SILVERSTREAM AIR LUBRICATION TECHNOLOGY DELIVERS SIGNIFICANT ENERGY SAVINGS

Lloyd's Register verifies sea trials on 40000DWT product tanker; technology achieves 4.3% fuel savings with scope for further improvement. Both Silverstream and Shell believe that a fully optimised system has potential to deliver more than 5% efficiency savings on an ongoing basis

LONDON, February 4 2015 -- Silverstream Technologies and Shell today announced the successful sea trial of Silverstream Technologies' new air lubrication technology for ships, the Silverstream® System. The sea trials, independently verified by Lloyds Register Ship Performance Team, show net energy efficiency savings in all analysed cases.

Shell funded, and with Silverstream, oversaw the installation of the Silverstream® System on the 40000DWT products tanker MT Amalienborg, owned by the leading Danish Shipping company Dannebrog Rederi.

"This is a landmark moment for Silverstream Technologies and the development of our air lubrication technology, confirming it as a current, and commercially viable solution for reducing fuel costs and emissions within the shipping industry," said Noah Silberschmidt, CEO, Silverstream Technologies.

The trials verified by the Lloyds Register Ship Performance Team showed net average energy efficiency savings of 4.3% and 3.8% for the vessel in ballast and laden conditions respectively. The figures represent an average from all raw data captured during each trial, which included optimal and non-optimal air flows. Based on the trials both Silverstream and Shell believe that a fully optimised system has potential to deliver more than 5% efficiency savings on an ongoing basis when deployed on a full-bodied vessel with a large flat bottom.

The Silverstream® System produces a thin layer of micro bubbles that creates a single 'air carpet' for the full flat of bottom of the ship. This reduces the frictional resistance between the water and hull and improves the vessel's operational efficiency, reducing fuel consumption and associated emissions. The technology can be added to a new build design, or quickly retrofitted to an existing ship within just 14 days as was the case for the MT Amalienborg.

"Following this successful trial, we are confident that we can enhance the already significant savings that we have seen. We believe these results show that the Silverstream® System can play a crucial role in supporting the shipping industry to increase operational and environmental efficiencies and reduce fuel costs," continued Silberschmidt.

Dr. Adri Postema, GM Shell Shipping & Maritime Technology, stated: "We constantly look for ways to improve our shipping efficiency, both operationally and with innovative technology. Our maritime technical experts worked closely with Silverstream Technologies, Lloyd's Register and a number of other parties to achieve a successful trial of this promising technology."

Nick Brown, Lloyd's Register's Chief Operating Officer, Marine, in commenting on the project, said:

"Ship owners and operators need to trust the savings and return on investment calculations that manufacturers claim. This trust can only be built by ensuring rigour and transparency within the trial process, to ensure the highest level of accuracy in the projected figures that are communicated to the market. The sea trials for the Silverstream® System have been conducted in such a way, with independence ensured throughout."

Johnny Schmoelker, CEO, DannebrogRederi AS, commented: "Given impending stringent environmental regulations that will further increase operational costs, energy efficiency technologies that can reduce fuel consumption and associated emissions are critical in limiting the bottom line impact for ship owners and operators. We are proud to be the first owner to install the Silverstream® System and demonstrate the efficiency gains."

A BMT SMART^{ACCESS} and SMART^{VESSEL} performance monitoring system was fitted to the vessel to record data from the trials. This will continue to monitor the system's performance over the next 12 months during normal shipping operations.

Notes:

- Prior to the sea trial, the leading hydrodynamic research company HSVA, from Hamburg, Germany worked closely with Silverstream Technologies to test the technology.

Trial Design

- The MT Amalienborg was retrofitted with the Silverstream® System in just 14 days. Following Harbour Acceptance Tests and under the direct supervision of Lloyd's Register's Ship Performance Group (SPG), a series of 52 single runs under ballast load conditions (6.9m draught) were conducted in the Kattegat Sea under ideal environmental conditions during March 2014. A subsequent laden condition trial conducted on a constant heading due to operational restrictions (10.6m Draught) was completed six months later. The trials procedure for both trials was specified by Lloyd's Register and conducted in line with LR, STA and ITTC recommendations and in accordance with acceptable trial control criteria pertaining to weather, water depth, rudder control, system steady state criteria and hydrostatics.
- A full analysis of the trials data was conducted by SPG with the following key conclusions drawn:

Ballast trials

- The performance of the system varied with speed and air settings applied. Comparing measurements of either the shaft power with the Silverstream® System power, or fuel flow for the main engine (M/E) including the diesel generators (D/G), a modal average saving of 5% was demonstrated for all data captured during the trial (difference between the baseline and Silverstream® System on).
- A mean average power saving of 4.3% was found for the vessel over the sea trial (including the Silverstream® System power and increase in drag caused by the cavities).
- The air (in the form of a rigid 'carpet' of microbubbles) was found to pass down the whole length of the ship's hull.
- The Acoustic Emissions signals showed no increase in excitation levels when the Silverstream® System is switched on. This indicates that cavitation excitation is not increased by air ingestion into the propeller. No ship handling issues were reported by the crew with the Silverstream® System in operation.

Laden Trials

- At all speeds tested, the Silverstream® System demonstrated performance improvements in both power and fuel consumption, against the baseline (no air) curves.

The mean average net power saving of the trial was calculated as 3.8%, against specific CFD baseline calculations of the vessel in the trial deep load condition. This compares measurements of the total of shaft power and Silverstream® System power against the vessel without cavities fitted.

Efficiency

- Bunker fuel represents the single largest cost to ship owners and operators, accounting for up to 50% of all operational costs, with the shipping industry spending an approximate $240 billion per year.
- CO2 emissions from shipping currently stand at over one billion tonnes per annum. Vessels under the IMO's (International Maritime Organisation) Energy Efficiency Design Index (EEDI) are required to reduce their carbon emissions from 2013, graduating to 30% by 2025.

Based on the experience and results of the Silverstream® System trials, Silverstream Technologies has further optimised the design and engineering of the system, which is now ready for commercial launch. The laden and ballast trial figures represent a mean average result of all raw data captured during each trial, in conditions where speed, system air content and draft were effectively balanced, thus providing an optimal performance response, as well as in instances where they were not.

About Silverstream Technologies

Silverstream® Technologies – previously known as DK Group – has pioneered air lubrication within shipping for over ten years, and has invested significantly in the research and development, and testing of air lubrication for ships. The Silverstream® System reduces frictional resistance between the water and the hull surface, dramatically reducing fuel consumption and associated emissions. The Silverstream® System is unique in that it is the only proven air lubrication technology that can be retrofitted in 14 days, as well as being applicable for newbuildings. It lasts the lifetime of the ship, is complementary and can be used in conjunction with other clean technologies, and return on investment is typically between 12 and 26 months.

About Shell Shipping& Maritime

Shell Shipping & Maritime is Shell's centre for maritime expertise. Located within Shell's integrated Trading and Supply business it provides commercial, ship management and technology services, along with assurance advice to internal and external customers. It is the world's largest charterer of ships and operates 10 oil tankers and 44 LNG carriers – making Shell one of the largest LNG shipping operators in the world.

On any one day, Shell has an interest in around 350 ships and 1200 barges on the world's oceans and rivers. It is involved in over 100,000 cargo transfers a year, with one loaded or discharged every five minutes into one of the 130 global ports and terminals in which it operates.

Shell Shipping & Maritime is also accountable for many of the safety aspects across Shell's floating activities, including 35 mobile drilling rigs, over 350 supply boats, anchor handlers and tugs, Floating Oil Storage, Regasification Units and Single Buoy Moorings.

About Lloyd's Register

Lloyd's Register (LR) is a global engineering, technical and business services organisation wholly owned by the Lloyd's Register Foundation, a UK charity dedicated to research and education in science and engineering. Founded in 1760 as a marine classification society, LR now operates across many industry sectors, with over 9,000 employees in 78 countries.

LR has a long-standing reputation for integrity, impartiality and technical excellence. Our compliance, risk and technical consultancy services give clients confidence that their assets and businesses are safe, sustainable and dependable. Through our global technology centres and research network, LR is at the forefront of understanding the application of new science and technology to help prepare our clients for the future. www.lr.org/marine

About Dannebrog Rederi

Dannebrog is part of Weco Group. Weco Group consists of Dannebrog Rederi, Nordana, Stena Weco and Weco Bulk. Dannebrog Rederi manages a number of tankers as well as dry cargo vessels within its fleet management department. Nordana focuses on break bulk liner services, operating multipurpose and ro/ro vessels. Nordana is recognized as a specialty carrier, able to accommodate its customer's varying needs for cargo handling, reliability and port calls. Nordana Project & Chartering is an independent division within Nordana, operating a fleet of various tonnages owned and chartered on period and voyage. Stena Weco – the joint venture between Stena Bulk and Weco – has embarked on the journey towards being the market-leading operator in the MR tanker segment. Weco Bulk offers its services to shipping companies and business enterprises worldwide as a provider of maritime transport and logistical service for the majority of bulk goods, including agricultural, steel, scrap, aluminum, cement, coal, pet coke, iron ore and wood pellets.