IQT Test

Ralph Lewis of Power Research reports on the development of a new device which can accurately determine the ignition quality of any heavy fuel oil with an inexpensive 20-minute test

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Until recently, the Calculated Carbon Aromaticity Index (CCAI) has been the sole method by which bunker consumers have been able to judge potential fuel ignition quality. But the CCAI concept, as useful as it has been, does have drawbacks.

Ignition quality can sometimes have little or nothing to do with the relationship between viscosity and density – the parameters on which CCAI is based. In some cases, chief engineers can be lulled into a false sense of security, bunkering a fuel with a low CCAI number that still results in poor firing, excessive smoke, and high exhaust gas temperatures.

Now, thanks to a device originally developed by **Southwest Research Institute** (**SWRI**) of San Antonio, Texas, the ignition quality of any heavy fuel oil can be accurately determined in a relatively inexpensive and short 20-minute test.

Named one of the 'top 100 inventions of 2001' by **R&D Magazine**, the *Ignition Quality Tester* (*IQT*) measures the cetane rating of distillate fuels approved under the ASTM D6890 and IP 498 standards. With an easy modification that permits fuel pre-heating, the device can also produce a highly accurate ignition measurement of varying grades of heavy fuel oils. The licensee for manufacturing, **Advanced Engine Technology (AET) Ltd**, Ottawa, Canada, is now exploring the option for an IP standard for heavy fuel oil testing.

Such an approval would be simple, according to Gary Webster, President of AET: 'It would only require a slight modification to the present standards.'

The *IQT* was originally developed as a more accurate and faster way of testing cetane values of distillates than that achieved under the ASTM D613, which required the use of a single-cylinder diesel engine. Such accuracy was demanded by SWRI, a south Texas complex that provides extensive engine, emissions and petroleum testing services for many of the world's largest automotive manufacturers and refiners. For fuel producers, a faster and more efficient test method was also long overdue, given that modern refiners needed a quick and easy way to make ignition quality adjustments in-house, based on ever-changing distillate streams.

Extensive application confirms that the *IQT* is highly responsive to subtle changes in ignition quality in distillate, bio-diesel and heavy fuel oils. The initial validation in 2002 of the *IQT* machine involved 63 distillate samples of which 20 were treated with a cetane improvement additive. Testing was conducted under a joint ASTM/IP inter-laboratory test programme with the involvement of 10 laboratories.

Yet what of heavy fuel oil testing accuracy? According to Webster: '*IQT* is extremely accurate – with repeatability in heavy fuel even better than that for distillates.'

So we decided to put *IQT* to the test, sending two samples of the same RMG 380 fuel to AET. Unbeknownst to AET, Sample A was treated with a modest dose of our HFO fuel treatment, *PRI-RS* (see *Bunkerspot*, August/September, page 32). Sample B was the same fuel without *PRI-RS*.

Since *PRI-RS* chemistry is specifically designed to improve ignition quality of heavy fuel oil, we expected to see a positive response on the *IQT*. Yet we were just a little sceptical.

Months earlier, we had submitted samples of *PRI-RS* treated and untreated RMG 380 fuel for testing on the *Fuel Ignition Analyzer* (*FIA*), a competitive device manufactured by **FuelTech AS** in Norway. Like the *IQT*, the *FIA* is also based on the constant volume combustion apparatus (CVCA) concept. And an IP standard (IP541.06) indeed exists for the *FIA*, the result of work by an **Energy Institute** task force comprised of participants from **Man B&W**, **Wartsila**, and major fuel testing companies.

In this test, the FIA showed little response to additive treatment – surprising in view of the fact that in emissions testing with Man B&W and at SWRI, PRI chemistry evidences improved ignition response with consistent reductions in carbon monoxide, unburned hydrocarbon and particulates.

Not so with the *IQT*. Testing on the

device confirmed a very marked, positive response with *PRI-RS* treatment of the fuel. Repeatability was also excellent. The two baseline tests of the untreated fuel indicated a derived cetane number of 26.66 and 26.55 – good repeatability indeed. With *PRI-RS*, response jumped 1.67 points, increasing to 28.27.

'It is important to remember that refineries routinely use additives to adjust ignition quality in distillate fuels, so the *IQT* was designed to have a very high sensitivity to the subtle changes that occur with varying dosing levels,' said Webster.

Webster says that while the *IQT* is similarly based on the CVCA concept, it is a different machine altogether. A key component is the patented air-assist injection system, designed with 'very tight tolerances' that make for extremely high accuracy and excellent repeatability.

The *IQT* instrument also has another major advantage – widespread availability and low testing cost. The machine is now a cetane measurement workhorse in more than 55 petroleum-testing laboratories and 18 refineries world-wide. The simple addition of an auxiliary unit makes the instrument immediately capable of providing accurate readings for heavy fuels.

Hence, with little additional expense, laboratories with the *IQT* can make the instrument readily available to check HFO ignition qualities. In view of recent ignition quality issues associated with some conventional and low sulphur fuel oils, ready access to the *IQT*, coupled with fast turnaround at reasonable cost, could mean the difference in ensuring proper bunker choices.

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