporation recommended lowering the cooling supply air flow from 90,000 CFM to 60,000 CFM, allowing the design team to downsize their HVAC equipment (and budget). All three scenarios required that at least 15,000 CFM be exhausted out of the top of the skylight to keep temperature extremes below 120°F.

Nighttime banquet conditions during winter were also modeled to determine the potential of condensation forming on the glazing and framing system of the skylight. Using Airpak and THERM, a glazing system heat transfer program developed by Lawrence Berkeley National Laboratory, it was found that with 500 people eating hot meals on a cold winter night, condensation would not occur. Taken together, the results allowed the architects and clients to feel confident in the proposed Central Gallery HVAC and skylight design. ■