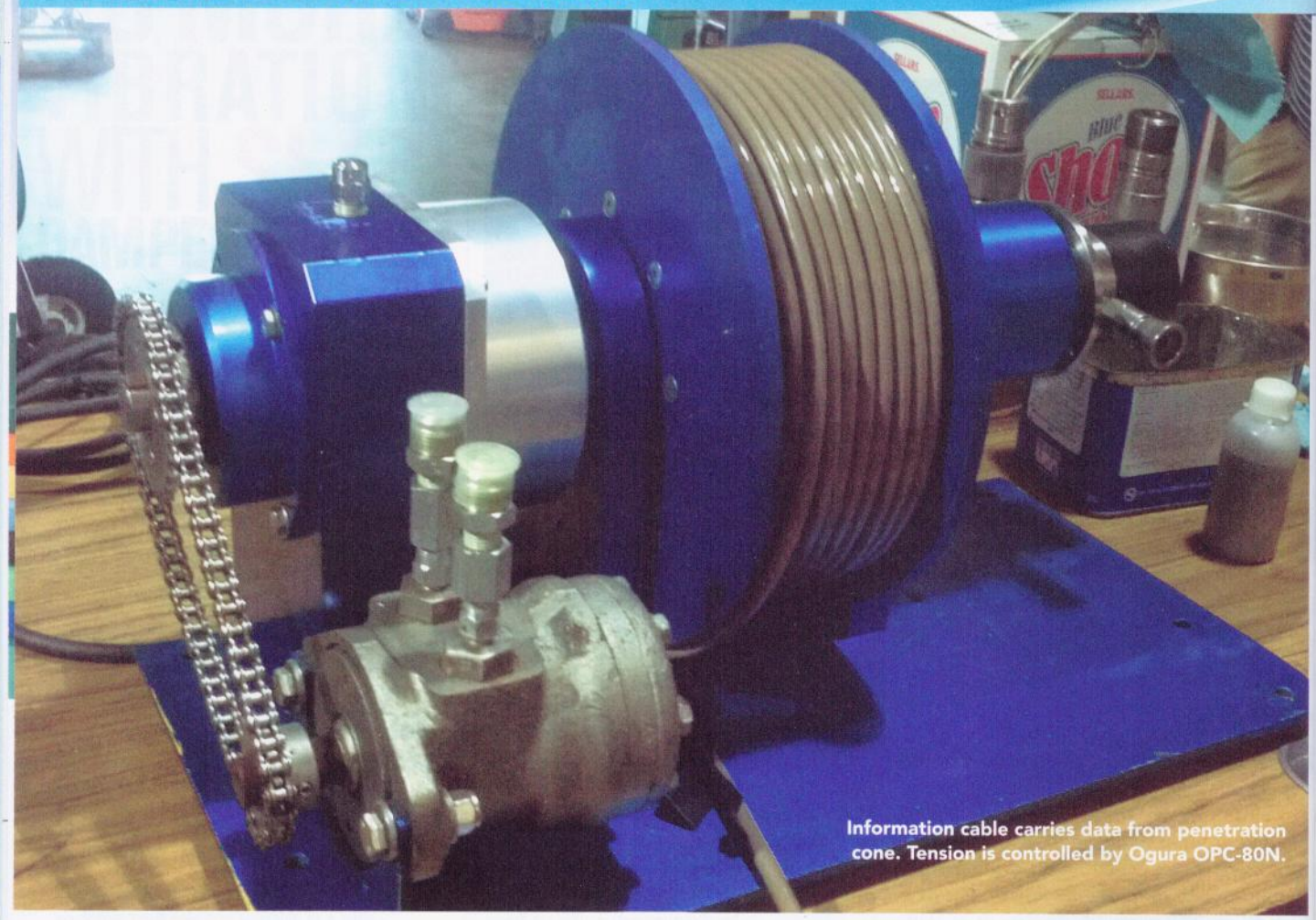

Information cable carries data from penetration cone. Tension is controlled by Ogura OPC-80N.

# Building a **Solid** Foundation

## The OPC-80N is providing consistent and repeatable torque in places few humans have ever seen.

**BY MIKE VASKO, OGURA INDUSTRIAL CORP.**

These days the price of gasoline is a touchy subject. Who's controlling these high prices is a debate that will go on forever. But whether you point the finger at the speculators, the oil companies, OPEC, or even our own government, one thing is for sure — there is much more that goes into the process of getting the oil out of the ground and into your gas tank than most of us realize.

With fewer and fewer areas available for oil exploration in the US, the oil and gas industry is forced to look for untapped resources far offshore in remote ranges of the Gulf and Atlantic and Pacific oceans. Well before construction even begins on a deep-water well (or any well for that matter), much research is done to first determine if oil is even present. Once the area on the ocean floor is leased (not purchased) from the government, the process of determining where the rig will be placed begins. Remember, many wells are in water at depths of up to a mile or more. Eons of decaying plant and animal life, as well as silt have settled to the bottom of the sea, making the ocean floor much different than terra firma.

A deep water oil rig is not built on a foundation on the ocean floor per se; instead, it is anchored to the floor and is allowed to move for somewhat obvious reasons. Determining where the anchors are placed as well as the location of other seafloor structures (pipelines, manifolds etc.) is critical to the design of the offshore platform. Information about the soil strength must be collected and analyzed before any thought of construction begins. In the past, this process has taken place from the ship at the surface via thousands of feet of drill-string suspended below the vessel. It is a painstakingly slow method and is at times not as accurate as one would hope.

Gregg Drilling, in conjunction with Schilling Robotics, has designed an apparatus called the Gregg Seafloor CPT System. It is a seabed-based testing system that allows the operators to control a small robotic unit sitting on the ocean floor from the ship. The unit conducts Cone Penetration Testing into the seafloor sediments to determine their strength properties. The CPT System has been used for a number of years on land. Originally developed in the 1950's in The Netherlands, this technique entails the use of a cone-shaped electronic probe which is pushed into the ground and delivers information on the density and other characteristics of the soil back to the user. However, with new oil discoveries in numerous areas of deep water (well over a mile to almost two miles deep), this system has produced significant interest for potential use in this sector of the industry.

## How the CPT Works

The first task toward the final goal of retrieving the information from the ocean floor is actually getting the CPT system to its destination, which in itself is no easy job. From the ship, a Launch and Recovery System (LARS) lowers the Seabed CPT via a winch and cable. The entire submersible system itself resembles an open space capsule. Consisting of high-quality robotics and telemetry and hydraulics developed by Schilling, the entire system weighs just 5 tons. Weight (or lack thereof) is critical to the control of the CPT as it relates to positioning on the seabed. As the CPT is lowered, the diameter of the cable attached to it increases, increasing the weight of the entire system.

The CPT, once sitting on the ocean floor, uses the weight of the unit as well as suction anchors to force a cone-shaped probe into the seabed to depths of up to 150 feet. By pressurizing the inside of the probe and modifying the load cell design inside the cone, the CPT is insensitive to external hydrostatic pressure, which can reach 5000 psi at a working depth of up to 13,000 feet. The design is the achievement of Ronald Boggess, a marine Services Operations Manager for Gregg. It essentially takes the pressure factor out of the equation at these depths and allows for much more accurate density, shear strength, as well as tip resistance of the cone in soil that has the consistency of what has been described as oatmeal. The innovations in both the cone and the Seafloor CPT provide tremendous advantages for the user. Productivity increases by providing two to three times the footage in a period

with less impact on the exploration site.

One of the many hurdles Boggess had to overcome was finding a way to maintain the correct amount of tension on the cable that provides the feedback from the probe and relays data to the control station on deck. He went to Ogura to find a solution, and selected the OPC-80N Electromagnetic Mag-Particle Clutch, which is designed to deliver high performance under constant slip conditions. While some modifications were necessary, the OPC-80N is providing consistent and repeatable torque in places few humans have ever seen.

The Ogura magnetic particle clutch is designed for any number of applications requiring fast response time and stable torque. These same units can also be set for continuous slip which makes them ideal for tension applications like Gregg's. Since voltage to torque is a linear function, output torque of these clutches can be easily controlled by varying the input current. Conversely, torque is virtually independent of slip speed, with only minimal changes with large increases or decreases in speed.

In addition to the OPC's operational characteristics, the OPC was chosen for its dependability and long life. With almost unimaginable costs associated with undersea exploration, it is critical for this component to be as reliable as possible. The OPC by design has no wear surfaces as is typical of a friction clutch. Torque is transferred by magnetizing the particles inside the clutch cavity, which bind together and transfer torque from input to output. The strength of the binding particles is controlled by the current/voltage to the coil, so the more current/voltage, the greater the torque. Torque to current/voltage is almost linear which allows for precise control on the cable tension. These clutches also incorporate large oversize bearings for increased robustness and side load capacity. Large shaft seals retain the powder and prevent any contamination from the external environment. These features combined lead to extremely long operating life.

After Hurricane Katrina in 2005, new regulations came into effect requiring additional and earlier research to be done prior to construction of anchored floating oil platforms. The Gregg Seafloor CPT System provides the specific information that is critical in determining the safest and most productive site selection. Though Gregg has made a great contribution to the oil industry, there are additional opportunities for growth in both the scientific industry, as well as the ocean mining industry.

*For more information, go to* ***www.ogura-clutch.com, www.greggseafloordrill.com,*** *or* ***www.greggdrilling.com.***

*Mike Vasko is regional sales manager for Ogura Industrial Corp.*