

A large industrial facility, likely a gas-to-liquids (GTL) plant, with a tall central distillation column and complex piping. The sky is clear and blue.

Petroleum & Offshore

T E C H N O L O G Y

A special publication from

OIL & GAS TECHNOLOGY

Connecting BRIC and Western Oil & Gas markets

Shell's Pearl: The world's largest GTL facility

FPSO innovation: The secret to offshore success

BP and the future of deepwater E&P

Fracking with gas – fad or watershed?

Techniques for better oil recovery rates

Subsea 7 exclusive: Propelling innovation

www.oilandgastechology.net



CAVENDISH GROUP

Offshore drive systems on which you can rely.



Visit us at
Booth 413



innovation has a name

We have been developing custom drive solutions for mechanically, hydraulically, and electrically driven machinery for nearly 100 years. We work with leading OEMs worldwide. Our engineering expertise and extensive manufacturing are available to solve your greatest equipment challenges. When you need expert solutions for the drive mechanisms on cranes, winches, hoists, jacking systems, top drives, coil tubing injectors, mud pumps, frac pumps, compressors, or other equipment, we provide the right answers.



Oerlikon Fairfield
US 52 South / PO Box 7940
Lafayette, IN 47903-7940
T +1.765.772.4000
F +1.765.772.4001

www.oerlikon.com/fairfield

oerlikon
fairfield



Geared for reliability

Gear drive systems for offshore platforms and ROVs operating at extended depths must display improved power density, optimum stress levels and withstand demanding marine environments to achieve optimum service life

Gear drive systems are frequently overlooked components when compared to the greater functionality of machinery designed for use in offshore environments. However, their performance in lifting, rotating, or propelling is of critical importance to the reliability of jacking drives, cranes, winches, compressors, pumps and generators.

One reason for this lack of appreciation is these systems are highly engineered and purposely built for the applications they encounter. Firms building drives for the offshore industry often have extensive expertise regarding the nuances found with these applications. As a result, they design for equipment life that can be measured in years, if not decades. Oerlikon Fairfield (Lafayette, IN) has this expertise, having worked with leading original equipment manufacturers (OEMs) around the world to provide engineered drive designs for a variety of offshore applications.

Rob Kress, business development

manager at Oerlikon Fairfield says: "Besides the obvious engineering talent to design gear systems to operate at optimum stress levels based on static and dynamic load conditions, it is essential to have a thorough understanding of classification society rules. Certifications from ABS and DNV covering materials selection, manufacturing, heat treatment, testing and inspection are imperative for any serious manufacturer providing components to this industry."

"Stresses and loads in these applications can be very different", Kress says. Gearbox designs take this into consideration and manufacturers frequently modify the gear geometry – tooth profile, the amount of crown, tip radius, tip relief, etc., to withstand surface and bending stresses. The knowledge to do so results from a combination of AGMA and ISO standards as well as the manufacturer's own experience and testing.

Gearboxes used in jack-up rigs and lift boats can experience normal jacking loads

as high as 690 short tonnes per pinion and require elaborate test equipment to validate design integrity. The performance requirements also need to factor in the conditions under which the equipment operates. Special paints to withstand marine environments are necessary. Lubrication selection and flow paths are important to meet design specifications that can require reliable performance at -20°C. Internal corrosion can also be a factor. Oerlikon Fairfield also adds a vapour phase corrosion inhibitor for internal protection to these gearboxes. "We include an additive within the gearbox and seal it. The additive vaporizes and creates a positive pressure and a coating of corrosion inhibitor to the internal gearbox", Kress says. "Providing the seal is undisturbed, the additive provides 2-3 years of corrosion protection before further treatment is required."

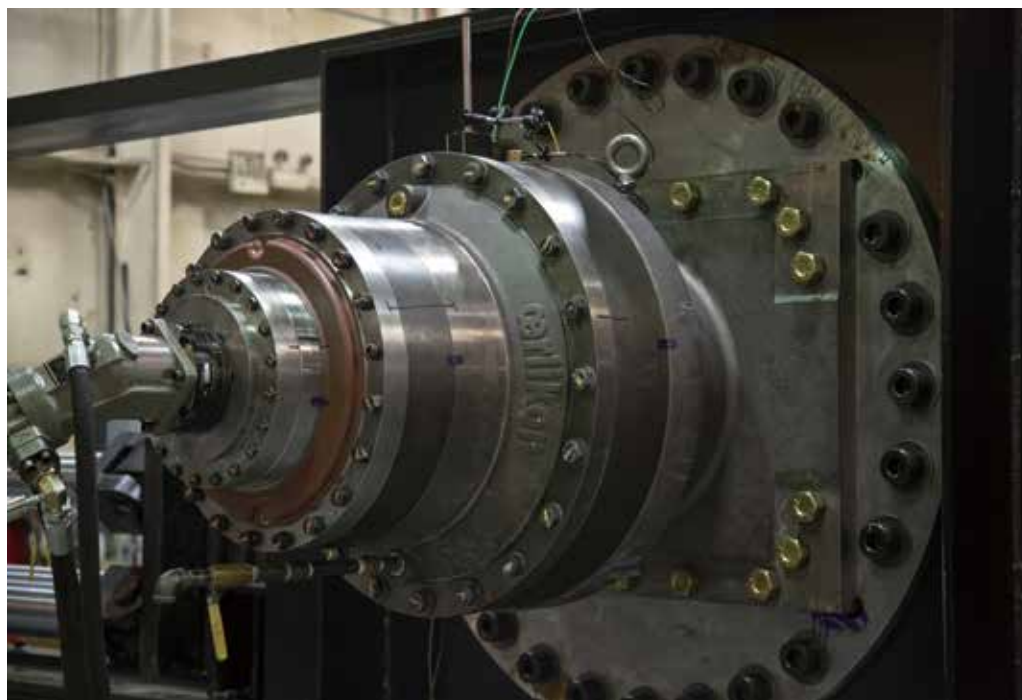
Custom solutions are often developed to support the needs of the OEMs. Working

with GustoMSC, a leader in the design and engineering of mobile units and vessels servicing the offshore industry, Oerlikon Fairfield adjusted the design of the gearbox for the installation of a load measurement system provided by GustoMSC.

"With these big jack-up rigs, measuring the actual load at the pinion is difficult," says Ben Schoon, drive systems engineering manager at Oerlikon Fairfield. "Typically, these systems had shock pads with load cells that measure the load on the entire leg. Nowadays, with fixed jacking systems shock pads are no longer used. Working with GustoMSC, we have incorporated a load cell directly on a gear shaft over a bearing in the gearbox. This reads the bearing load via strain gages that are placed in the load zones of the bearing and then get converted to the load experienced by the pinion through a calculation."

Cranes and winch drives are other common application areas requiring specialised gearbox designs. Winch drives are often constrained spatially by a requirement to fit within a certain physical envelope. While downsizing a drive generally reduces torque transfer, Oerlikon Fairfield employs a patent-pending technique to increase the power density of its drives in these smaller footprints. Oerlikon Fairfield has developed a shape milling technique to increase the spline engagement within its drives. This is especially important where spline engagement meets a shoulder surface, or into a blind hole. By maximising the usable length of a spline engagement in these conditions, torque transfer is improved substantially. In testing, Oerlikon Fairfield has demonstrated improvements of as much as 62 per cent, enabling the firm to meet size requirements without a limitation to power density.

This technique was recently employed to solve an application issue with a winch drive developed for a leading manufacturer of remotely operated vehicles (ROVs). In this application where the ROV was operating at extended depths, wave actions were transferred to the winch through the tether cable, creating a gear failure through a mechanism known as "fretting". To improve reliability, Oerlikon Fairfield developed a new winch drum



Jacking drive undergoing performance tests

drive, the CT360, incorporating the shape milling technique in connection with high performance coatings applied to the internal gears by Oerlikon Fairfield's sister company, Oerlikon Balzers.

The key to success in any application is to define and understand the actual use conditions. Sometimes meeting performance and reliability expectations is a matter of developing a new approach for common design elements. During development for a custom hoist drive

produced for a leading marine crane manufacturer, it was determined through testing that the fluid in the gearbox, once it exceeded a certain level, actually contributed toward increased heat generated by the drive, and exposed internal bearings situated near the top of the drive to premature failure. The client preferred not to include a fluid pump in connection with lowering the fluid level to achieve the necessary lubrication, believing the added component created an additional failure mechanism. To meet a 10,000 hour service life expectation, it was necessary to study the lubrication flow and design custom channels within the gear drive to convey fluid produced by a splash pattern to critical lubrication points.

All drive manufacturers servicing the offshore industry possess a wealth of experience and techniques to solve the unique performance challenges to which their products are exposed. The result is often a product that operates trouble free for decades, and receives limited consideration for its engineering content. And, that is the way it should be. ■



Cross section of shape milled surface within drive to improve power density

This article was written by Gregory Moreland, marketing manager, Oerlikon Fairfield.