

FURNACE OIL TREATMENT DURING STORAGE PERIOD

INTRODUCTION-Crude oil collected from sea is fractionated into various distillates and Residuals in Refinery processes. One of the useful residual is Furnace oil which is widely used in different Industries as a fuel for combustion process. Fuel oil tankers dispatched from refineries or from their distribution centers get unloaded into Storage tanks as and when they are received at different sites including far off locations.

Description-Now, based on the supply and consumption pattern, the oil may have at times to stay back for a couple of days or weeks until it is consumed into running boilers. Even, Climatic conditions may also affect their immediate application. Transit journey and storage in unsealed or uncovered tanks provide opportunities of external mixing of mechanical impurities like dirt, dust, industrial ash, atmospheric moisture or industrial gases to take unwanted entries. Even Mild steel storage tanks or pipelines may also face internal corrosion in presence of moisture if they do not have protective coat. Depending upon the Specific gravity the water layer may float on the stored oil or form intermediate layer or settle down at the bottom of the tank giving full chance to it's slippage ahead into combustion zone through running burners (if, heaters are not provided in between.)

Remarkably, in due course of time the fuel Oil faces natural degradation through auto oxidation from atmospheric air. As a result, it produces sludge and becomes thicker and thicker .The viscous gum like nature so acquired changes its desired viscosity which is anticipated as per design. Flash point may also change. The auto oxidation flourishes through Free Radical formation as a chain reaction.

Secondly, presence of intermediate water layer starts degrading/decomposing fuel oil into organic acids thereby alloying acid attack inside storage tank on internals linings, associated pipelines, valves etc

Thirdly, in due course of time, the oil becomes polymerized into heavier forms like asphaltine and paraffins which may settle down at times as varnish like deposits in oil heaters. Thus, the basic nature of the furnace oil gets disturbed.

Associated Combustion problems-

While using the heavy furnace oil (stored into storage tanks) it is pumped into the combustion zone through strainer, heater and burners. The Primary Air from Primary Air fan is mixed with the furnace oil and forced into the boiler combustion zone, through application of number of burners arranged in rows. The boiler may have front or back fired or Radial corner fired mechanisms as per the boiler design. However, the fire ball is produced at the center of the furnace. In order to support full combustion secondary air enters into the wind box its passage from the sides of burners. This entry of secondary air from sides creates turbulence in the combustion zone which helps in burning of residual unburnt Carbon lying associated with the ash.

Heavy viscous furnace oil in due course of time, may clog the burner tips, affect fire refectories, deposit loosely on to the boiler tubes as foul ant, or even corrode by affecting the protective hematite coat.

It may create clinkers in the combustion zone (first path) and when passed through the bottom ash hopper affect the grinding process.

Never the less, in the second path of Radiant zone while crossing the Super heaters, it may hang on there (known as birds nesting) as loose deposits hampering heat transfer. The fly ash may also erode or loosely deposit on to the tubes of super heaters and the system ahead like economizer, air pre heater etc.

The residual un burnt Carbon particles may leave the chimney as black shoot and affect the surrounding atmosphere vis-a-vis the local population. Even improper combustion may lead to rise in back end temperature (ID fan Side) and direct heat /energy loss thereby affecting the boiler efficiency.

Remedial suggested are-

[1] In order to guard Auto Oxidation, Anti Oxidants are added which stop the free radical reaction.

[2] Water layer from the top is removed by controlled over flowing of storage tank. Whereas bottom water layer is removed by partial draining the storage tank. Finally the intermediate water layer can be emulsion by re circulating the stored furnace oil in the storage tank.

[3] Polymerization is controlled by addition of Anti Polymeric compounds which brings sludge into colloidal form.

Treatment Program

To start with, these chemicals are added in powder or liquid form in the Oil storage tank directly and re circulated through fuel oil pump to achieve uniform mixing. The addition can be on bi weekly or weekly basis in the beginning depending upon prevailing site conditions.

They can also be dosed into first or second path on particular locations after making necessary injection arrangements.

Treatment Monitorings

Fuel Oil samples may be drawn as and when required or on periodical basis and sent to site lab or to national laboratories for detailing.

Analytical checks recommended are

[1] Kinematic viscosity measurement at 50 deg. Centigrade in Centistokes(cst) using Kinematic viscometer.

[2] Flash Pont measurement using Panasky Martins Closed cup method in degrees deg.C..

[Std. result-(>60 deg.C)]

[3] Density at 15 deg.C. in gms/ml.[Std result-(<0.99)}

[4] Mechanical impurity on ppm basis.

[5] Sediment on % Basis. [std result- $<0.5\%$]