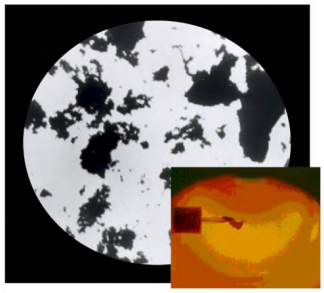
THERMAL STABILITY FUEL OIL TREATMENT FOR STEAM TURBINES



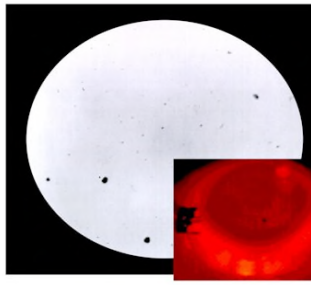
Untreated Fuel: *High carbon weight structures form during combustion – shown above under an electron microscope and in a burner nozzle test. The result is post-combustion fouling.*

The unique thermal stability chemistry of **PRI-RS** successfully overcomes the primary fuel oil quality challenges faced by power plant and steam turbine ship engineers today – emissions control, excessive sludge precipitation, and potentially damaging vanadium deposits.

PRI-RS is formulated with physical and thermal stability additives, and the most advanced vanadium control additives to successfully address these challenges.

First, **PRI-RS** inhibits the precipitation of organic fuel sludge an average of 70 percent, based on independent laboratory data.

Second, the proprietary thermal stability chemistry of **PRI-RS** inhibits the formation of high carbon weight structures where they start – in the second combustion stage. In so doing, particulate emissions are greatly diminished.



PRI-RS Treated Fuel: PRI-RS *elevates the thermal stability of fuel – preventing the formation of waste carbon during combustion. Post combustion fouling is dramatically inhibited, soot fouling and particulate generation is minimized.*

This reduction in particulates – resulting in reduced smoke opacity, permits operators to reduce excess air to the unit, hence reducing NOx as much as 17 percent. **PRI-RS** is also formulated with sulfur control technologies that reduce both SO_2 and SO_3 emissions.

Third, while most fuel treatments contain conventional MagOx additives, **PRI-RS** is formulated with a much more advanced and effective vanadium control technology that completely prevents any vanadate formation on boiler tubes. **PRI-RS** is sufficiently strong to prevent fouling even in fuels with vanadium contents as high as 400 ppm.

This unique approach offers multiple benefits:

- **Boilers operate closer to design specifications, optimizing efficiency.**
- **Boiler tubes remain free of vanadate deposits, maintaining high heat transfer rates.**
- **Smoke opacity is reduced 20-to-45% along with emissions of NO_X and SO_2. Heavy soot fouling is eliminated.**
- **Boilers are able to tolerate higher viscosity fuels and fuels with high vanadium content.**

PRI-RS is simple and economical to use. **PRI-RS** is easily dosed into the fuel during bunkering, and always at its economical treatment 1:4,000. **PRI-RS** has been tested safe by D.N.V. and Lloyd's FOBAS and verified by Man Diesel under the strict Marpol Annex VI protocol. **PRI-RS** provides tremendous value by improving the way fuel oils are used. System reliability is enhanced, operational difficulties and costs are reduced, and the end result is realized: increased profitability!

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Specifications	
Color & Appearance	Dark Amber Liquid
Odor	Hydrocarbon
Boiling Point	213 C.
Flash Point	68 C.
Specific Gravity	0.78 – 0.81
Water Solubility	Insoluble
USA DOT ID Number	UN 1268
Class/Division	Combustible Liquid
IMDG	Not classified as dangerous under IMDG regulation
IATA	Not classified as dangerous under IATA regulations

Dosage Rate:

PRI-RS is dosed at the rate of 1:4000, regardless of fuel specifications under ISO 8217. The fixed dosage rate was developed in consideration of the fact that heavy fuel oil characteristics can be widely variable, and that quality standards, as proscribed under ISO 8217 do not completely account for all deficiencies associated with fuel performance.

Hence, optimal protection is ensured at the 1:4,000 dose rate.

Dosage Method:

Power Research Inc. suggests that **PRI-RS** can be dosed at the main bunker manifold by means of a safe and easily operated air driven gear pump arrangement. However, **PRI-RS** is highly miscible with heavy fuel oil and may be added directly to tanks no greater than 60 minutes prior to bunkering. Agitation from fuel flow into the tank typically provides a sufficient mixture.

Quality control:

PRI-RS is manufactured in accordance with strict, chemical manufacturing standards. Each blend is numbered, and a retain sample is FTIR tested against a laboratory standard to ensure optimal conformance.

Miscibility:

PRI-RS is a highly complex blend of organic chemistries that, once blended with heavy fuel, will not stratify or separate, even with fuel purification. In fact purification systems remain cleaner and more efficient when processing **PRI-RS** treated fuels.