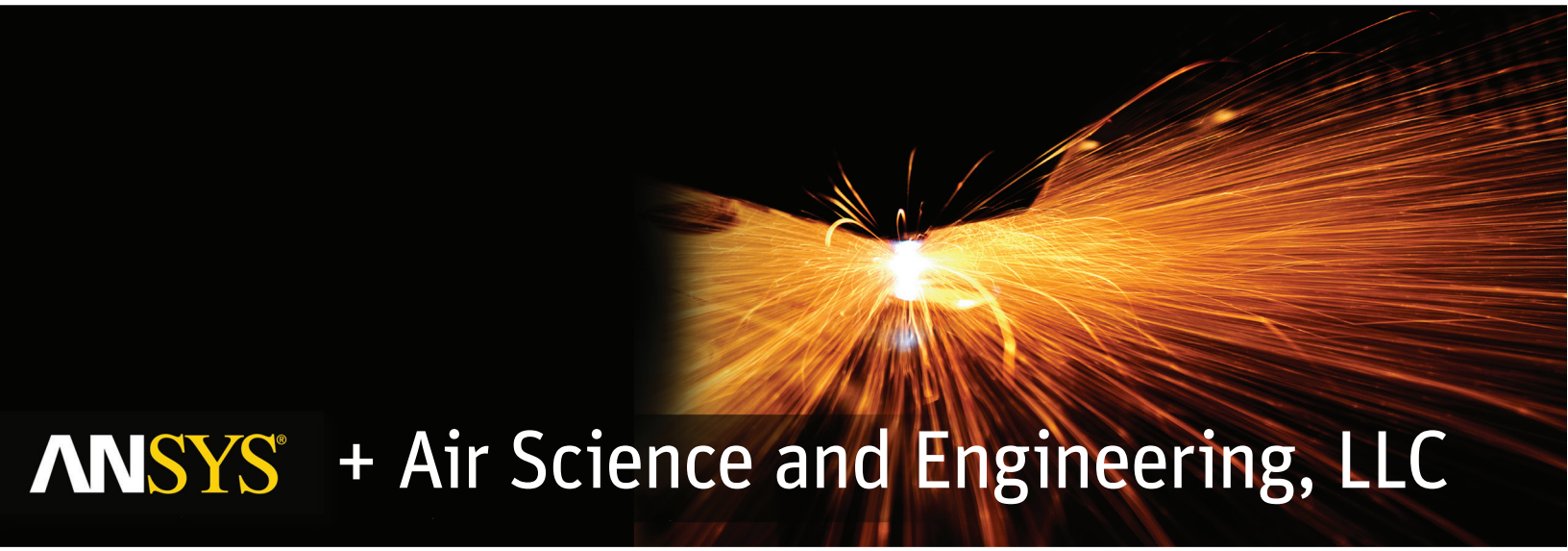
Case Study



ANSYS® + Air Science and Engineering, LLC

Using ANSYS Airpak in conjunction with traditional industrial hygiene engineering enabled us to meet our customer's requirements more quickly and efficiently. After the new hood was installed, the client's project manager reported, 'The new hood performs just like the model!'

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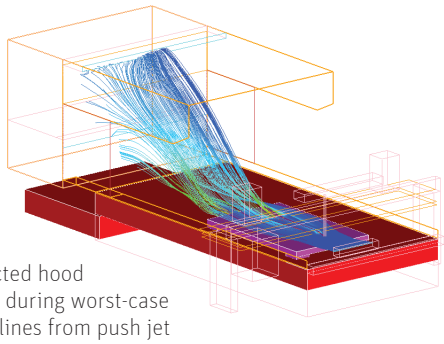
Principal
Air Science & Engineering, LLC

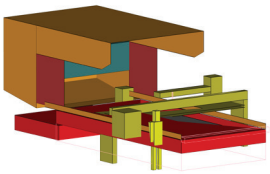
ANSYS

Air Science and Engineering, LLC

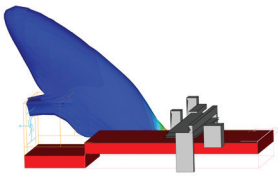
Simulation-Driven Design for Commercial Buildings



Model predicted hood performance during worst-case cutting: pathlines from push jet and fume source



Large back-draft hood: option selected by owner



Baseline CFD model output: cloud of constant fume concentration

A client in the metalworking industry was dealing with metal fumes from a large torch cutting operation. The fumes were escaping into adjacent work areas, bypassing an existing ineffective side-draft hood and contaminating the work area.

Air Science & Engineering was hired to develop a hood design that would capture and contain the process fumes while minimizing the required exhaust flow rate. Additionally, the new hood needed to continue to allow parts to be loaded by an overhead crane and to accommodate the existing high-velocity push jet necessary to prevent the buildup of flammable gases under the workpiece.

Technology Used

ANSYS® Airpak®

Engineering Solution

Air Science & Engineering combined traditional industrial hygiene (IH) engineering with CFD analysis. Since the process was unique, field testing was necessary to characterize the fume source, the high-velocity push jet and the cross drafts in the open-bay shop environment. A baseline CFD model of the existing condition was developed and validated using the field data. The model was then utilized to evaluate the likely effectiveness of possible new hood configurations and to optimize the design of the final selected configuration.

Various combinations of exhaust rate, cutting position and environmental conditions were modeled, leading to a final design exhaust rate of 11,500 cfm. This optimization process also indicated that a second push jet would likely be necessary for worst-case cutting conditions. Detailed designs for the exhaust hood and the secondary push jet were developed.

Benefits

- Using ANSYS Airpak CFD modeling software along with traditional IH engineering, a new exhaust hood was designed and installed, effectively capturing the process fumes.
- ANSYS Airpak software allowed the hood design and exhaust rate to be optimized before construction, leading to an estimated savings of $50,000 in capital costs and $5,000 in annual operating costs.
- The new hood performed as predicted from startup; field prototype development and associated rework costs and production delays were avoided.

Company Description

Specialists in industrial hygiene engineering including computational fluid dynamic (CFD) modeling, whole-building modeling, air systems engineering and related services, Air Science & Engineering helps its clients find solutions to air contaminant and environmental control problems in industrial, HVAC and information technology applications.

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