ACTIONS OF THE DIESEL FUELS "rb bertomeu"

Technical document RB-27

Depending on the specific needs and requirements, the **"rb bertomeu"** additives are supplied with up to 30% wt/wt of Magnesium and varying percentages of other components.

The **"rb bertomeu" additives with dispersants** should be added to the fuel storage tank in order to obtain all the expected benefits of the treatment. In this way, the fuel is prepared for use in the corresponding combustion equipment and to obtain the maximum efficiency.

The addition must take place, in industrial facilities, at the moment of unloading the fuel into the storage tank.

Only when it is to obtain partial benefits, mainly related to Vanadium corrosion reduction, it is possible which some of the additives will be injected and metered in the fuel oil feed line of the combustion equipment or to the daily consumption tank. Each case must be analysed, taking into account the benefits which are desired from the additive

The immediate actions of **"rb bertomeu"** additives for heavy Fuel oil in the fuel storage tanks are the following:

1- **De-emulsion and separation of the water** present in the fuel oil. This water must be removed from the tank by periodic drainage. This way, part of the Sodium present in the fuel oil is eliminated, as well as its corrosive effects during combustion. Also, as water is eliminated, it does not damage the injectors and any power is lost during the vaporisation during combustion.

   See letter of reference by Cogeneración Electrica de la Ribera d'Ebre A.I.E"

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2- **The hydrocarbons in suspension**, solid or semi solid, of high molecular weight and are always present in the heavy fuel oil, **they are disintegrated, dispersed and maintained in homogeneous suspension, avoiding the separation of organic sludge** in the tank. This avoids the sludge building up in the tanks, the loss of fuel material, the cumbersome operations of tank cleaning and the costly withdrawal of sludge by specialised contractors.

3- **The degradation** due to the action of the time and temperature (polymerisation) , which is normally the cause of the appearance and separation of more and more sludge in the heavy fuel oil tanks, this **is also avoided with our additive treatment** to the storage tanks.

For more information, please read our Bulletin No. 3: "Reducing the formation of fuel oil sludge cuts fuel consumption, reducing operating costs"

The improvement actions of the **"rb bertomeu"** additives for heavy fuel oil and gasoil, in the engines and burners of boilers or furnaces, are the following when the treated fuel oil is used and consumed in the corresponding plants:

1- **The fuel circuits are kept cleaner** for longer periods of time due to the lower quantity of sludge, **including purifiers and filters**. According to the experience of our customers in cogeneration [power] plants, **the trigger rates of the purifiers can be delayed to the maximum permitted by the program** and the automatic filters (which operate by opening against pressure) remain almost without being opened due to the lower quantity of sludge.

For more information, please read our Bulletin No. 4: "The fuel oil treatment reduces the consumption in big engines operated with fuel oil. Data on savings obtained in two cogeneration plants"

2- **Combustion improves** due to the presence of surfactants which enhance the atomisation of the fuel and consequently its mixture with the combustion air. Due to this, **there are no unburned hydrocarbons in the exhaust gases**, therefore

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improving the energy efficiency. In the case of **diesel engines**, this is especially important as the combustion time is limited, while in the case **of boiler burners, the effect of the additive permits operation with least excess of air** over the theoretic necessary and obtains some gases at greater temperature, which **raises the rate of heat exchange and the energetic efficiency of the boiler** in the steam generation.

For more information, please read:

Bulletin No. 24: "Statistical data on analysis of combustion gases from steam boilers running on fuel oil"

Bulletin No. 27: "Statistical data on analysis of combustion gases in cogeneration plants with diesel engines running on fuel oil"

3- Surface reactivity

The chemical synthesis process by **"rb bertomeu"** produces the Magnesium Fatty acids Organic salts completely soluble in hydrocarbons where the Magnesium particles are Mg^{2+} ions, with a radius of 72 picometers (1 picometer is 1,000 times smaller than a nanometer).

The surface reactivity of these Magnesium ions over conventional materials (oxides and hydroxides of magnesium) is about 10 times higher if the particles are nanometric and 100 times higher if the particles are micrometric.

The **"rb bertomeu"** additives with soluble Magnesium are the most reactive agents known to neutralize corrosion by Vanadium pentoxide and Sodium vanadates and cannot make any damage by hitting or corroding the gas turbine's blades because the Magnesium particles are molecules. Being the additive in molecular form, it provides an active area (~ 1,800 m2 / g Mg) between 10 and 100 times higher than the one in nanometer-sized and micrometer-sized particles, and thereby increasing by a proportional factor the chemical reactivity.

When burning fuel oil, a fuel with a large quantity of metal impurities, the **"rb bertomeu"** additive, that is composed by Magnesium Organic Salts SOLUBLE in HYDROCARBONS, oinstigates the formation of non-corrosive compounds with a high fusion point, **avoiding the presence of low fusion point sodium vanadates**, which are mainly responsible for **corrosion in exhaust valves, turbo-compressors** and other hot parts of the engines, the **heat exchangers** of the boilers, etc. and also of the **formation of residual encrustation** in these elements.

Especially corrosives (due to its low fusion point: around 350ºC) are the sodium vanadates with a molar ratio V_2O_5/Na_2O of 3, although other compounds with higher or lower molar ratio have fusion temperatures between 400º and 650ºC and can be also dangerous in some points of the engine where theses temperatures are reached.

For more information, please read our Technical document RB-7: "Heavy fuel oil and its corrosive effects in the industrial combustion"

The action of fixing of heavy metals, is also translated in a decrease of the oxidation of SO2 to SO3 (formed from Sulphur in the fuel oil), by minimising its catalytic action on the reaction; as consequence, the appearance of sulphuric acid condensation when the combustion gases cool reduces and with this the cold corrosion.

For more information, please read:

Bulletin No. 29: "The reduction in emissions of soot and incrusted residues in steam boilers running on fuel oil"
Bulletin No. 5: "Minimizing incrustation on steam boilers reduces fuel consumption"
Bulletin No. 1: "Corrosion on exhaust valves and turbo-compressors in large engines running on fuel oil is preventable"

The corrosion which appears in the turbo-compressors is produced, usually, over a longer time period than in the exhaust valves of the engines. Through years of experimentation in power plants, reliable data is being obtaining which indicates which

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the regular use of **"rb bertomeu"** additives notably increases the life of the turbo-compressors and reduces their cleaning necessities, run-time cleaning (by water injection, steam, dry milled vegetal shell , etc.), as well as in-depth cleaning of the dismantled equipment. This reduction of cleaning also means an important increase of the annual production of power due to the decrease in down time of dismantling and rebuilding turbos and to the minus time operating at reduced power, as usual when cleaning is done during run time.

For more information, please read:

Bulletin No. 9: "Turbo-compressors in Diesel engines running on heavy fuel oil. How to increase its operational life and cleaning TBO."

February 2018

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