



Chemraz® 541 satisfies customer with quick lead times and excellent chemical resistance

Customer

Oliver Equipment, a Texas-based distributor and service company, has been a dependable supplier to various industries including Refining, Petrochemical, Chemical, Oil & Gas, and Industrial markets since 1975. With decades of industry experience, particularly in handling equipment such as pumps and turbines, Oliver Equipment understood that downtime could be costly for their customers. They recognize the urgency of repairs, aiming to complete them in as little as a week to minimize downtime for their customers.

Problem

In response to a customer's urgent pump overhaul, Oliver Equipment searched for a supplier who could deliver O-rings that could meet the customer operational requirements and arrive in the required time. They contacted Greene Tweed with a request for a seal that could withstand its customer's gas sweetening process.

Gas sweetening uses amines to remove hydrogen sulfide (H₂S) or carbon dioxide (CO₂) from gas. This process earned its name because H₂S adds a "sour" smell, which dissipates with its removal from the gas. Depending on the process, several types of amines, including diglycolamine

(DGA), may be selected to strip out the corrosive elements from the gas. Removing the H₂S and CO₂ from the gas reduces the possibility of damage to piping and increases the quality of the final product. Selecting a seal that can more reliably resist chemical attack minimizes the possibility of unplanned downtime.

Solution

To provide the right material recommendation, Greene Tweed's applications engineering team evaluated the complete application. The need for excellent chemical resistance to amines combined with temperature requirements led to the selection of a Chemraz perfluoroelastomer solution. Perfluoroelastomers provide the broadest chemical resistance of any elastomer and can also be molded into typical sealing shapes, such as o-rings, making the material a reliable choice for an aggressive, hot amine environment. Knowing that based on operational temperatures, multiple Chemraz perfluoroelastomer compounds could be offered, Greene Tweed's engineers focused on chemical resistance as primary factor to make a recommendation. Based on their comprehensive review, Greene Tweed's engineering team suggested that the universal purpose Chemraz compound, 541, could meet the customer's requirements.



GREENE TWEED
Chemraz®
541

Greene Tweed engineered Chemraz® 541 as a universal purpose compound suitable for a wide range of industries

CASE STUDY

Greene Tweed engineered Chemraz 541 as a universal purpose compound suitable for a wide range of industries including chemical processing, life sciences, oil & gas, and semiconductors. Chemraz 541 seals are used in a wide variety of applications including analytical instrumentation, gas sweetening, and mechanical seals. Since Chemraz 541 is designed as a solution for a wide range of operational environments, establishing its chemical resistance in a variety of fluids was crucial.

Results

Greene Tweed followed ASTM D471 methodology to assess chemical resistance for Chemraz 541. The testing process began with benign fluids such as the Mobile Jet Oil II at an elevated temperature of 347° F/175° C for three days. Next it was assessed in other fluids such as distilled water and steam. The distilled water and steam soaks were held for 70 hours (about 3 days) at 250° F/121° C. With good results and a baseline chemical resistance established, the testing process then shifted to extremely aggressive tests for acids and amines. Greene Tweed immersed Chemraz 541 in sulfuric acid at 250° F/120° C for one week and then for a separate soak test to check for resistance against amines, selected diglycolamine.

While also used in agrochemicals and pharmaceutical intermediaries, diglycolamine is one of the amines that can be utilized in the gas sweetening process to remove H₂S, making it an ideal candidate to measure against for Oliver Equipment's customer. Diglycolamine is a high solubility parameter chemical so the expectation is that it will not cause swelling in perfluoroelastomers such as Chemraz except at temperatures at or around 212° F/100° C. This chemical also has one primary amine connected to a highly polar glycol molecule, making it a very reactive fluid for this test.

Like the other chemical resistance tests Greene Tweed executed, Chemraz 541 was placed in a vessel containing diglycolamine at a temperature of 302° F/150° C for one week. O-ring measurements were taken before and after exposure to fluids.

Once the test was concluded and the O-rings removed from the vessels, Greene Tweed evaluated the volume change after the diglycolamine soak to determine Chemraz 541's resistance to that fluid. Greene Tweed considers a material to have excellent compatibility with a fluid, both in static and dynamic service, if the volume change measures less than 10%. Chemraz 541 post-soak measurements registered the volume change at 6 percent, thus earning it the top rating for chemical resistance to amines.

Fluid Aging		Chemraz® 541
70 hours @ 347° F in Mobile Jet Fuel II		
Hardness Change, Type M	Points	0.37
Tensile Strength	%	5.83
Elongation	%	6.23
Volume Change	%	0
70 hours @ Room Temp in ASTM Ref. Fuel B		
Hardness Change, Type M	Points	0.2
Tensile Strength	%	4.5
Elongation	%	3.1
Volume Change	%	0
70 hours @ 250° F in Distilled Water		
Hardness Change, Type M	Points	1.3
Tensile Strength	%	-2.9
Elongation	%	5.1
Volume Change	%	1.3

Fluid Aging		Chemraz® 541
70 hours @ 250° F in Steam		
Hardness Change, Type M	Points	0.2
Tensile Strength	%	-6.8
Elongation	%	2.5
Volume Change	%	1.0
168 hours @ 250° F in Reagent Grade Sulfuric Acid		
Hardness Change, Type M	Points	-3.5
Tensile Strength	%	2.5
Elongation	%	-0.2
Volume Change	%	9.3
168 hours @ 302° F in Diglycolamine		
Hardness Change, Type M	Points	-4.0
Tensile Strength	%	-1.0
Elongation	%	31.0
Volume Change	%	6.0

CASE STUDY

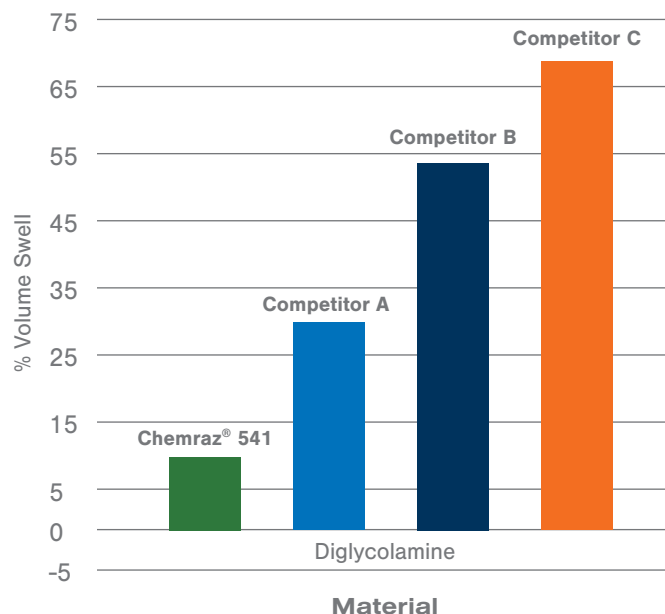
Subsequent side-by-side testing against competitor materials under the same conditions shows Chemraz® 541 exhibits the lowest amount of volume swell in diglycolamine. Because diglycolamine is one of the more reactive amines combined with the test temperature 302° F/150° C, these results lead GT to have confidence that 541 will outperform competitor materials in most amines of the same or lower aggressive nature.

After reviewing the data, the customer accepted Greene Tweed's recommendation to use Chemraz 541 in their application.

Benefits

Greene Tweed delivered the O-rings to Oliver Equipment in the specified lead time, thus enabling Oliver to complete its customer's repair on schedule. Oliver Equipment reported that the pump is now back in service, and with its new Chemraz 541 O-rings installed, is performing successfully in the gas sweetening process.

**Volume Swell % in Diglycolamine
(168 hours at 302° F/150° C)**



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