Strobic Air Corporation
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A ganged hood exhaust with an idle blower (foreground) that was removed after the photo was taken.

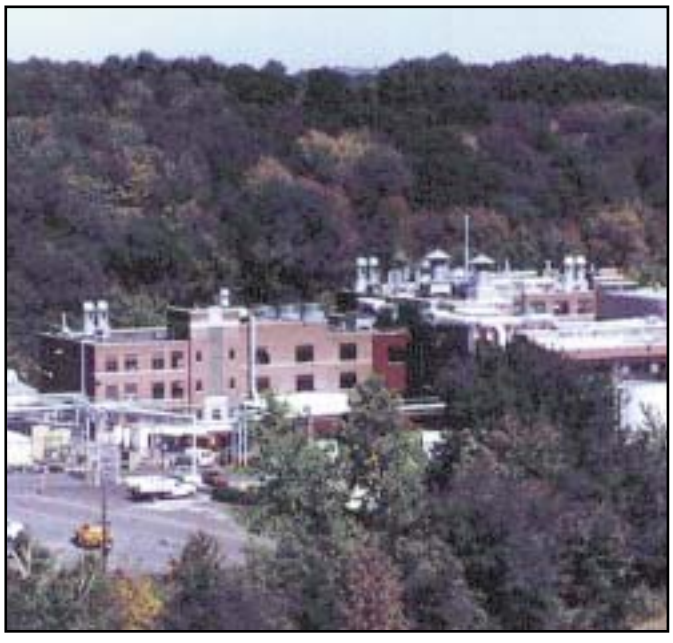
Pilot-plant exhausts tamed

Approach increases effective stack height, prevents re-entrainment

Three different exhaust problems had to be addressed at Monsanto's chemical pilot plant facility in Indian Orchard, MA.

The first problem concerned high-velocity discharge that causes re-entrainment into another facility downstream. The second problem was exhaust air quality at the company's technology complex. The third situation involved discharge at the company's chemical plating laboratory, which had a plastic discharge line and scrubber already in place to minimize pollution, but was not performing satisfactorily.

Company engineers considered many options before successfully finding solutions to the problems.



Monsanto's Indian Orchard, MA, facility

Options explored

One option was to combine chemical processing laboratory fume hoods together instead of using individual exhaust stacks, and then install more powerful air handlers on the

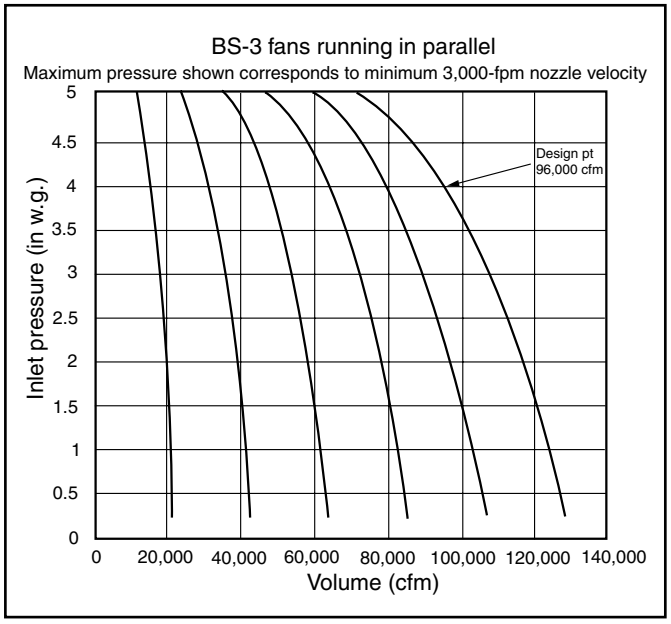


Fig. 1 *Performance curves for six different high-volume exhaust systems.*

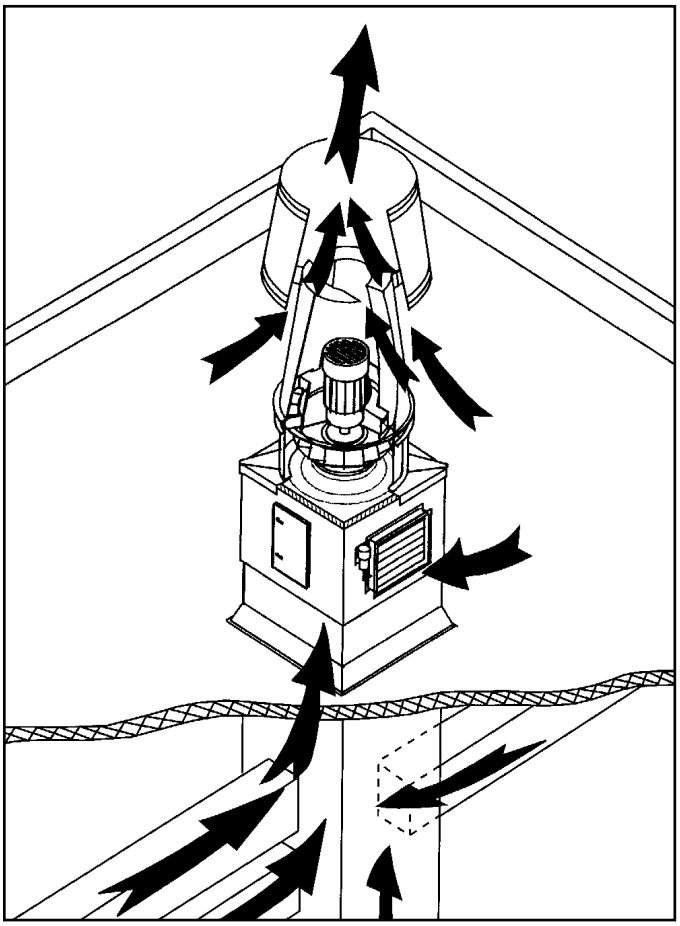


Fig. 2 *Exhaust system*

roof. This approach would have been costly to install and would have required substantial energy consumption for operation. Planners also doubted that it would solve the re-entrainment problem.

The engineers learned about a system that involved mixing outside air with process air at the exhaust fan nozzle exit. After evaluation, the systems were installed and they increased exhaust volume by as much as 260% of design flow.

The resultant discharge plume produces an effective stack height that is sufficient to penetrate the building boundary layer and safely disperse effluent in the free stream. Once there, it cannot be re-entrained into building intakes.

The fans mix outside air with process air at the exit of the fan nozzle. An entrainment nozzle helps provide plume speeds up to 6,600 fpm. The tight plume—at a jet throw height of 210 ft in still air—creates a current of air 110 ft in diameter, moving at 250 fpm.

Total air movement is greater than 500,000 cfm, which is achieved with a 7-1/2 hp motor operating at 1,170 rpm. In addition to placing the effluent high in the air where it is rendered harmless, the system also dilutes the effluent at the nozzle with a large volume of air, further neutralizing its effect.

The systems chosen conform to ANSI Z9.5 standards, and were retrofitted to existing equipment without interrupting the work flow. Stack height is typically only about 40% of conventional systems. In Monsanto's case, static pressure and horsepower were also dramatically reduced.

All laboratory fume exhaust problems at the Monsanto facility were solved with the high-volume systems, and they proved to be lower in cost and more efficient than alternative approaches. The systems were easy to install and both maintenance and operating costs have been low.

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