COMPANY INFORMATION

WORLD BUNKERING

IN-LINE VISCOSITY MONITORING VS SAMPLING

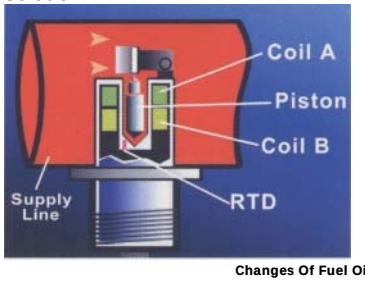
Increasingly stringent bunker regulations are forcing Ship Owners and Bunker Suppliers to re-think their understanding of words such as liability and ownership. Following bunker disputes it is not uncommon for a vessel to be held in port until arbitration proceedings determine who is responsible for poor quality bunkers. Bunker Suppliers are reluctant to accept responsibility for the quality of "goods in transit" and with the gathering liability culture in the maritime world it has never been more important for Ship Owners/Operators to identify sub-standard bunker at time of delivery.

To verify bunker quality, vessel operators have traditionally relied on the testing of a sample that can take many days to process. The limitations of the sampling approach are obvious. Is the sample representative? Can it really reflect a non-homogeneous fluid possibly a million times its size? Is the process reliable and tamper-proof? And is the information available when and where it is needed? Chief Engineer John Duke of the MN TANABATA operated by Pacific Gulf Marine commented, "The issues related to poor quality marine bunkers have forced ship owners to take advantage of technologies that provide more accurate results while reducing response time".

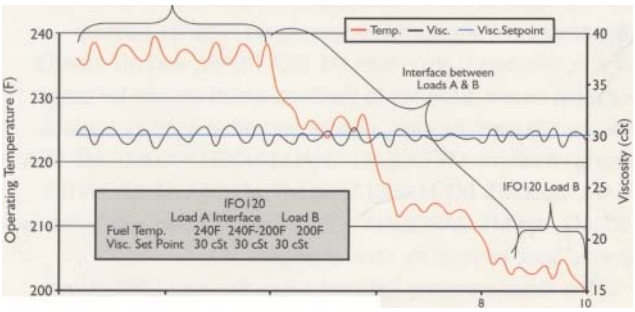
There are a number of properties that determine the quality of marine fuels, however the key parameter is viscosity. Each grade of bunkers is quoted with a specific viscosity tested at 50° Celsius. Irrespective of whether a load of bunker is refinery produced or blended at a shore facility it is expected to be within a few (cSt) Centistokes of its specification. In reality bunker loads can vary considerably from specification and are seldom homogeneous. The causes of off-spec bunkers vary from human error and corruption to instability of blend inherent in the original product. In many cases the supplier is as much a victim of the system as the end-user.

Understanding why the viscosity of blends can vary from load to load is only one piece of the puzzle. Understanding what happens as a result of varying viscosity is another. Varying grades of bunkers form layers when stored in the same storage tank. As a result, in order to maintain a viscosity set point, fuel oil combustion control systems are required to react to drastic changes of bunker viscosity when an interface between varying bunkers meets the fuel oil pump suction. (See the inserted graph to view an example of varying loads of IF0120). The graph illustrates a considerable change of viscosity between layers of IF0120 referred to in the graph as Loads °A" and °B". The change in viscosity required a reduction of fuel temperature from 240° F to 200° F in order to maintain the Viscosity Set Point of 30 cSt. Consider what would happen if the operator relied solely on a theoretical Temperature Set Point derived from typical Fuel Combustion Curves. Burner tips would foul more frequently and emissions would be adversely affected.

Cambridge Viscosity, Inc. (CVI), a leader in providing solutions for viscosity monitoring and control, has developed a solution



Changes Of Fuel Oil Temperature Required To Maintain IFO120 Load A **Viscosity Set Point Between Loads Of IFO 120**



Operating Temperature (F)

to real-time monitoring of marine bunkers. CVI has been providing Heavy Fuel Oil Viscosity Control and Bunker Blending Viscosity Control systems since its formation in 1984. Cambridge has since released a bunker-monitoring version of the VISCOpro 2000 that utilizes an in-line sensor and microprocessor technology to provide real-time viscosity data during bunkering operations. The Cambridge VISCOpro 2000 bunker monitor is endorsed by J.J. Sietas KG Schiffswerft shipyard of Hamburg for all new-builds that require a bunker monitoring system. "With the rising cost and declining quality of fuel oil, smart buyers are now demanding more and more quality verification. The bunker monitor can assure every litre in every ton delivered", says Ernst Thone, Energy Consultant of Martechnic GmbH.

Earlier this month, CVI released the latest version of VISCOpro software (version P1.08.9) that offers new features as well as an improved user interface. A few of the features include: • Streamlined menus, that require minimal user input

• Viscosity displayed in units of Saybolt Seconds Universal (SSU) as well as Centistokes (cSt) and Centipoises (cP)
• Self-Cleaning Operation of sensor

• Maximum Operating Temperature has been increased from 190^{0}C to 370^{0}C

CVI provides a complete line of both process and laboratory viscometers that operate with only one moving part, a stainless steel piston that is forced up and down within a sample of fluid by electromagnetic force. Thanks to a simple design Cambridge viscometers are highly accurate, easy to install and relatively maintenance free. Thousands of CVI viscometers have been installed with such companies as Maersk Line Ltd, NOL/American President Lines/ASM, Westfalia Separators, General Motors and GE Power Systems. For more information, please contact our sales team or visit us at www.cambridgeviscosity.com.

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