rexroth
A Bosch Company

Low-speed/high-torque hydraulic radial piston direct-drive motors produce extremely high amounts of torque from a relatively compact package, making them well-suited to handle demanding maritime applications.

Offshore Hydraulics: Key advantages of direct drives and effective maintenance strategies in a marine environment

Workboat and offshore environments often involve lifting, moving or operating heavy equipment, especially within tight space constraints. And, with harsh maritime conditions, machinery needs to be properly repaired and maintained to ensure thousands of hours of reliable and safe operation. Downtime is expensive, and equipment-related accidents can be catastrophic.

A new generation of compact, hydraulic radial piston direct-drive motors delivers the performance required for a wide range of marine applications, including winch drives, cranes, jack-up systems, subsea trenchers, top drives and rotating tables on drilling operations, and more. These LSHT (low-speed/high-torque) hydraulic motors produce extremely high amounts of torque from a relatively compact package, making them well-suited to handle the kinds of loads encountered in these applications. Understanding the advantages of direct-drive motors, as well as following key service and maintenance strategies to minimize downtime and keep equipment running efficiently, can help maximize the value of this technology.

FUNCTIONAL AND OPERATIONAL ADVANTAGES OF DIRECT DRIVES

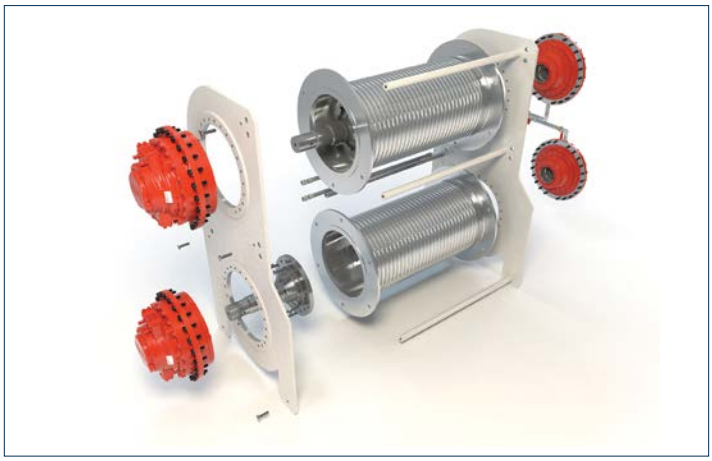
Combined with housings engineered to withstand the effects of a harsh environment, hydraulic direct-drive systems offer multiple performance advantages.

Direct power and efficiency: Hydraulic direct-drive motors mount directly to the driven shaft of a machine, providing up to 98% efficiency in their operation. Marine equipment is often powered by variable-frequency electric drives coupled to gearboxes; conversely, the hydraulic direct drive removes the need for gearboxes and coupling equipment. In addition, hydraulics are natural shock absorbers, so the impact on mechanical components is mitigated, or in some cases completely eliminated, leading to fewer failure points and reduced maintenance and downtime.

Compact and energy-efficient: Due to the compact design of the latest generation of hydraulic direct drives, they provide exceptional torque-to-weight ratio, providing higher levels of lifting and moving power for the drive's size — for example, with power capacities ranging from 113 kW up to 3.3 MW. This power density helps reduce the space needed on a crowded workboat or offshore platform deck, as well as help reduce the machine's overall weight and power consumption. They can also operate in all four quadrants — forward and reverse in both the driving and braking modes — to give system engineers greater flexibility when designing machines.

Superior torque control: Maritime applications such as capstan and winch drives must move punishing loads through hundreds of meters of ocean current. Hydraulic direct drives feature high starting torque at zero speed and throughout the speed range to meet the demands of these systems. They can both supply and maintain high starting torque, which is available directly from zero degrees of rotation. This makes it possible to supply operators with exactly the torque they need, even down to zero rotation speed, which electromechanical systems have difficulty handling. This can be exceptionally valuable in applications such as winch control when lifting heavy equipment from the ocean floor: the operator may need very fine control paying out the hook at a fast rate of speed on the way down, but once the load is ready to be raised, the operator may need a lot of torque, at very low speeds, to lift the load.

Engineered for tough environments: Leading suppliers of hydraulic direct-drive systems, such as Bosch Rexroth, have developed models that are hardened against salt spray, seawater and high levels of vibration often encountered in maritime applications. These include special epoxy coatings to prevent corrosion, as well as tightly enclosed housings and specially designed sealing kits and sealing arrangements where the motor joins the driven shaft to prevent corrosion or leakage. These motors are also rated to use biodegradable hydraulic fluid, so they can be safely used in water without risking environmental contamination.



Hägglunds compact direct-drive hydraulic motors for winch applications, from Bosch Rexroth, mount directly to the driven shaft, providing up to 98% efficiency in their operation, while eliminating the need for gearboxes and coupling equipment.

KEY TIPS FOR EFFECTIVE MARITIME HYDRAULICS MAINTENANCE

No matter how well hydraulic components are designed or engineered, the punishing conditions in offshore and marine environments make it essential for operators to implement effective maintenance strategies. Temperature extremes, harsh weather, seawater, and salt spray can erode performance in even hardened equipment and lead to costly and hazardous failures. Implementing key PM (preventative maintenance) best practices for hydraulic equipment — pumps, cylinders, power units and hydraulic direct drives — can avoid major breakdowns, saving time and money versus shutting down operations and shipping off a damaged

component to a repair center. An effective maintenance strategy involves several items:

Periodic inspection and maintenance checks: Equipment inspection intervals should be monthly at a minimum, whereas some operations conduct weekly inspections. Document danger signs, such as main pump pressure changes, fluctuations in motor speed, increased oil temperatures, increased case drain flows, hydraulic oil leaks and low oil reservoir levels. These inspections not only prevent breakdowns but can also capture machine performance data to improve both the maintenance and production processes.

Hydraulic fluid selection and condition: First, follow the equipment manufacturer's fluid viscosity rating; then, stay on top of fluid condition. The number one root cause of hydraulic systems failure is fluid contamination, so routine fluid sampling and analysis is critical, especially in complex marine systems with higher operating temperatures that can lead to reduced viscosities, altered lubricating characteristics and increased risk to hydraulic components.

Service filters and seals: Change hydraulic filters at specific intervals to reduce contamination buildup that can cause premature wear in hydraulic system components. For complex systems such as hydraulic direct drives, manufacturers may specify the type of filter to use, as well as more detailed recommendations — filter medium and micron level, for example — depending on the operating environment. In addition, most hydraulic systems have fittings that use O-ring seals to prevent leakage. Due to the shock loading and vibration inherent in many applications, these seals may wear out more frequently. Periodic inspections will identify leaks so you can replace worn O-rings, tighten loose fittings or replace any damaged fittings.

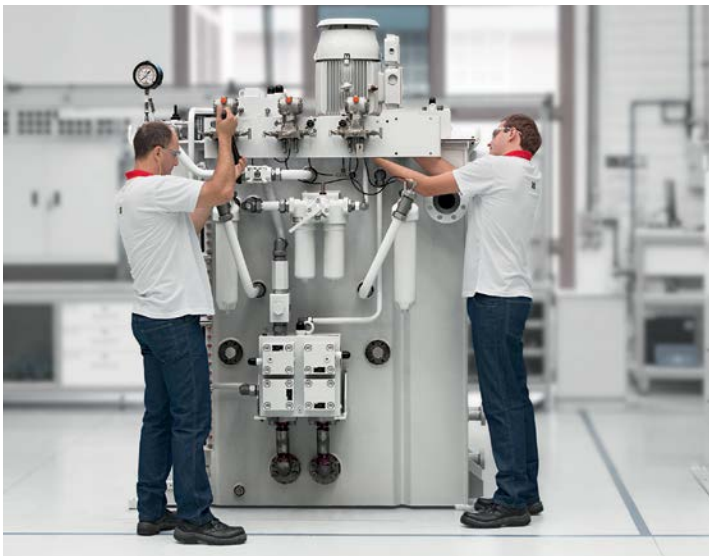
Choose OEM-certified service suppliers: Many marine hydraulics systems have specialized design and operating characteristics. This can require a higher level of expertise and resources, which is usually best supplied by OEM-certified facilities. Third-party repair facilities will not have the original manufacturer specifications to properly repair, calibrate and test a hydraulic motor to new condition, for example — and will usually not be able to perform a fully warrantied remanufacture. OEM-certified facilities should be staffed with technicians who are factory-trained to inspect, service and maintain the OEM's equipment. Certain specialty components may only be available from OEM-certified facilities; also, there may be specific equipment tolerances that only the factory or OEM service shop is equipped to work with.

Use OEM parts: To achieve a "like new" condition, it's critical to ensure the right parts are used. When hydraulic motors are repaired with used parts taken from scrapped components or with aftermarket parts that aren't designed for extreme environments, you risk lower performance and early failure. It makes sense to specify that any repairs use original OEM parts supplied from the manufacturer. In fact, some hydraulic direct drive manufacturers do more than repair their equipment. Bosch Rexroth, for example, uses fully remanufactured drives and equipment with "like new" warranties.

Preventative maintenance programs: These best practices can be built into a comprehensive PM program that identifies risks and corrects issues before they lead to downtimes. Effective PM programs include annual major inspections and quarterly minor inspections, carried out in the field by factory-certified technicians who understand the technology and use established processes for inspecting equipment. With each inspection, a detailed report of findings, recommended maintenance, required spare parts and follow-up actions is supplied.

MAXIMIZING THE VALUE OF HYDRAULICS FOR OFFSHORE APPLICATIONS

Today's hydraulic direct-drive systems are a valuable and proven technology successfully driving many demanding maritime applications. They provide excellent power density, high torque-to-weight ratios and compact design with housings engineered to resist extreme weather and corrosion conditions.



OEM-certified facilities should provide factory-trained technicians to inspect, service and maintain hydraulic equipment. In addition, there may be specific equipment tolerances that only the factory or OEM service shop is equipped to work with.

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However, although hydraulic systems in marine applications can take a lot of punishment, it's equally important to understand how the right maintenance practices protect this critical machinery. By following these practices and implementing comprehensive preventative maintenance programs, equipment managers can help ensure their high-value hydraulics systems deliver the life cycle performance that maritime operations require.

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