

Why you should monitor indoor fuel systems



There are hundreds of thousands of emergency and back-up generators in use around the world. Modern business communications and data systems required uninterrupted power. Most hospitals, police buildings, fires stations and other critical mission facilities have back-up power. Even high-end residential buildings and Class A office space are equipped with standby generators. While natural gas and LPG is becoming popular for small scale installation, diesel fuel is still the dominant energy source larger commercial and institutional facilities. Generally, diesel powered standby systems are safe and reliable. Decades of experience in design, installation and maintenance have made diesel powered generators the default option for most large facilities. But diesel fuel storage and pumping systems are not without risk. Here is a sampling of news stories from late 2015 through June 2016:

250 Gallons of Diesel Fuel Spill Into Schuylkill River

<http://www.nbcphiladelphia.com/news/local/Schuylkill-River-Diesel-Fuel-Spill-Philadelphia--366479731.html>

Clean-up underway of diesel spill above Detroit Lake About 450 gallons spilled from cell tower generator

<http://www.ktvz.com/news/Clean-up-underway-of-diesel-spill-above-Detroit-Lake/38127630>

Company to pay \$23,000 after diesel fuel spill in Appomattox River

<http://www.charlotteobserver.com/news/local/article46433845.html>

More than 100 gallons of diesel fuel leak from generator into South Bristol cove

<http://bangordailynews.com/2014/11/06/news/midcoast/more-than-100-gallons-of-diesel-fuel-leaks-from-generator-into-south-bristol-cove/>

Oiled ducks, turtles rescued after diesel spill into Little Sugar Creek

<http://www.charlotteobserver.com/news/local/article46711990.html>

Irish Sea diesel spill came from Larne Caterpillar factory

<http://www.larnetimes.co.uk/news/larne-news/irish-sea-diesel-spill-came-from-larne-caterpillar-factory-1-7428643#ixzz4BbN0D0OD>

The common thread of these stories is that the fuel leak was detected after it escaped the facility. “Leak Detection by Neighbors” seems to be the most common detection method. Why does this occur? Generators sets, their day tanks, pumps, valves, filters, couplings and other fittings are hidden away in basements. The reliability of these systems, the low level of required maintenance leads to an owner’s sense of complacency. Many systems include automated monthly start-up testing and load simulation that further minimize the need for routine user interaction. While the odds are low that any given installation being the cause of an environmental release, the vast number of installations implies that at least a few systems will leak every month. Hopefully the leak rate is slow and facility personnel discover the spill while it is still small, but the news stories cited above demonstrate that is not always the case.

Risk mitigation strategy

Most facility managers with responsibility for a diesel powered generator are aware of the safety and environmental risks of storing diesel fuel on site. At least some inspection and routine preventive maintenance are the standard, not the exception, but this compilation of recent news events show that best intentions are not always good enough. So what more can be done and how much to spend doing it?

Here’s a way to think about the cost of risk mitigation strategy: Make a guess as to the likelihood of a leak at your facility in any one year. For instance you could estimate 0.1%. That means that the

probability of no leak is 0.999 and the probability of no leak over 20 years is $(0.999)^{20}$ or about 98%. That result implies that likelihood of at least one leak over the next 20 years is about 2%. Next, take a guess at the cost of the clean-up, civil penalties and damage to the company's reputation should an off-site leak occur. This one is hard to quantify, but \$50,000 is probably optimistic on the low side. That means the expected value estimate of the cost of a leak at your facility is about \$1000 ($2\% \times \$50,000$) for the next 20 years. There is still a 98% chance that your leak cost will be zero. But, on average, there is a 2% chance the cost could be \$50,000 or more. If you are responsible for 100 generators or consider yourself as part of a pool of generator owners the average cost will be about \$1000 per generator for a 20 year life cycle. Obviously, this value is the product of the underlying assumption and you are free to make your own estimates of clean-up cost and likelihood of a leak, but \$1000 per generator is not a bad starting point.

The sub-\$1000 solution

TRM Sensors LLC designed the [TRM-DFS-3](#) system to meet the \$1000 challenge. Here are the key elements of the design:

- A low center of gravity and wide base so the sensor sits flat on the floor or in a drip pan.
- Sensor element in direct contact with the floor to detect a spreading puddle of fuel. The activation height should be zero if possible – Most un-contained leaks do not form a puddle deep enough to activate a float switch.
- No moving parts to foul or corrode over the years
- No external power requirement – optical sensor, for instance, require 12 to 24 volts in addition to the alarm feedback wiring.
- Response to diesel fuel measured in seconds ...not minutes or hours like sensor cable
- Simple passive technology with no microprocessor to hang-up
- Conductive polymer, resettable sensor that clears and resets once remove from fuel spill
- Easy to replace sensor element in the event of mechanical damage
- Simple two-wire connection to the customer's pre-existing Building Management System (BMS), PLC or other monitoring equipment; configurable as either a normally open or normally closed device.
- Suitable for installation in hazardous areas as a passive device via two channel zener safety barrier

... And do it all for less than \$1000

The TRM-DFS-3 does, indeed, hit these objectives. At a cost of less than \$250 per sensor, it is possible to target the big three leak sources: day tank, flex couplings/filter, pump/valve manifold and protect the floor drain with a fourth sensor and still have a few dollars to spare.

If the facility does not have a BMS or other system to monitor the sensors then TRM Relay Unit Type-CV can be added to provide dry contacts that can switch on alarm horns or beacons or similar indicators.

The bottom line: You may never have a diesel leak. You may never experience a fire either. But you wouldn't dream of going without fire alarms and fire insurance and you should put diesel leak detection in the same category. For a one time investment in the \$1000 range, you can buy "leak insurance" that

will significantly reduce the risk of an expensive clean-up. Knowing about and reacting to a small fuel puddle on the mechanical room floor is a whole lot better than “Leak Detection by Neighbors”.

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