

# Power proof

*Power Research tells Bunkerspot that Man B&W testing has confirmed the benefits of the PRI-RS additive*



Ralph Lewis is the Vice President Technical at Power Research Inc.

Lewis, who has served as a technical consultant for the US Mine Safety and Health Administration and a technology transfer and public information specialist with Shell Oil, is the author of numerous articles on mine safety technology, oil field engineering and refining, world oil economic and political trends, and fuel oil quality issues.

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**T**he capability of the heavy fuel oil additive *PRI-RS* to significantly reduce unburned hydrocarbon and particulate emissions while improving combustion was recently confirmed in stationary engine tests conducted by Man B&W at the company's engine emissions certification facility in Holeby, Denmark. The test engine was a Man B&W model 5L21/31 engine burning 180 centistoke (cst) fuel oil.

The April test verified that *PRI-RS* fuel treatment reduced total hydrocarbon emissions (THC) as much as 22.6% and particulates as much as 17.2%, depending on load range. Carbon monoxide was reduced as much as 6.9% – indicative of greater combustion efficiency.

Manufactured by *Power Research Inc.*, *PRI-RS HFO Treatment* has been a staple of cruise ships operating in Alaska to reduce visible smoke opacity since 2001 (See *Bunkerspot* April/May, page 26). Other vessel types, including tankers and container ships, have been applying *PRI-RS* since the product was first offered in the late 1980s to prevent build-up of carbonaceous deposits and soot on marine diesel engine components.

Data from oil-fired power plants has also established the capability of the *PRI-RS* chemistry to provide emissions reductions. Yet until the Man B&W test of *PRI-RS*, accurate emissions data from motor ships was mostly limited to opacity readings from cruise vessels.

'Accurate emissions testing at sea can be very expensive and is often unreliable,' said Ralph Lewis, technical vice president of Power Research Inc. 'We turned to Man B&W simply because they have the proper facilities to conduct rigorous and accurate testing that complies with MARPOL Annex VI protocols. They also have a comprehensive understanding of the chemistry and behavior of fuel oils in combustion.'

Testing was conducted over a three-day period, and involved operating the engine at five different load ranges.

Lewis says that, at first, he expected to see most of the reductions in unburned hydrocarbon emissions to occur at lower operating loads. Yet the data showed good reductions across the board, even at 100% and 75% loads.

He expects this capability of the *PRI-RS* chemistry to have important implications for vessel owners operating in areas with strict regional emissions standards, and for vessels that operate for prolonged periods at reduced loads.

'*PRI-RS* application is rapidly expanding in these areas, but we have seen excellent growth in all regions over the years,' commented Lewis. 'These reductions in unburned hydrocarbons and carbon particulates are just another way of quantifying the capability of *PRI-RS* to prevent the formation of soot and carbon deposits on engine components. That's why reducing maintenance costs for our clients has been our primary focus since we began with our first vessel in 1991.'

And what of claims for greater fuel efficiency?

'There are no "miracle products" that can provide big reductions in fuel consumption,' Lewis says. 'Changes in fuel consumption rates are virtually impossible to measure at sea, and difficult, at best, to measure in stationary engine tests over several hours. But significantly, the data shows that *PRI-RS* application results in carbon monoxide reductions – proof positive of greater combustion efficiency and reduced fuel consumption.'

'At sea,' Lewis adds, 'we also keep track of turbocharger differential pressure. It is simple to calculate the improvements in turbocharger efficiency, provided in every instance, over time, with *PRI-RS*. Obviously, with reduced back pressure and greater turbocharger efficiency, reduced fuel consumption rates follow.'

While refiners routinely use additives in automotive fuels to inhibit engine deposits and reduce emissions, some ship owners still turn a jaundiced eye toward additive use in heavy marine fuels, citing lack of the effectiveness and no demonstrable return on investment with many products.

'The scepticism is justified,' said Lewis. 'Trials with many additives have left a wake of disappointment. Still others rely on subjective judgments by chief engineers rather than on hard data. In the past, testing by engine manufacturers has yielded poor results from most of today's additives. This is why this recent testing of *PRI-RS* is so highly significant. It verifies the beneficial effects

of this cutting-edge chemistry.'

Lewis is quick to point out that *PRI-RS* contains no ferrocene, a component used by many heavy fuel oil treatment manufacturers. Rather, *PRI-RS* relies on a methodology that 'elevates thermal stability' of all fuels. As Lewis explains, all fuels have a tendency to form high molecular weight structures during the second combustion stage. These structures – much more difficult to burn – are formed as a result of chemical reactions that occur within the fuel itself as it is heated and oxidised.

The result? Unburned carbon, typically in the form of petroleum coke and soot, forms on pistons, exhaust valves, on turbocharger blades and on economiser tubes. Any remaining unburned carbon particles exit the stack and are evident as visible smoke.

*PRI-RS* inhibits the reactions that are responsible for the formation of most of the unburnable higher weight structures. 'With *PRI-RS*, the fuel burns more completely,'

explained Lewis. 'Unburned carbon residue and soot are not allowed to form on engine components, and visible smoke is greatly reduced.'

*PRI-RS* has been in use since 2002 at power plants in the US where **Environmental Protection Agency (EPA)** mandated continuous emissions monitoring systems have documented product capability in dramatically reducing smoke opacity, oxides of nitrogen and sulphur dioxide from oil-fired boilers.

Bob Englund, who manages the Benning Road plant for **Potomac Electric Power Company** in Washington DC, said that *PRI-RS* is largely responsible for the continued operation of the two 300 megawatt (mw) units at the facility.

'*PRI-RS* has been the key factor in helping us meet the District of Columbia's opacity limit while achieving much higher megawatt production. This chemical has essentially permitted us to stay in business,

and that's no understatement,' said Englund.

'A plus is that we also get none of the deposits on our boiler tubes that we used to get running on untreated fuel. Nitrous oxide (NOx) is down about 12%, and reduced stack temperatures on our two 300 mw units is but one indicator of the better combustion efficiency we have achieved with this chemical.'

In marine emissions control areas, *PRI-RS* cruise ships are seeing reduction in smoke opacity averaging 45%, based on state of Alaska readings.

But the biggest return on investment for vessel operators, Lewis says, is that engine components remain much cleaner for longer periods, permitting component overhaul extension intervals and improved operating efficiency.

*PRI-RS* will also help minimise NOx emissions. Cleaner engines can help operators keep NOx emissions down in line with MARPOL Annex VI protocols.

## MAN B&W laboratory tested. Proven over two decades at sea. **PRI-RS HFO TREATMENT.**

PRI-RS® HFO treatment has been the best choice for commercial merchant and cruise lines around the world for over twenty years. Our unique PRI thermal stability chemistry improves combustion efficiency, keeps economizers and turbochargers soot-free, inhibits damaging carbon deposits and reduces component wear – which leads to more profitability and enhanced vessel performance.

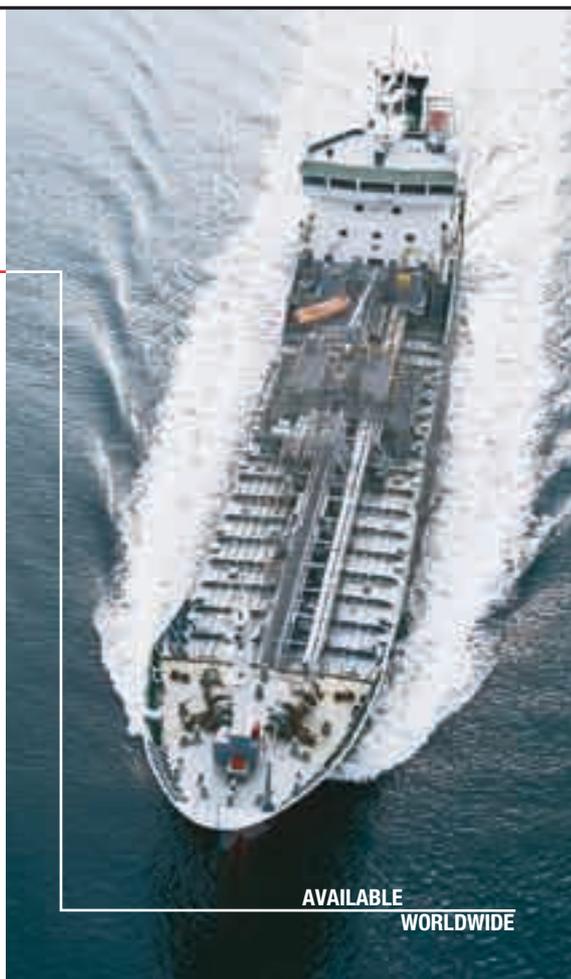
PRI-RS performance has been **MAN B&W tested** with these proven results:

- **Cuts particulate emissions and visible smoke;**
- **Reduces unburned hydrocarbon emissions; and**
- **Provides more complete combustion.**

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