Is There A Long-Term Stored Diesel Fuel Management System?

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This report is a reference to ASTM STP 1005, pg. 119 - 138, **"Method of Managing Long-Term Diesel Fuel Integrity"** , Paul M. Melton, Lannie S. McGaughey and Alice M. Goldwire, President, Vice President and Contributing Chemist and Data Analyst, respectively, Diesel Fuel Maintenance Service, Inc., San Angelo, TX.

Abstract: Deteriorating fuel quality, disposal problems, the effects of storage facilities installations and fuel cost have created a **need for intelligent stored diesel fuel management**. Alternative methods of cleaning, treating or both, contaminated diesel fuels stored under "real world" conditions were tested and results analyzed to determine methods of managing stored fuel integrity. The methods tested include;

1. mechanical centrifugation/filtration,
2. filtration/chemical treatment,
3. chemical treatment without filtration,
4. the combination of (1) and (3).

Each method is discussed in detail in addition to concluding remarks addressing the most viable method supported by the test results.

Discussion: ***General***

Though not initially planned as an integral part of this paper, some discussion is necessary to describe factors that contribute to stored fuel degradation, conditions and inhibit stored fuel maintenance, and the need for a broader approach to full scale stored fuel management. Such would necessitate beginning with more intelligent storage tank design, better tank installation engineering and then an appropriate stored fuel maintenance program.

Initial assumption was that climatic conditions would have some detrimental effects on stored fuel: that is, more oxidated fuel, with little or no water contamination in dry, arid areas; and high water content (more condensation) in areas having high relative humidity. However, mishandled fuel-drops and poorly engineered tank designs and installations seemingly contributed more to fuel contamination than climatic conditions.

Significant water bottoms were found in normally dry areas where tank inlets were below ground level and caps were loose or broken; highly oxidated fuel was found, with little or no water contamination, in areas with normally high humidity. In addition to these anomalies, unusual debris was found that could be only the result of mishandling poorly placed inlets and vents.

Conclusions

- Personnel responsible for managing stored fuel may lack knowledge of the storage system's design and capacity; age, quantity and quality of the fuel in storage; and be unaware of a need to maintain the fuels integrity. Educating owners and managers about stored fuel's inherent ability to age and become contaminated; the

damaging, and many times costly, consequences of using contaminated fuel; and the means, equipment and treatment chemicals that are now available with which to restore and maintain fuel clarity and purity would do much toward expanding the time fuel could be stored.

- There may be little, if any, improvement in the quality of refined diesel/kerosene fuels in the near term. The high cost of changing refining techniques, the low market value of fuel, the glut of fuel on today's market, together with many owners of stored fuel being either unaware or unconcerned about their fuel's condition, does little to force improvements. Unfortunately, from some owners' point of view, until a calamity occurs; or, they are convinced that such an occurrence is inevitable, they seem satisfied to either do nothing about restoring the fuel's clarity and purity or just to burn off existing fuel willing to risk damage to their equipment and leave sediments in the tank's bottom to contaminate new fuel. This attitude is due, to some degree, to the owners being unaware of the consequences and, to a greater degree, having other demands placed on their expense budget.
- Proper tank placement is important to sustaining stored fuel integrity by protecting it from contaminates. Improper tank, inlet, or vent placement, in the cases experienced, had more damaging impact on stored fuel than climatic conditions. Until some tanks are replaced, inlets or vents modified, or both, fuel contamination will be continual and severe. Awareness of the consequences of improper tank placement by architects and construction engineers could aid in improving this situation. Related standards should be reviewed to ascertain the need for change.
- Though some contaminates can be removed by flowing the fuel through coalescer and particulate filters, many may pass through these type elements. Fuels containing additives with surface tension reducing surfactants appear to inhibit the efficiency of coalescer and particulate filters.
- Chemical treatment, alone, of stored fuel laden with contaminants and sediments may not achieve the desired results. Contaminants and sediments should first be extracted from the fuel, then treatment chemicals carefully and thoroughly blended with the fuel to achieve optimal results.
- The use of high-speed centrifuge in combination with series-mounted particulate filters and a chemical injection system capable of instream treatment of the purified fuel achieved the more desired results. Whether the system is portable or stationary, it can provide a viable means, along with periodic fuel sampling and laboratory or field sample analysis, of restoring and sustaining stored fuel's integrity.

The above information was extracted from ASTM STP 1005, published in 1988.
NOTE: "The Society is not responsible, as a body, for the statements and opinions advanced in this report".

What's changed in the past 10 years?

Modern refining processes are leaving distillate fuel more susceptible to contamination. Studies have concluded that the contamination and degradation process of stored diesel fuel #2 is well underway within 28 days of storage. With the tighter engine tolerances required of engine manufacturers, **"the need for intelligent stored diesel fuel management"** is more critical than ever.

The 1984 Underground Storage Tank Resource Recovery Act has somewhat contributed to UST installation, inlet and vent location. However the Act is concerned with spill containment and fuel tank leaks and does not address fuel maintenance.

Filter media technology has improved to allow us to remove particulate, foreign matter, microbial growth and repolymerized fuel down to 3 microns. Water Block filters are

capable of removing 99.5% emulsified water from stored diesel fuel. Coalescer technology will remove 99.5% free water from stored diesel fuel. Providing good clean fuel, well within the standards of ASTM and Engine Manufacturers.

Chemical additives, (treatments), have been developed that are self dispersing and do not require costly injection systems for introduction to the stored fuel.

Who is **responsible** for the delivery of clean fresh fuel to the prime mover of an emergency power system or a fire pump at a Level 1 facility? **Everyone**: the Regulator's, the Design Engineer, the Property Owner, the Facility Occupant and the Facility Engineer.