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Evaluation of a Marshall Plastics Film

Background: The Customer is asking to check the properties of the film, manufactured by Marshall Plastics.

Purpose: To test VCI properties for the submitted blue film, manufactured by Marshall Plastics, and compare to VpCI-126ES film.

Materials: Submitted sample of blue film, manufactured by Marshall Plastics
Razor Blade Test Kit
VIA Test Kit
SO_2 Test Kit
Perkin Elmer FT-IR 1000 Spectrometer
EM Quant Nitrite/Nitrate Test strips (Lot # OC555062, Exp 9/08)

Method: Razor Blade Test
VIA Test
SO_2 Test
FT-IR Analysis

Procedure: The above tests were performed according to the standard procedures for each

Results:

Razor Blade Test (carbon steel)

Material	Panel #1	Panel #2	Panel #3
Submitted Marshall Plastics blue film (2.75 mils)	Pass	Pass	Pass
Typical results for VpCI-126ES (2.75 mils)	Pass	Pass	Pass
Control	Fail	Fail	Fail

VIA Test

Material	Plug #1	Plug #2	Plug #3
Submitted Marshall Plastics blue film (2.75 mils)	Grade 1	Grade 1	Grade 1
Typical results for VpCI-126ES (2.75 mils)	Grade 3	Grade 3	Grade 3
Control	Fail	Fail	Fail

SO_2 Test

Material	Plug #1	Plug #2	Plug #3
Submitted Marshall Plastics blue film (2.75 mils)	Grade 4	Grade 4	Grade 3
Typical results for VpCI-126ES (2.75 mils)	Grade 4	Grade 4	Grade 4
Control	Fail	Fail	Fail

Physical Properties of Marshalls Plastic Film

Breaking Factor Machine Direction (lbs/in)	Breaking Factor Cross Direction (lbs/in)	Machine Direction Tensile Strength at Break (psi)	Cross Direction Tensile Strength at Break (psi)	Machine Direction Elongation at break (%)
13.98	12.97)	4053.52	3998.12	394.8

Cross Direction Elongation at break (%)	Machine Direction Tensile Strength at Peak (psi)	Cross Direction Tensile Strength at Peak (psi)	Machine direction tear strength (newtons)	Cross direction tear strength (newtons)	Puncture strength (joules)
474	4053.52	3944.36	2982.24	12347.52	0.82

Physical Properties of VpCI-126 ES

Breaking Factor Machine Direction (lbs/in)	Breaking Factor Cross Direction (lbs/in	Machine Direction Tensile Strength at Break (psi)	Cross Direction Tensile Strength at Break (psi)	Machine Direction Elongation at break (%)
8.08	8.48	3164.37	3506.38	402.8

Cross Direction Elongation at break (%)	Machine Direction Tensile Strength at Peak (psi)	Cross Direction Tensile Strength at Peak (psi)	Machine direction tear strength (newtons)	Cross direction tear strength (newtons)	Puncture strength (joules)
391.0	3225.97	3531.44	8423.52	12,085.92	0.87

Conclusion: The submitted sample of Marshall Plastics blue film passed the razor blade and SO_2 test, but failed to pass the VIA test. VpCI-126 ES film however, has very good contact and vapor phase corrosion inhibiting properties. In addition, VpCI-126 ES in the 2.5 mil thickness outperforms Marshall Plastics 2.5 mil film in puncture strength-the most important property of the protective film.

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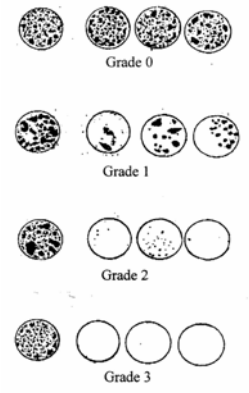
VIA Test Grades (Grade 2 or 3 are passing)

Grade 0:	Blind test No corrosion inhibiting effect
Grade 1:	Blind test Minute corrosion inhibiting effect
Grade 2:	Blind test Medium corrosion inhibiting effect
Grade 3:	Blind test Good corrosion inhibiting effect



SO_2 Grades (Grade 3 and 4 are passing):
Grade 0- Extensive corrosion covering 25% or more of panel surface
Grade 1- Moderate corrosion covering 10-25% of panel surface
Grade 2- Slight corrosion covering 5-10% of panel surface
Grade 3- Very slight corrosion covering 0-5% of panel surface
Grade 4- No visible corrosion on panel surface

FTIR Analysis

Submitted blue film