



PRODUCT BULLETIN

FUEL CONDITIONER 77

Multi Functional Fuel Oil Additive

General Description

FC-77 is a multi functional fuel oil conditioner concentrate that contains organic combustion catalysts, and nonionic dispersants. **FC-77** is a complete fuel oil additive formulated with the components required to prevent problems associated with all fuel oils, including No. 2 through No. 6 - Bunker C residual oils.

Problems encountered in the storage, handling and burning of fuel oils are varied and complex, a single component fuel oil additive is usually not effective in preventing the numerous problems that occur throughout the fuel handling systems. **FC-77**, however, is a combination of several multifunctional materials. It provides fuel oil stability, sludge and deposit control, fuel oil viscosity control, corrosion control and fireside deposits control.

Fuel Oil Problems

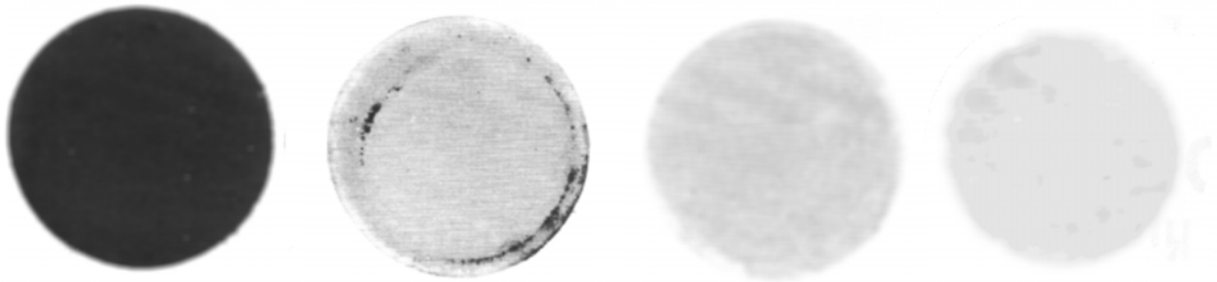
Fuel Oil Stability: Dispersed water in fuel oil, as well as the oxidation products of fuel oil contaminants, results in instability of fuel oil when stored for extended periods. In the shipping, storage and burning of distillate and residual fuels, it is almost impossible to keep each fuel stock segregated. The mixing of different fuel oil stocks, particularly combining certain straight run fuels with catalytically cracked fuels, can lead to severe problems in compatibility and fuel instability even during short term storage. Fuel oil additives containing multifunctional **FC-77** will help prevent stratification of mixtures of fuel stocks in storage. **FC-77** also prevents the formation of sludges and other deposits that may result when incompatible fuel stocks are mixed. The formation of deposits caused by oxidation and polymerization of polar or non-polar hydrocarbons in fuel oils is minimized when the fuel oil is treated with **FC-77** as it is put into storage. Treating fuel oil with **FC-77** will eliminate problems associated with excessive accumulations of water. **FC-77** promotes emulsification of water in the fuel. This enables water removal from the system via combustion of the fuel.

Sludge and Deposits Control: The mechanism of sludge formation in stored fuel oil is complex and depends on several factors that are not readily controlled. Extensive laboratory testing has demonstrated that the combination of components in **FC-77** prevents most of the problems associated with sludge and deposits in fuel oil handling systems.

This is done in at least two ways:

- i. **FC-77** retards the oxidation and polymerization of substances in the fuel, thereby inhibiting the formation of insoluble substances in the fuel.
- ii. The highly active dispersing, peptizing and dissolving properties of **FC-77** prevent the agglomeration of sludges, and the insoluble materials that do form in the fuel are kept in a finely dispersed state.

These mechanisms keep storage tanks, fuel lines, strainers and burner nozzles free of deposits. In fact, the continuous use of **FC-77** in the fuel tends to remove old accumulations already in the system. The effectiveness of **FC-77** as a sludge dispersant is illustrated in Figure 1 noted on the next page.



Corrosion Control: The continuous use of **FC-77** as an additive to all types of fuel oil prevents corrosion of tanks, lines, strainers and other components of fuel handling systems. Corrosion occurs as a result of the accumulation of corrosive substances in the emulsified water in the oil or in the free water that accumulates in storage tanks. Corrosion can also result from the uncontrolled growth of microorganisms in the fuel storage system. Corrosion not only causes premature failure of equipment, but also creates rust particles and other debris that clog strainers or plug burner nozzles. Costly maintenance, shutdowns and equipment replacements can be avoided when steps are taken to prevent corrosion.

The corrosion control component of **FC-77** forms a thin protective film on metal surfaces contacted by the soil. This film provides a barrier against the corrosion substances in the fuel oil. Moreover, the dispersion or emulsification of water in the system by components reduces the potential for corrosion by eliminating the water from the system.

A reduction in cold-end corrosion and stack corrosion is also obtained through the continuous use of fuel oil additives formulated with **FC-77**. The combustion catalyst component of **FC-77** maintains more complete combustion, eliminates soot accumulations and stabilizes the fuel flow to the firebox. This has a direct effect in reducing SO_2 and SO_3 emissions and the resultant cold-end corrosion problems. Lower SO_3 content in combustion gases permits improved operating efficiency, since burner operation at lower stack temperature is possible without corrosive acid deposition from combustion end products. Furthermore, the multifunctional components of **FC-77** do not contain chlorinated hydrocarbons, acids or other compounds that in themselves may contribute to corrosion.

Viscosity Control: The emulsifier component of **FC-77** helps maintain uniform oil viscosity, even when mixtures of fuel oil stocks are added to the same storage tank. Variations in the viscosity of residual fuel oils contribute to erratic fuel flow and nozzle pressures. This, of course, limits the combustion efficiency and frequently causes increased fuel costs for available Btu yield. No. 6 fuel oils treated with **FC-77** have lower pour points. This can eliminate the need to blend residual fuel oils with more expensive fuel oils (i.e., No. 2 fuel oil) to attain a certain fuel viscosity.

FC-77 also prevents deposit buildups or fouling of fuel preheaters and thereby helps to maintain more uniform fuel flow. Supplemental amounts of **FC-10** (See the FC-10 Product Bulletin) can be formulated with **FC-77** to provide a greater degree of viscosity reduction when fuel handling conditions are met.

Fireside Deposits Control: Soot is the residue from incomplete combustion of fuel in the firebox. The accumulation of soot at the burner in the firebox is both a symptom and a cause of combustion problems. It also causes deposit problems. The accumulation of soot and other fireside deposits contributes to increased stack emission and cold-end corrosion. Coke and unburned hydrocarbons from incomplete combustion stick to tube surfaces and act as accumulators for inorganic residues from the sulphur, sodium salts and vanadium salts in the fuel oil. These materials can cause oil slag formations in the firebox and in the superheater sections of some boilers. Cold-end corrosion occurs in the cooler areas of the system because of the deposition of acid sulfate and chloride salts.

The slag and corrosion scale decreases heat transfer and causes higher pressure drops in flue gas flow. The net result is wasted fuel, lower Btu yield, and higher fuel costs; all adding to the difficulties related to maintenance and stack emissions.

The addition of **FC-77** to residual fuels prevents accumulations of soot and other deposits in the firebox. By use of **FC-77**, which contains a combustion catalyst component, it has been possible to reduce the need for soot-blowing to less than 25% of the former frequency. Operation with reduced excess air is possible with **FC-77** treated fuel, retarding or eliminating the formation of vanadium pentoxide accumulations. Extensive field studies have shown that deposit formation is substantially reduced in systems burning **FC-77** treated fuel, and those deposits that are formed easily are easily removed with simple brushing and water-rinsings.

Application and Handling of **FC-77**

FC-77 is a liquid that is easy to store, easy to compound with other non-aqueous liquids and easy to dispense from shipping containers by means of chemical-metering pumps or suitable measuring containers. **FC-77** should be fed into the line transferring the fuel from the tank car or tank truck to the storage tank. Alternatively, the **FC-77** can be added manually to the tank before each delivery of fuel oil is received.

Dosage levels of **FC-77** will depend in part on the severity of conditions in which it is being used. Under most conditions, **FC-77** can be used as received at dosages of 1 quart of **FC-77** for every 1000 gallons of fuel oil.