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LABORATORY ACCREDITATION BUREAU a division of A2LA ACCREDITED ISO/IEC 17025
Certificate # L2267 Testing

Competitor Film Testing Compared to VpCI-126

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Project #: 18-014-1825

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ISO 9001 QUALITY SYSTEM REGISTERED
ENVIRONMENTAL ISO 14001 SYSTEM REGISTERED

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Background: Andeavor is the former Tesoro Petroleum refinery. They are currently purchasing film from McMaster-Carr. However, they are having some issues with this film. The testing in this report will determine if VpCI-126 film provides better corrosion protection.

Sample Received: Blue McMaster-Carr Ziploc Film Bag, 4mil, received on 1-26-18 in good condition

Method: VIA Test, CC-027
FTIR Analysis, CC-006
Razor Blade Test, CC-004*
Nitrite/Nitrate Test*
*The test(s) marked are not covered under Cortec Laboratories, Inc. ISO 17025 Scope of Accreditation

Materials: VIA test kit (testing jars and lids, steel plugs, 400grit sandpaper)
Copper panels and Carbon Steel panels, SAE 1010 (for razor blade testing)
VpCI-126 film, 3mils (batch #510220)
Glycerol (lot #Q10A018)
Methanol, ACS grade (lot #071417B)
Nitrite/Nitrate Test Strips (lot #HC553793)
Plain polyethylene film (control film)
40°C oven (oven #10)

Procedure: The testing was conducted according to standard procedures for each test.
Note- VIA tests were conducted using two strips of sample per jar (1" X 6" per strip)

Results: The following results were found:

Razor Blade Test- Carbon Steel Panels

Sample	Panel #1	Panel #2	Panel #3	End Result
Blue McMaster-Carr Film	Fail	Fail	Fail	Fail
VpCI-126 Film	Pass	Pass	Pass	Pass
Control	Fail	-	-	Fail

Razor Blade Test- Copper Steel Panels

Sample	Panel #1	Panel #2	Panel #3	End Result
Blue McMaster-Carr Film	Fail	Fail	Fail	Fail
VpCI-126 Film	Pass	Pass	Pass	Pass
Control	Fail	-	-	Fail

VIA Test

Sample	Plug #1	Plug #2	Plug #3	End Result
Blue McMaster-Carr Film	Grade 2	Grade 2	Grade 1	Fail
VpCI-126 Film	Grade 3	Grade 3	Grade 2	Pass
Control	Grade 0	-	-	Fail

Nitrite/Nitrate Test Strips

Sample	Results
Blue McMaster-Carr Film	Tested positive for both nitrite and nitrate

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Photo from the VIA test:

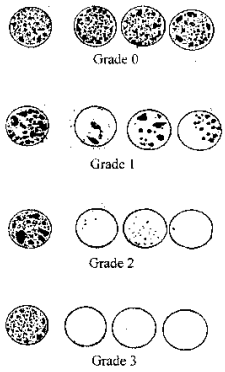
Blue McMaster-Carr Film

Control Plug#1 Plug #2 Plug #3

VpCI-126 Film

Control Plug#1 Plug #2 Plug #3

VIA Test Grades (Grade 2 and 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	

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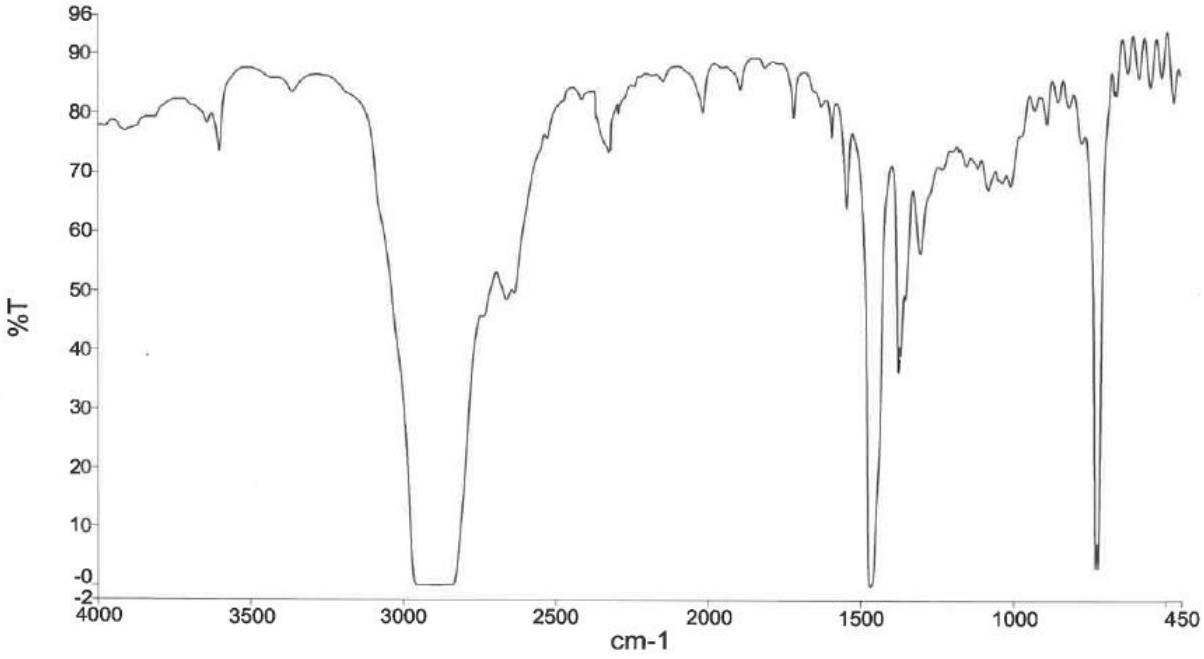
FTIR Analysis:

Blue McMaster-Carr Film



Interpretations: The blue film from McMaster-Carr does not provide sufficient corrosion protection to pass the VIA or razor blade testing. VpCI-126 film provides excellent corrosion protection for both the contact and vapor phase.

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