

Ventilation Efficiency in Metal Finishing

There are ventilation costs associated with both plating and painting lines, both associated with removing hazardous materials from the air. A plating line can have a large ventilation system to vent either a large number of process tanks or to ventilate individual large tanks. A paint line using high VOC paint will have a special ventilation system to handle the flammables in the paint fumes during the spraying operation as well as ventilation during the drying operation.

In the northern US, any air vented out in the heating months requires the heating of incoming, cold outside air. So reducing the total air exhaust has an immediate energy savings due to heating cost reductions.

The larger the exhaust system, the greater the cost to run the ventilation system. The following table shows the increase in both the air heating and electricity costs as a ventilation system increases in size.

Exhaust CFM	Blower hp	Annual electricity cost, \$.09/kW-hr	Annual make-up air heating cost, \$5/decatherm of natural gas	Total annual ventilation, heating cost
10,000	50	\$23,696	\$6,463	\$30,159
8,000	40	\$18,957	\$5,170	\$24,127
5,000	20	\$9,479	\$3,231	\$12,710
2,000	10	\$4,739	\$1,293	\$6,032

Methods of reducing ventilation

Plating lines:

- Variable frequency drive fan motor that can run the ventilation flow at lower rates after process tanks have either been covered or cooled.
- Automatic tank covers linked to variable flow rate exhaust system. The exhaust flow can increase or decrease depending on the number of tanks with the lids open
- Push-pull tank vents that increase the air velocity across the surface of the tank, therefore reducing the total air flow needed to capture fumes.

Paint lines:

- If the line consists of independent booths or workstations then the ventilator to each work station can be tied into its spray system. After the spray system is turned off, the ventilation fan

can shut down after a time-out period. Therefore, the ventilation will be directly tied to production.

- Booths should be sized for the work. If the largest parts or part array is two feet by two feet then the booth ventilation area should be proportioned to that area. There is no need to ventilation this example with an eight foot by eight foot ventilation area.
- If the ventilation system is one large system for multiple booths then the ventilation fan could have a variable frequency drive motor tied in with damper controls on each booth. When a booth is not active, the damper will close and the ventilation rate will drop accordingly.