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Corrosion Resistance of Laboratory Hood Exhaust Dampers

(AFC-1)

We offer these white papers as a contribution to the growth of our industry. These ideas may or may not apply to a specific project. Please contact us for detailed recommendations.

Introduction

Many questions have been asked about the corrosion resistance of the Waddell Laboratory Hood damper (WHD), compared to alternative metal dampers of stainless steel. Corrosion resistance is difficult to measure in the same manner, as say CFM or pressure drop. Normally, corrosion resistance is presented in charts by the coating manufacturer, based on assumptions - temperature, liquid or vapor, concentration, etc, obviously, there can be a large difference between the actual operating conditions and the manufacturer's method of test. The user often cannot accurately predict what vapors will flow through the hood.

Comments

We have found that corrosion resistance charts are usually based on immersion tests, and are entirely too conservative to use for laboratory hood application where there are small amounts of vapors which are highly diluted.

Our valves are normally mounted vertically so that there is no condensation. Epoxy (flexible) coating on the interior damper surfaces is normally quite good for light duty hoods. Stainless Steel is suitable for heavy duty or defined use hoods .

Conclusions

We are enclosing a generalized list of corrosion resistance for the epoxy coating of the metal surfaces and the internal bladder material . This list must be used as a guide only. Waddell has several thousand Hood Exhaust dampers in service, and that Connor, prior to it's closure, had at least this number. We believe that normal corrosive applications are suitable for our damper.

ICorrosion Resistance Tables

Table I.
Material Specifications
E633 EPDM Bladders
Specification ASTM D2000 3BA 620 A₁4B₁₃C₁₂F₁₇Z₁Z₂Z₃Z₄Z₅

Original Properties	As Specified	As Obtained
Durometer (Shore A)	60 ± 5	60
Tensile Strength	Min. 2000 psi	2200 psi
Elongation	Min. 400%	425%
Tear Resistance (G ₂₁)	----	
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Oven Aged 60 Hrs. @ 212° (A ₁₄)		
Durometer Change	Max. -10	+5
Tensile Change	Max. -25%	-4%
Elongation Change	Max. -25%	-10%
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Compression Set 22 Hrs. @ 158°F (B ₁₃)		
% Deflection	Max. 25%	20%
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Water Immersion Set 70 Hrs. @ 212°F (EA ₁₄)		
Volume Change	+10%	+0.5%
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Ozone Resistance 168 Hrs. @ 50 PPHM + 104°F @ 20% Strain (C ₁₂)		
No Cracking or Checking	Passed	
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Cold Test, Flexibility Brittle Point @ -40°F (F ₁₇)		
No Cracking before or After Impact	Passed	
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Special Tests: Samples baked 7 days @ -250°F in a tightly covered 500 ml. Berzelius Beaker on a hot plate (Z ₁ -Z ₄)		
Z1	No oily emissions, fogging or crystalline formations within the beaker or on the glass cover plate.	
Z2	Maximum weight loss 1.0%	
Z3	Maximum +5 durometer change (Shore A)	
Z4	No cracking when flexed 180° several times.	
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Special Test: Tear Resistance (Z ₅).		
Z ₅	Tear Resistance (ASTM D 624, Die C) minimum 200 p.i.	

Table II.
Epoxy Coating of Internal Damper Parts @ 75°F¹

Alum	E	Sodium Nitrite	E
Aluminum Potassium Sulfate	E	Sodium Sulfate	E
Aluminum Sulfate	E	Hydrochloric Acid 25%	E
Ammonium Bicarbonate	E	Hydrochloric Acid 36%	E
Ammonium Chloride	E	Hypochlorite Bleach 2%	E
Ammonium Hydroxide	E	Lead Acetate	E
Ammonium Sulfate	E	Magnesium Carbonate	E
Barium Carbonate	E	Magnesium Chloride	E
Barium Chloride	E	Magnesium Sulfate	E
Barium Hydroxide	E	Mercuric Chloride	E
Benzene Sulfonic Acid 25	E	Mercurous Chloride	E
Bleach Liquors	NR	Nickel Chloride	E
Boric Acid 100%	E	Nickel Nitrate	E
Calcium Chloride	E	Nickel Plating - Harshaw Bright	E
Calcium Hydroxide	E	Nickel Refining Solution	E
Calcium Hypochlorite	E	Nickel Sulfate	E
Calcium Sulfate	E	Nitric Acid 5%	E
Chlorite Dioxide Bleach	E	Phosphoric Acid	E
Chromic Acid 30%	E	Potassium Bicarbonate	E
Copper Chloride	E	Potassium Carbonate	E
Copper Sulfate	E	Potassium Chloride	E
Ethylene Glycol	E	Potassium Ferrocyanide	E
Ferric Chloride	E	Potassium Hydroxide 50%	E
Ferric Nitrate	E	Potassium Nitrate	E
Ferric Sulfate	E	Potassium Sulfate	E
Ferrous Chloride	E	Sodium Acetate	E
Ferrous Sulfate	E	Sodium Bicarbonate	E
Fluorine 100%	NR	Sodium Bisulfate	E
Glycerine	E	Stannic Chloride	E
Hydrochloric Acid 10%	E	Sulfuric Acid 50%	E
Sodium Bromide 10%	E	Toluene	G
Sodium Carbonate	E	Trisodium Phosphate 10%	E
Sodium Chloride	E	Trisodium Phosphate 25%	E
Sodium Cyanide	E	Trisodium Phosphate 50%	E
Sodium Ferricyanide	E	Trisodium Phosphate 90%	E
Sodium Hydroxide 50%	E	Water	E
Sodium Hypochlorite 2%	E	Zinc Chloride	E
Sodium Nitrate	E	Zinc Sulfate	E

¹ E = excellent, G = good, F = fair and NR = not recommended