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Has waste fuel recovery become an industry standard overnight?

In the marine industry, it is almost unheard of for a new application to penetrate the market quickly, especially when it builds entirely on a new technology. Yet judging by major orders for Alfa Laval's PureDry – placed by the leading ship owners in nearly every vessel category – this is exactly what has happened. Simply put, waste fuel recovery and PureDry have changed the industry.

Since 2008, MARPOL rule MEPC.1/Circ.642 has allowed the recovery and reuse of the HFO fraction of waste oil as engine fuel. As yet, however, only one product has emerged to take advantage of it. Alfa Laval's PureDry separator lets vessels recover virtually all of their fuel oil losses, which range from 0.5 to 2% of their total fuel consumption.

"In general, I can only think of this as an excellent idea," says Jacob Norrby, Newbuilding Project Manager for Stena. "We recover something that is normally wasted, and that we sometimes have to add energy to in order to burn it." His company is just one of the leading players who together have ordered more than 100 PureDry systems for newbuilds in progress. Joining Stena are Carnival Corporation, Frontline, MSC, Norwegian Cruise Line and Wallenius, whose shipyards are installing the system aboard cruise vessels, product tankers, container vessels, cape-size bulk carriers, car carriers and more.

Even more remarkable than the range of vessels is the fact that all of their designs have been modified by the shipyard to segregate fuel and lube oil waste. This marks a paradigm shift, as vessel design changes to accommodate a truly new separation technology. "This is exactly the sort of thing we've been waiting and longing for," says Christer Karlsson, Sr. Vice President Newbuilding for Norwegian Cruise Line. "I realize that makes me sound like a salesperson, but I really can't say anything other than that."

An opportunity long hoped for

Indeed, the arrival of PureDry is the end of a long wait for an effective way to deal with waste

fuel oil. Previous attempts with traditional separators have marginally reduced waste volumes, but process water and discharge losses have allowed a large amount of waterlogged, fuel-containing waste to remain. “For many years, all this was just considered sludge, because there was no cost-effective equipment capable of cleaning fuel out of it,” says Renato Storari, Director of Research & Development for Carnival Corporation. “This is the space into which PureDry now fits.”

“The treatment and disposal aspect was normal, in that it’s been addressed over the years,” agrees JS Narayanan, Manager Newbuilding Projects for Frontline. Narayanan was somewhat surprised to learn of a solution that gets fuel out of the sludge, rather than simply reducing its volume. “This is new,” he says, “the recovery of fuel from what was previously thrown out.”

Others were not so much surprised by the arrival of a solution as they were by the solution’s merit. “Knowing that there’s 1-2% fuel (losses) in the sludge, it’s not surprising that this application should develop,” says Jacob Norrby of Stena. “But what’s encouraging is that we see PureDry as a quality product. It’s engineered well, and the technology Alfa Laval has built on is good.”

Embracing a breakthrough technology

Technology, of course, is what waste fuel recovery depends upon. PureDry is a remarkable hybrid technology: a high-speed disc-type centrifugal separator with a solid bowl, yet one that is self-cleaning as well. In well over a century of centrifugal separation, there has never been anything like it. Says Martin von Sydow, Vice President Newbuildings for Wallenius, “We didn’t really expect PureDry, which is pretty advanced in our opinion.”

As the name suggests, PureDry requires no process water and leaves no liquid in the solid waste. Nor does it have a bowl aperture or hydraulics. In the words of Stena’s Jacob Norrby, “The separator looks fairly simple, which is some of the beauty of it.” In fact, the only major moving parts are an outer bowl and a separator insert, which rotate at slightly different speeds. Attached to the insert is the XCavator, a patented spiral device that transports the separated, super-dry solids into a container at PureDry’s base.

Still another departure from traditional self-cleaning separators is the way that maintenance is performed. PureDry relies on Maintenance and Service by Exchange, whereby the separator

insert and Xcavator are replaced at fixed intervals. “This is attractive, because the crew on board are not high-tech experts,” says Frontline’s JS Narayanan. “The complete renewal of the rotating assembly makes maintenance simpler and easier, so we don’t expect much workload on the crew.”

Firmly convinced by the savings

Using PureDry, virtually all of a vessel’s fuel oil losses can be recovered with ISO 8217 quality. The elimination of this energy leak has a strong environmental implication, but above all it makes for a bulletproof business case. “We live in an economic reality,” says Martin von Sydow of Wallenius. “We have to motivate our investments from an economic as well as an environmental point of view. But when it comes to PureDry, we can be very confident in both aspects.”

Stena’s Jacob Norrby agrees. “These two things go hand in hand,” he says. “This is not a cheap investment, so it’s nothing you just run out and buy. You have to support the purchase.”

Christer Karlsson of Norwegian Cruise Line, which has two ships with PureDry on board and more – including one retrofit – on the way, says the support is easy to find. “Counting low, think something around USD 100,000 per vessel per year,” he suggests. “With our fleet of around 15 vessels, that’s USD 1.5 million annually. Plus it has the advantage that we don’t have to land all that sludge.”

Fewer procedures, greater control

For many ship owners, there is also a strong business case in the minimization of sludge volumes, which PureDry reduces by 99%. Some of them, like MSC, claim this is the decisive factor. “This is the product’s best and most unique advantage,” says MSC Manager Newbuilding Projects Giuseppe Gargiulo. “We strongly believe in PureDry.”

PureDry leaves just 5-10 kg per day of non-pumpable, super-dry solids, which are landed simply as dry waste. All of the water, with an oil content of approximately 100 ppm, is passed on to the bilge water system. This does away with the whole procedure of offloading waste to a barge.

“We don’t want to see any barges near our vessels except for the barges delivering fuel,” says

Gargiulo, noting that there is no fuel whatsoever in the solid waste that remains. “We believe this is an important step, even from an environmental point of view. We can now know exactly what we’re doing with all of our fuel, every bit. We can have the entire fuel process under control.”

Making room for a new application

If there is anything to complicate the PureDry business case, it is the fact that modifications in vessel design are needed to achieve all the benefits. On the one hand, PureDry makes it possible to reduce sludge tank holding capacities by at least 50% under current legislation. But to recover fuel in addition to reducing waste, the streams of waste fuel oil and waste lube oil must be segregated.

Segregating the tanks, rather than demonstrating PureDry’s effectiveness, has thus been the main hurdle. “The real obstacle for us in terms of installing it was that most of our ships collect fuel and lube oil sludge together, in a combined system,” says Carnival Corporations’ Renato Storari. “This is why we haven’t installed any units until now – it’s not because the system isn’t proven or efficient.”

For a newbuild, of course, the procedure is simpler, since the changes can be made on the drawing board. Yet for shipyards unfamiliar with waste fuel recovery, even this has led to some discussion. “The product is unique, so there was no challenge in selecting it,” says JS Narayanan of Frontline. “The challenge was making the shipyard understand the simplicity of it. But once it has been done with one shipyard, others can simply follow.”

As shipyards grow more familiar with the application and with PureDry itself, smoother integration can be expected. Even among the ship owners currently installing PureDry, there are already many who have found the procedure painless. “The really big yards in the Far East are often reluctant to put new technologies in,” says Martin von Sydow of Wallenius. “It can take some persuading, but in this case it was rather easy.”

Proving its worth at sea

One of the ship owners that has been through the installation procedure is Norwegian Cruise Line, who has been operating PureDry on Norwegian Breakaway and Norwegian Getaway for around a year now. “We had the waste fuel recovery process drawn in, so it’s been very easy

to implement it – no problem at all in fact,” says Christer Karlsson. He also confirms that PureDry has lived up to expectations: “We see good results on Breakaway and Getaway.”

Carnival Corporation, too, has seen its expectations met in practice. “We tested PureDry on one of our ships, the Costa Luminosa,” Renato Storari relates. “In the six months of the test, we processed 32 tonnes of fuel oil sludge, and we recovered 9 tonnes of good fuel for reuse. In addition, we removed 22 tonnes of water. That left us with only 1 tonne of sludge.”

The arrival of a new standard?

With the savings documented so far, it is hardly surprising that there is talk of waste fuel recovery as a new standard. “For us, waste fuel recovery is going to be standard on all newly built vessels,” says Christer Karlsson when asked about PureDry’s future with Norwegian Cruise Line. “We know that PureDry works, and it would make no sense to do anything otherwise when you think about all the money it can save.”

Likewise, a precedent is being set by the sheer number of vessels where PureDry is drawn in from the beginning. “For newbuilds, we specify the segregation of fuel and lube oil sludge systems,” says Renato Storari of Carnival Corporation. “We’ve changed the specification of our vessels because of the new technology.”

Even among the installing ship owners who have no direct experience with PureDry, the sentiment is much the same. “We haven’t seen it in operation yet, but we strongly believe this will work,” says MSC’s Giuseppe Gargiulo. “It’s our intention to retrofit vessels based on the outcome of these installations. If this works, we’ll be placing a lot of orders.

Summing up, Gargiulo puts simply what the whole industry seems to be saying about waste fuel recovery: “This is the future, we believe.”

Fact box:

Industry leaders on waste fuel recovery and Alfa Laval’s PureDry

“Without PureDry, the vessel would need to deposit 32 tonnes of sludge every six months. Now that’s reduced to one tonne.”

Renato Storari

Director of Research & Development
Carnival Corporation

“We welcome anything that can lead to savings in our fuel use and the reduction of emissions. We welcome the new technology.”

JS Narayanan
Manager Newbuilding Projects
Frontline

“How much are you wasting by burning one tonne of sludge? It’s unbelievable, not only how much money you’re wasting, but also how much goes into the atmosphere. PureDry is a revolutionary system that allows reuse of the fuel instead.”

Giuseppe Gargiulo
Manager Newbuilding Projects
MSC

“I think this has been a very successful introduction of a new technology. PureDry has an enormous potential for the world’s fleet and for anyone who thinks in terms of fuel economy. Simply put, it’s a huge success.”

Christer Karlsson
Sr. Vice President Newbuilding
Norwegian Cruse Line

“If we expect to recoup 1% of the bunker consumption, that’s on the margins of what is possible to measure. But we believe in the technology. And we expect it to work as intended in regard to performance and maintenance.”

Jacob Norrby
Newbuilding Project Manager
Stena

“The selection of PureDry was an easy decision from our side. We’ve worked with Alfa Laval for a long time and have great confidence in their technical abilities. But also the savings presented in relationship to the investment costs made this an easy business case to make.”

Martin von Sydow
Vice President Newbuildings
Wallenius

All interviews for this article were conducted by telephone between 8 April and 11 April 2014. To learn more about PureDry and Alfa Laval’s approach to waste fuel recovery, visit www.alfalaval.com/marine

Editor's notes

About Alfa Laval

Alfa Laval is a leading global provider of specialized products and engineering solutions based on its key technologies of heat transfer, separation and fluid handling.

The company's equipment, systems and services are dedicated to assisting customers in optimizing the performance of their processes. The solutions help them to heat, cool, separate and transport products in industries that produce food and beverages, chemicals and petrochemicals, pharmaceuticals, starch, sugar and ethanol.

Alfa Laval's products are also used in power plants, aboard ships, in the mechanical engineering industry, in the mining industry and for wastewater treatment, as well as for comfort climate and refrigeration applications.

Alfa Laval's worldwide organization works closely with customers in nearly 100 countries to help them stay ahead in the global arena.

Alfa Laval is listed on Nasdaq OMX, and, in 2013, posted annual sales of about SEK 29.9 billion (approx. EUR 3.45 billion). The company has today about 16,300 employees.

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