

COMBAT CORROSION

— PROTECT DIESEL FUEL —
EQUIPMENT FROM CORROSION

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VEEDER-ROOT

WHY IS CORROSION OF DIESEL FUEL SYSTEM EQUIPMENT AN ISSUE?

- In-tank corrosion, caused predominantly by **Microbiologically-Influenced Corrosion (MIC)**, has been a significant challenge in the retail fueling industry for over a decade.
- Advancements in diesel fuel, particularly **Ultra-Low Sulfur Diesel (ULSD) and Biodiesel**, created an environment where microbial growth could flourish.
 - *Higher contents of sulfur, found in diesel fuel prior to 2007, acted as a biocide and mitigated these effects.* ¹
- Microbial growth feeds on contamination and components of diesel fuel and creates a biofilm that adheres to fueling system equipment and tank walls. High acid values within the biofilm create a **corrosive condition** that leads to the **degradation of equipment**.
- The presence of these microorganisms can cause fuel degradation, filter plugging, pump and injector problems, and buildup of biofilms inside the tank resulting in **unplanned downtime and increased maintenance costs.** ¹

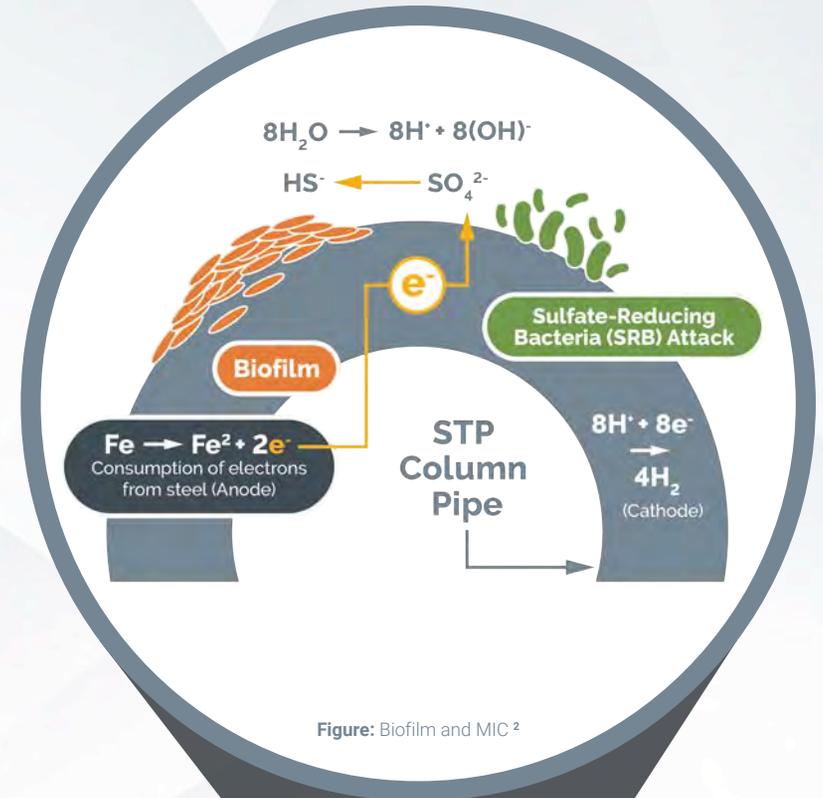


Figure: Biofilm and MIC ²



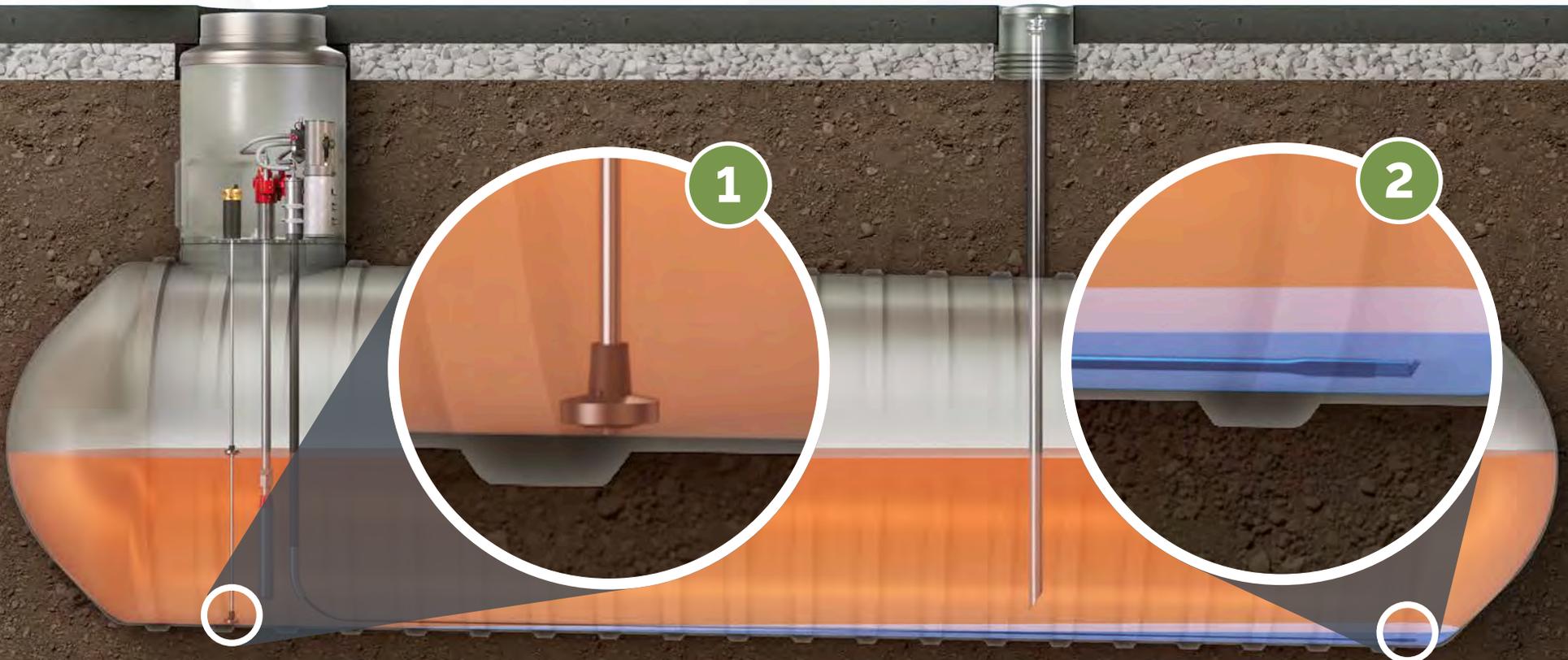
THE ROLE OF WATER

▶ HIDING WATER

- 1 Float-based probe technology requires a minimum water level of 3/4" in the probe area to alert, allowing for water to remain hidden under that threshold.
- 2 Up to 32 gallons of water can be present in the lowest point of a tank with a 1-degree tank tilt.

▶ CRITICAL TO MICROBIAL GROWTH

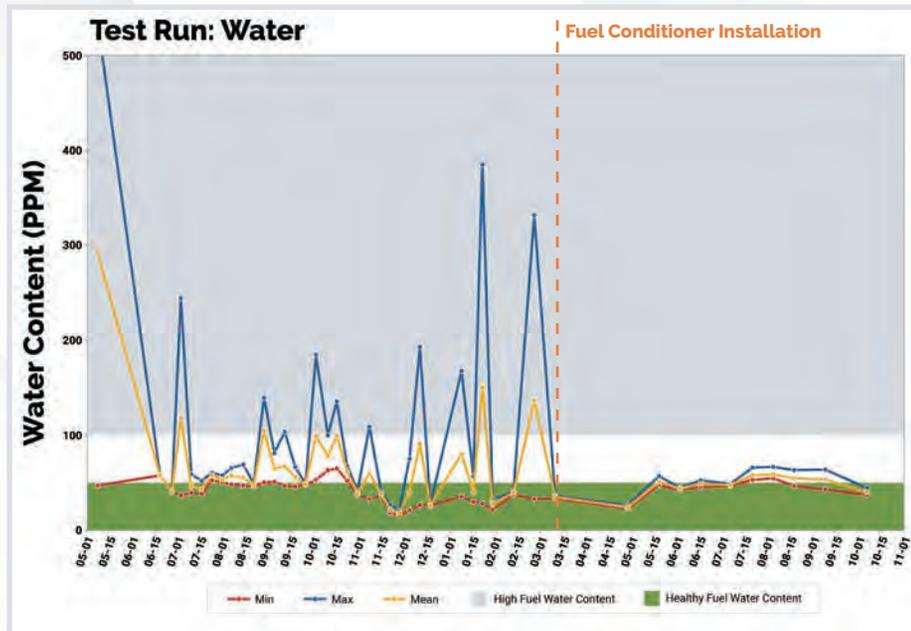
- The fuel-water interface is central to microbial growth as water provides a suitable environment for microbes to thrive within the UST.
- Microbial growth feeds on contamination and components of diesel fuel:
 - Glycerol
 - Fatty Acid Methyl Esters (FAME)
 - Ethanol cross contamination
- Metabolic bi-product settles to the tank bottom and creates an acidic environment. ³



LIMITING IN-TANK CORROSION

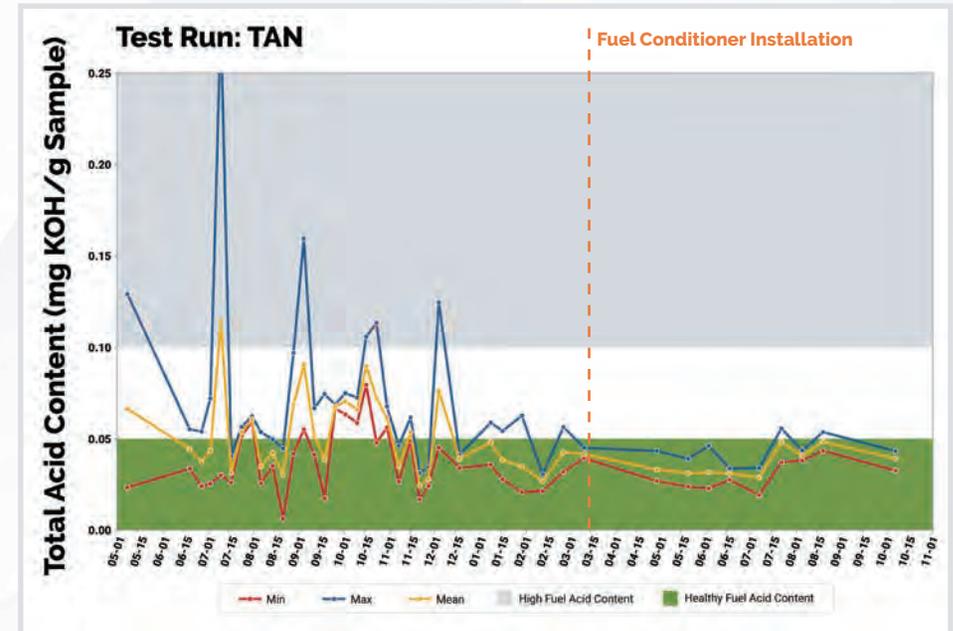
There is a strong correlation between water control and fuel acidity. Higher acidity levels correlate with higher water levels in this tank. Once the Fuel Conditioning System is installed, both the water content and the acidity levels drop.

WATER CONTENT



Prevalence of water in USTs directly correlates to the prevalence of corrosion.

TOTAL ACID NUMBER (TAN)



Controlling water will control the total acids in the fuel, a leading indicator to a corrosive environment.

EPA GUIDANCE

“The best way to minimize the risk of corrosion is to regularly monitor the diesel UST system for water in the tank and remove it. Monitoring for water and keeping it to a minimum is standard industry practice and part of a critical regular maintenance routine.”⁴

- EPA 2016

“Maintaining water presence as close to zero as possible is the best way to minimize the chance of corrosion and risks to functional failure of the tank or equipment due to corrosion.”⁴

- EPA 2016



SOURCES OF WATER INGRESS

▶ LEAKING SEALS

- Water ingress through leaky seals is common where there is a poor grade (lower elevation) or high-water table in the tank area.

▶ FLOODED SPILL BUCKETS

- Water in unkept spill buckets can enter the fill pipe through loose caps.

▶ CONDENSATION

- Hot, humid air enters the tank and condenses on colder fuel.

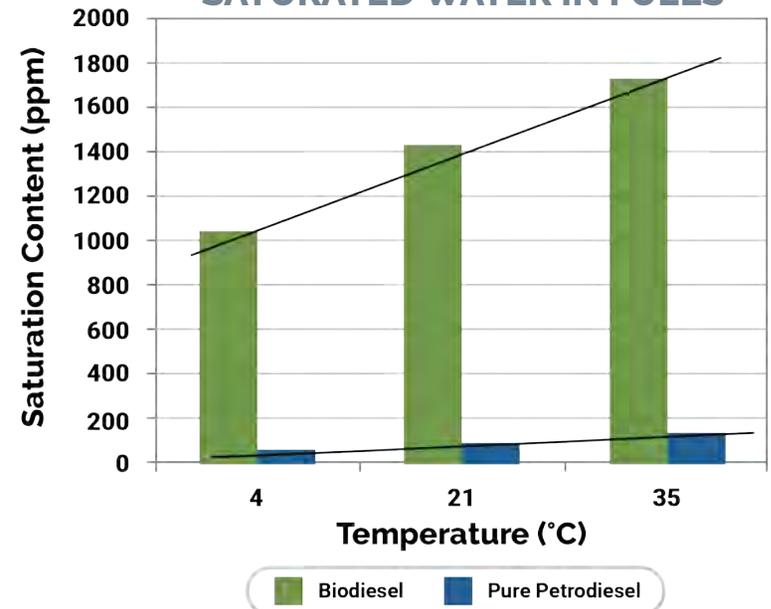


DELIVERIES



Biodiesel and biodiesel blends hold significantly more moisture than petroleum diesel. ⁵

SATURATED WATER IN FUELS



WHAT ARE THE FIRST STEPS TO LIMITING CORROSION?

► **Water ingress through deliveries and condensation are not as easy to detect and control. Conditions to look out for include:**

- **Vinegar smell in the fuel**
- **Line leak failures, not holding pressure**
- **Standing water in the tank, as indicated by probe water alarms**
- **More frequent dispenser filter changes**
- **Hazy fuel within UST, typically more prevalent on tank bottoms**
- **Evidence of scale and rust on internal components**
 - Inside of riser pipes
 - Under-side of bungs
 - STPs and UMPs
 - Valves



If you have any of these conditions, water is likely an issue in your tank.



**TO REDUCE THE LIKELIHOOD OF CORROSION,
LIMIT THE PRESENCE OF WATER WHERE YOU CAN.**

- ✓ Ensure fittings are watertight
- ✓ Repair leaky seals
- ✓ Empty spill buckets regularly

WHEN WATER IS AN ISSUE

Consider Installing
the HydrX™ Fuel Conditioning System



The Veeder-Root HydrX Fuel Conditioning System combats in-tank corrosion by providing continuous water removal within diesel underground storage tanks. HydrX unique design removes water from the lowest point in the tank, preventing water from stagnating on the tank bottom and breeding microbial contaminants. The integrated filtration removes entrained water, rust, sand, and microbial particulate from the fuel, polishing it before returning clean fuel back to the tank. Keep your fuel within specification and maintain equipment at peak efficiency to avoid unplanned site shutdowns.



HydrX™

Fuel Conditioning System

▶ Continuous Conditioning Combats Microbial Contamination

- **Removes standing and entrained water** from the storage environment that may enter from delivery, flooded spill buckets, condensation, or leaky seals.
- **Removes rust, sand and microbial particulate** down to 25 microns from the fuel.
- **Intelligent operation** includes options for scheduling during quiet periods and deliveries, auto-hibernation mode when ideal conditions are reached.

▶ Benefits of a Fuel Conditioner for Diesel Operations

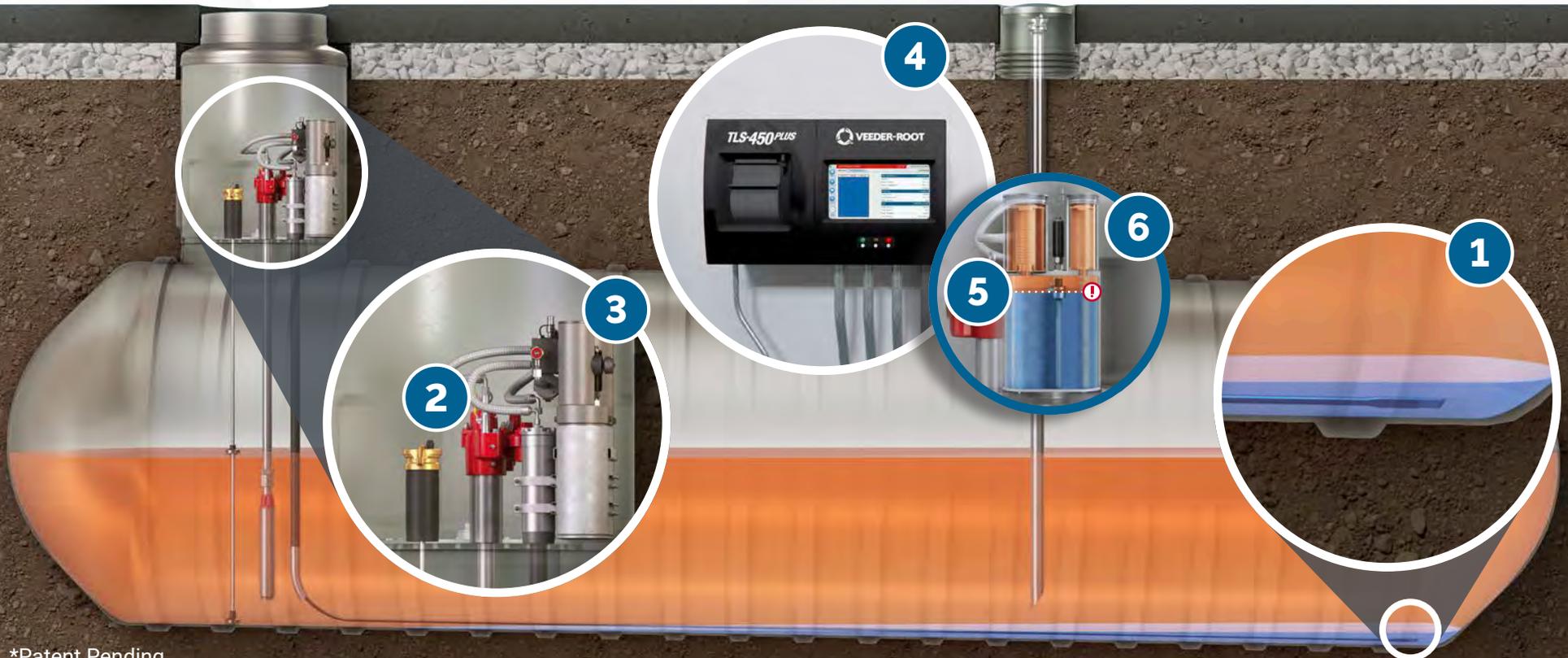
- **Lowers operations costs** with the elimination of emergency tank cleanings and fuel polishing.
- **Improves safety and serviceability of tank equipment** by removing water that is a leading cause of corrosion.
- **Increases flow rate at the dispenser**, as the restriction from clogged filters would be eliminated with a well-maintained tank. Site operators can expect less frequent dispenser filter changes.
- **Continuous cleaning action** ensures persistent conditions such as biofilms are mitigated.





HOW IT WORKS

- 1 The Water Intake Device (WID)*** is inserted through a spare bung in the Submersible Turbine Pump (STP) sump, which rests on the tank bottom to access water from the lowest point in the tank.
- 2 The WID is a multi-mode device** powered by the STP to collect water from the bottom of the tank and entrained in the fuel, delivering it to the Fuel Conditioner in the sump. Fuel and water are separated through filtering, and the water kept in the containment vessel.
 - Vacuum mode uses suction from the STP port to pull fuel, water and particulate into the fuel conditioning system.
 - Sweep mode uses clean fuel to push water and particulate to the lowest point in the tank where it can be picked up by the WID.
 - Polishing mode is activated when the vacuum and sweep modes are complete (i.e., no more water is being collected). This mode provides a fine polish for optimal fuel quality.
- 3 Separation and filtration** purifies the fuel before returning it to the tank.
- 4 The TLS-450PLUS Automatic Tank Gauge (ATG)** allows the user to see the water level real-time and alerts when the water containment vessel is full.
- 5 When the water containment vessel is full**, the system will automatically shutdown until water is removed from the containment vessel.
- 6 To remove the water**, a site technician would quick-connect to the water containment vessel and drain water into a separate container for disposal.



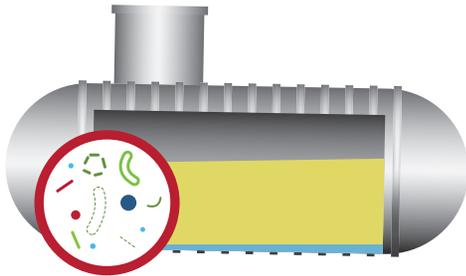
THE COST OF DOING NOTHING

Eliminate loss of revenue due to unplanned site shutdowns caused by out of specification fuel and broad contamination leading to equipment failure

TANK MAINTENANCE COST

Stagnant water breeds microbial growth:

- Water is the chief enemy of diesel storage
- Traditional water removal and tank cleaning methods are costly and time consuming
- Tank maintenance, costs up to \$6K/yr

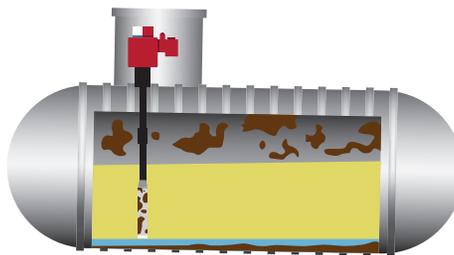


Return on Investment*
\$6,000/year

EQUIPMENT LIFE PENALTY

Microbial growth attacks fueling equipment:

- Corrosion causes improper operation or failure
- Acceleration of equipment aging up to 5X
- Reduced equipment life, costs up to \$10K/yr



Return on Investment*
\$10,000/year

DISPENSER THROUGHPUT IMPACT

Microbial growth contaminates the fueling system:

- Microbial particulate reduces dispenser filter life
- Clogged filters reduce fuel throughput
- A reduction in flow translates to \$15K in lost profit



Return on Investment*
\$15,000/year

* ROI estimates vary based on site conditions

COMBAT CORROSION

WITH VEEDER-ROOT EQUIPMENT

► PROTECT AGAINST IN-TANK AND IN-SUMP CORROSION

Corrosion of fueling equipment in tanks and sumps causes fuel degradation and premature equipment breakdown. Luckily, Veeder-Root is prepared to help you defend against corrosion with a portfolio of resilient products.

**The Red Armor®
Submersible
Turbine Pump**



**The Red Jacket®
Stainless Steel
Riser Pipes**



**The Red Jacket®
Trapper Intake Screen**



**The Red Jacket®
Sump-Dri™
Desiccant
System**



**HydrX™ Fuel
Conditioning System**



COMBAT CORROSION

PROTECT DIESEL FUEL EQUIPMENT FROM CORROSION

► It's important to understand the conditions in your tank and sump in order to best determine the right equipment to protect your fuel site.

	If Yes, Consider Installing:
Do you have standing water in the tank?	HydrX™
Do you anticipate standing water in the sump?	Red Armor® STP + Stainless Steel Riser
Are you experiencing high humidity in the sump or have installations in a high humidity environment?	Red Armor STP + Stainless Steel Riser + Sump-Dri™ Desiccant
Are you changing diesel dispenser filters more frequently (e.g., humbugs resulting in dark particulate in the filters)?	HydrX
Do you see evidence of scale and rust on internal diesel fuel system components?	HydrX
Are you operating in 100% Diesel, B100, or other Biodiesel Blends?	HydrX
Are you operating in Clear Gas [no Ethanol] or 100% Diesel?	The Red Jacket® STP
Are you operating in E85 or B-20 – B-100?	Red Jacket Alcohol Gas STP
Are you operating in E10 – E15?	The Red Jacket STP + Sump-Dri Desiccant
Are you concerned about corrosion from Ultra-Low Sulfur Diesel (ULSD)?	HydrX + Red Armor STP
Are you concerned about in-sump corrosion from High-Ethanol Blends?	Red Armor STP + Sump-Dri Desiccant



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