Table 9 Resistance to Corrosion of Materials Used for Hoods and Ducts[46]

Process	See Footnote 1	Galvanized Iron	Black Iron	Stainless Steel	Monel	Lead Lining	Aluminum	Hard Rubber	Natural Rubber	Pressed Wood	Neoprene	Terne Plate	Buna S	Koroseal	Asphalt: Paint on Iron Galv or Black	Asphalt: Hot, 180–200 F on Galv Iron	Asphalt: 3-Course Felted on Metal or Wood	Asphalt: Painted Pressed Wood	Phenolic Resin: Paint	Phenolic Resin: Bonded Plywood or Redwood	Phenolic Resin: Baked, or Solid Cast Resin	Asbestos Cement Board or Tube	Vinylite Resin Type Paint	Vitrified Clay Pipe with Mastic Joints
Acid, Chromic (Plating and Anodizing)		EP	EP	S		ES				SP	S	S			P				SF	P	EF			E
Acid, Hydrochloric		EP	P	E	S	F		E	E4		E	F	E	E	EF	S		S		F	EP	F	E4	E
Acid, Hydrofluoric		P			S				S						S						E			F
Acid, Nitric		P		E		E					E				FP	F					F		S	E
Acid, Oxalic (Anodizing)					E	S	E								S									E
Acid, Sulfuric		P	P	S5		E6		E	E7	P	E	S			EP	S	F		F	ES	E	E5	EP	E
Acid Dipping and Pickling (Horiz Ducts)															P	F	E							E
Alkaline Cleaner (Caustic 140–180 F)		EP	EP	E						S	E				ES			S			S	E		E
Alkaline Cleaning Solutions	2	E	E	E							E				E									E
Alkaline Plating (Cu, Cd, Ag)		EP	EP							E	S				ES			S			S	S	S	E
Plating and Anodizing (Horizontal Ducts)															P	S	E							E
Plating, Bright Nickel		SP	SP								S				E			S					S	E
Plating and Dipping (Vertical Ducts)		P													F					E				E
Tanning, Dressing, Dyeing, Bleaching Sol		S8							S9															E
Water, Boiling and Steam		EP	SP	E	E						E				ES	E						E	S	E
Decarbonising Agents	3	E																						E
Degreasing Compounds: Organic & Mineral Sol		E	E																					E
Enamels and Lacquers (Coating & Dipping)		E	S																					
Fabric Impregnation		S																						
Salt, Supersaturated Solution 300–400 F		S	S																					E
Wire Insulation		S																						

Classification	Approximate Service Life
E—Excellent	Over 5 years
S—Satisfactory	2 to 5 years
F—Fair	½ to 2 years
P—Poor	6 months
Combinations (EP)	Indefinite rating

Notes: 1. Ratings are based upon collated field service reports. Indefinite ratings are given where reports are inconsistent due to varying operating conditions (such as dilution, exposure to weather, etc.). Blank spaces denote insufficient information, not poor service. 2. Mild soaps, detergents, water soluble oils, 140–180 F. 3. Creosote oil, kerosine, ethylene dichloride. 4. To 20 percent: E; 50–70 percent, 150 F: S. 5. To 50 percent, plating: E; 20 percent anodizing, agitated 80 F: S. 6. To 50 percent plating: S; over 50 percent pickling, 20 percent anodizing: E. 7.5–23 percent, 135–215 F pickling: S; plating, pickling, anodizing: E. 8. Except acid. 9. Acid.

from the outdoors must be heated somehow to maintain comfortable temperatures in the area. The cost will depend on the ratio of exhaust air to that required for ventilation of the space occupied.

MAINTENANCE OF PERFORMANCE

Periodic inspection and checking of exhaust systems are necessary if control is to be maintained at the effective level of the original installation. Continued effectiveness depends on maintained design air volume flowing through the exhaust hoods. A checking procedure, therefore, must include some data to indicate at least relative air flow through the hoods. The static pressure or hood suction measurement will prove useful for such checking if data are available on air volumes and pressures at the time the system was installed. Testing and recording of such data for each new installation are of the utmost importance.

While hood suction readings have rightfully been discarded as a means of measuring air flow, they do offer a quick and accurate method of measuring relative air flow. If the hood suction is known while an exhaust system is functioning properly, its continued effectiveness can be assured so long as the hood suction is not reduced from its original value.

Difficulty from plugging may be encountered where heavy dust loads or moist air are encountered. Unless the hood design is altered or there are accumulations in the hood or branch pipe between hood and point of hood suction reading, the air volume exhausted from a hood cannot change without a change in hood suction reading.

The Pitot tube can be used for routine check purposes instead of the static pressure method but requires care in reading velocity pressures in an exact position with the tube paralleling the flow of air. The hood suction method of checking can, however, be more readily delegated to an assistant having no technical training. U-gages have been standard plant equipment long enough to eliminate any feeling of uncertainty in their use.

Since pressure readings vary as the square of the velocity or volume of flow, a slight change in flow is magnified by a comparison of gage readings. Normally, a reduction of volume or velocity of 10 to 15 percent will not be sufficient to reduce the effectiveness of the exhaust system. This range is equivalent to a reduction in static pressure readings of 19 to 30 percent.

A marked reduction in hood suction can often be traced to one or more of the following items:

1. Reduced performance by the exhaust fan caused by reduced speed due to belt slippage, wear on rotor or casing, or an accumulation of material in the rotor or casing obstructing the air flow.
2. Incorrect direction of exhauster rotation.
3. Reduced performance caused by defects in the exhaust piping, such as accumulations of material in branch or main ducts due to insufficient conveying velocities, condensation of oil or water vapors on duct walls, adhesive characteristics of material exhausted.
4. Leakage losses caused by loose cleanout doors, broken joints, holes worn in duct (most frequently in elbows), or poor connection to the exhauster inlet.
5. Losses in suction due to exhaust openings added to the system or due to a change of setting of blast gates in branch lines.
6. Increased pressure loss through the dust collector due to lack of maintenance, improper operation, wear, etc.

Table 10 Resistance to Corrosion of Materials Used for Exhaust Fans[46]

Process	Steel	Aluminum	Galvanized Steel	Cast Iron	Brass	Lead	Asphalt Paint	Vinyl Resin Paint	Red Lead Paint	Hot Asphalt	Phenolic Resin Baked Coating	Hard Rubber Lining	Soft Rubber	Neoprene	Everdur	Karolite	Pressed Wood	AISI 316	Acid Bronze
Acid Dipping, Pickling, and Stripping	EP	S		E		E	SP		E		S	E	ES	E	E	F			P
Alkaline Cleaning	EF	S	E	E			EP				S	ES		E	E	F		E	
Anodizing	SF	S					E	E	E		E	E		E					
Coating—Enamel and Lacquer	E	E			E						S			E					
Decarbonizing	ES				E		P					E			E	F			
Degreasing and Metal Cleaning	ES		ES		E														
Hardening and Quenching	ES		ES																
Plating	EP	S		E			ES	S			ES	E	E	E					
Washing and Rinsing	EP	E		E			SP			S		E		E			F		

Classification	Approximate Service Life
E—Excellent	Over 5 years
S—Satisfactory	2 to 5 years
F—Fair	6 months to 2 years
P—Poor	6 months
Combinations	Variable performance

Note: Ratings are based upon collated field service reports. Forward curved fans are not recommended for open-tank ventilation service. Cleanout doors and bottom drains are recommended on all fans on open tank operations. The deposits which build up on fan wheels and casings should be removed by regular cleaning. Repaint where any coating has been broken and removed.

MATERIALS REQUIRED FOR CORROSION RESISTANCE

In many cases, exhaust systems including hoods, ducts, air flow producing equipment, and air cleaning equipment will require protective coatings if carbon steel is used, or other materials of construction will be required. Need for such materials will be determined by (*a*) the corrosion rates on interior or exterior duct surfaces, (*b*) protection against product contamination, and (*c*) explosion hazards.

Construction for corrosion protection is the most difficult due to the complex factors that influence rate of corrosion. It is seldom possible to predict the concentration, composition, and dry-bulb and dew-point temperatures that will exist in actual operations. A guide for selecting corrosive resistant materials based on a survey of actual experiences has been reproduced in Tables 9 and 10.[46]

REFERENCES

The material in this chapter is based largely on the recommendations of the American Conference of Governmental Industrial Hygienists as published in the *Industrial Ventilation Manual*, 1958 Edition.

[1] J. J. Bloomfield and J. M. DallaValle: *The Determination and Control of Industrial Dust (U. S. Public Health Service Bulletin* 217, 1935).

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[6] W. N. Witheridge: *Principles of Industrial Process Ventilation* (University of Michigan, Inservice Training Course, October 1945).