

**James Fisher and Sons plc**  
Marine Services Worldwide



# Ship-to-Turbine™

Innovative wind turbine gearbox oil exchange system



# Ship-to-Turbine (STT)™

**Ship-to-Turbine (STT)™ is a new purpose-built fully marinised oil transfer system that provides significantly improved operational efficiency, safety and productivity through an innovative and cost-effective method of exchanging gearbox and hydraulic oils in offshore wind turbines.**

From the world leaders in oil transfers at sea, the innovative Ship-to-Turbine™ oil exchange system is set to have a significant impact on offshore maintenance operations versus tradition oil exchange methods by improving technician utilisation and reducing turbine down-time and risk of pollution.

STT™ employs proven vacuum, preheating and filtration technology to transfer the oil from a self-contained deck mounted unit, through umbilical hoses, directly eliminating the need to fill and hoist containers via the nacelle crane. The fully enclosed system ensures the delivery of clean product to ISO 4406:99 standards delivered straight to your turbine.

The STT™ system improves technician utilisation and reduces turbine down-time and risk of pollution. Successful trials demonstrated a considerable reduction in oil change operations to as low as 4 hours' total time per turbine, improving operational efficiency in your offshore oil change operations.

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## Features:

- Direct transfer of hydraulic and gearbox oil from vessel deck to nacelle
- Enclosed system with preheating and filtration to ISO 4406 cleanliness
- Deck located zero leak breakaway hoses
- Developed from oil exchange pumping technology in onshore applications
- Self-contained deck mounted unit
- Range of variants for different applications include: oil volumes, oil types, and umbilical lengths
- Meets with ISO 4406:99 product cleanliness standards
- Certified to Gear Oil Cleanliness Levels ISO 16/14/11
- Certified to Hydraulic Oil Cleanliness Levels ISO 15/13/10
- All units designed and manufactured to the DNV 2.7-1/EN 12079 standards
- Payload 1-10 tons
- 180m hoses on air rewind reel

## Benefits:

- Significantly increases operational efficiency
- Reduces wind turbine downtime helping to increase energy production
- Improves safety and utilisation of offshore technicians
- Enclosed process enables the extraction and transportation of oil without risk of contamination
- Ensures gearbox reliability and extends its potential life span
- Ensures oil is filtered at point of delivery and heated
- Utilises conventional access vessels for deployment
- Scale-able capacity, can service single or multiple turbines without refilling

## Environmental

STT™ helps reduce the risk of environmental contamination in the event of a vessel moving away from a turbine, during oil exchange operations. The system utilises a revolutionary hose breakaway system that will automatically stop the flow of product to significantly reduce the risk of oil spillage.



Eliminates pollution risk



Increased efficiency



Reduced costs



Enhanced safety



Capable of servicing multiple turbines on a single trip



# STT™ process flow

## Approach

**Ship-to-Turbine (STT)™ can be used as a stand-alone product or delivered as part of an integrated solution along with further in-house James Fisher capabilities to provide a cost-effective and efficient project.**

James Fisher's offshore support vessel, Dart Fisher is a well-considered operational solution to deliver the innovative oil exchange system, with a 60ft ISO container rail system enabling quick access and easy manoeuvrability to manage STT™.

The 30 tonne payload of the vessel supports the 20ft containerised STT™ system and its 10ft oil replacement ISO containers, enabling greater operational productivity in each dedicated visit to site.

## Oil exchange

**James Fisher can deliver a full oil exchange solution to support its customers in sourcing product, complete infrastructure solutions, exchanging old product for new and waste disposal.**

The integrated oil exchange approach from James Fisher significantly reduces the supply chain involved with the periodic providing maintenance of the turbine gearbox oil by undertaking the management of the supply chain providing its customers with a cost-effective and efficient solution for the exchange of turbine oil.

The whole process is delivered with quality assurance of its end product with the three-micron filtration system ensuring that the clean oil meets stringent filtration standards (ISO 4406:99) and can guarantee that any impurities and contaminants introduced during bulk lubricant delivery or IBC filling are removed before the lubricant reaches the gearbox. STT™ is focussed on enhancing offshore turbine gearbox performance by providing clean, industry approved product that enables effective asset protection by reducing damage and improving operational efficiency.





**1.** STT oil exchange unit delivered to portside location along with additional IBC's



**2.** STT oil exchange unit craned onto vessel



**3.** Vessel travels to turbine and pushes onto landing stage



**4.** Technicians ensure all relevant isolations and method statement steps are complied with in order to proceed



**5.** Hoses are winched up to nacelle and are connected using revolutionary breakaway couplings



**6.** Oil exchange commences, removing all used oil, flushing and replacing with clean oil



**7.** Vessel moves on to further turbines to repeat process



**8.** Vessel returns to shore where units are transferred



**9.** Waste oil is then disposed of within licensed waste transfer regulations



# System specification



## Ship-to-Turbine™ system specification:

2 x 1500 litre CE rated pressure vessel fluid tanks for vacuum and container of both used and new ISO viscosity grade

454 litre vertical CE tank

Shell & Tube Heat Exchanger System used to heat the new fluid

1000psi fluid pump driven by 5hp electric motor to deliver fresh fluid to gearbox

20 CFM (cubic feet per minute) air compressor driven by a 3 phase electric motor

2 x 120m fluid hoses paired together mounted on air rewind reel for both new and used oil fluids

1 x 120m hydraulic oil hose

Digital in-line 1000 psi fluid meters which register in litres and millilitres

PALL end of line filter system to 3 microns

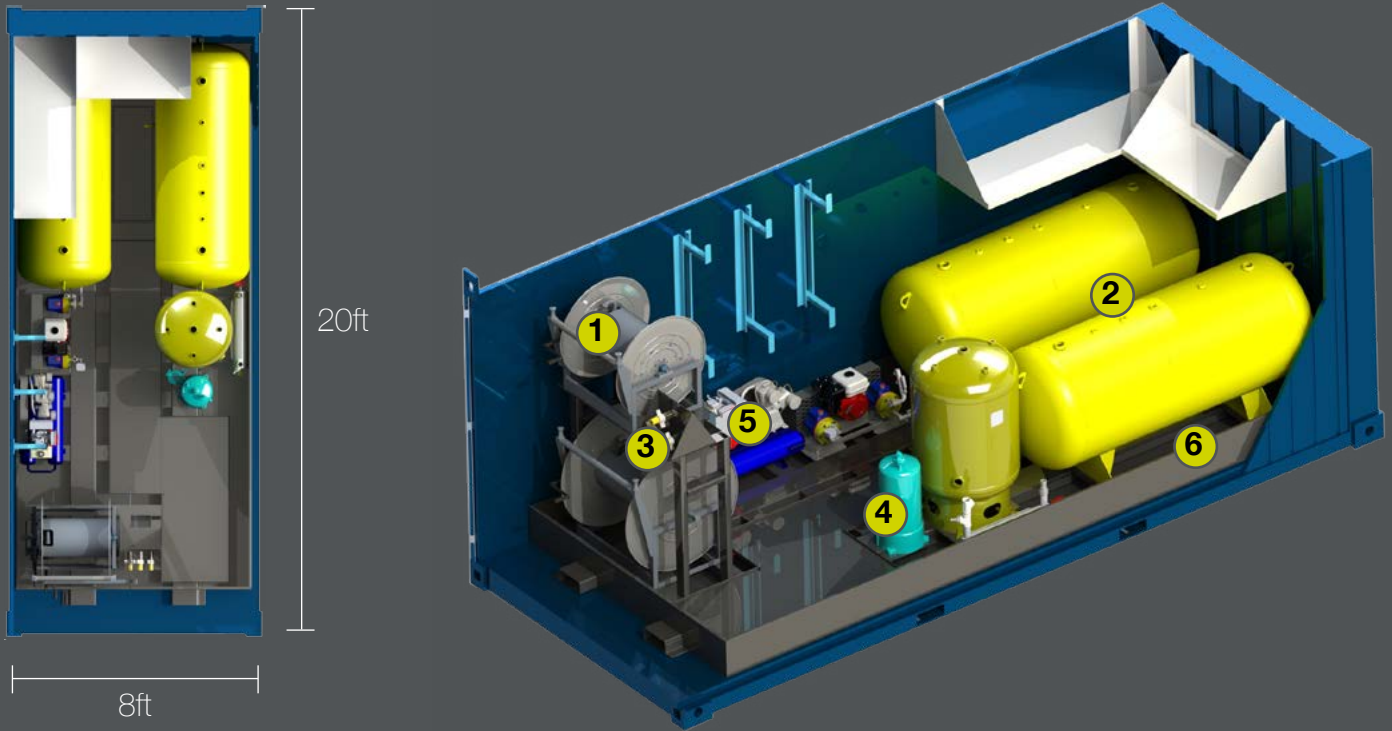
CC Jensen filtration unit

Secondary containment system under all fluid components designed to hold a minimum of 1600 litres of fluid

Remote control hand held pump shut off device

Valved breakaway couplings with a working pressure of 1000psi

The system utilises Sage Oil Vac's patented vacuum process to load the new oil tank with fresh fluid through a 50mm barrel straw and to evacuate used oil from the gearbox. Pressure is used to feed new oil to the pump and to off-load the used oil from the used oil tank.

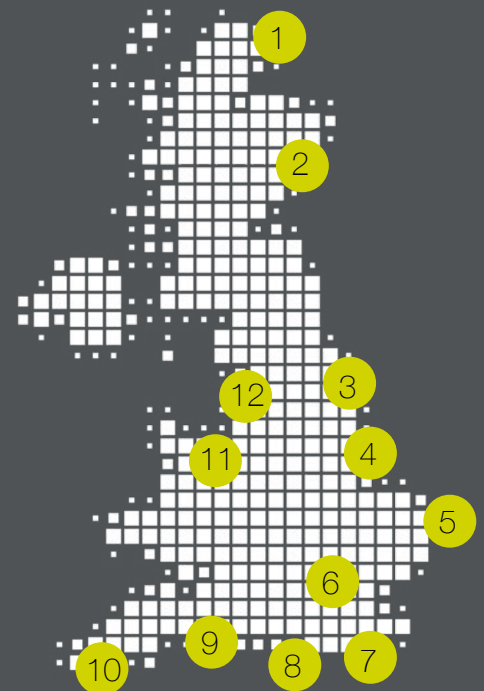


## Overview

- 1 120m fluid hoses
- 2 New and used oil tanks
- 3 Valved breakaway couplings
- 4 CC Jensen filtration unit
- 5 Fresh fluid pump
- 6 Heating system

## Nationwide locations

- 1. Lyness Harbour, Orkney Islands
- 2. Aberdeen
- 3. Grimsby
- 4. Immingham
- 5. Great Yarmouth
- 6. London
- 7. Newhaven
- 8. Cowes
- 9. Poole
- 10. Plymouth
- 11. Deeside
- 12. Barrow-in-Furness



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