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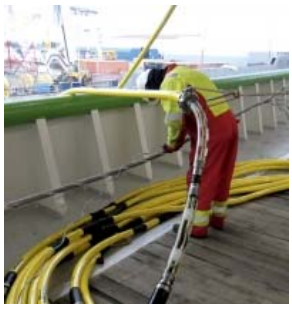


Installation of the DHSS during preparation of a new seismic vessel

The DYNA-HANGER™ suspension system

Getting a grip on u/w cable protection

By Bill Green, senior sales engineer, PMI Industries, Inc., Cleveland, Ohio, USA

Minimise downtime by protecting your multi-million dollar cable investment

The ever-growing oceanographic industry has seen an increase in demand for more enhanced, precise, high-resolution data interpretation equipment. Today's high-tech instrumentation can be found on vessels across the globe. Millions of dollars have been invested into the most accurate data processing equipment on the market today, but how do you protect that investment?

With all that you've invested into your data processing and interpretation equipment, how often do you think about your cable terminations? What happens if you lose contact with your down-cable equipment? What does that downtime cost you?

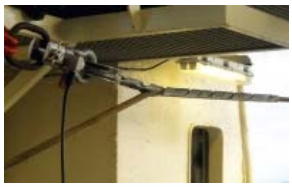
Backed by more than 40 years of quality and service, PMI Industries, Inc. has been serving customers in the marine industry with a full line of high performing products that are designed to protect multi-million dollar cable investments and minimise downtime. From the state-of-the-art testing lab to full-service engineering department, PMI provides customers mission-critical support, consulting and products.

In 1969, PMI Industries emerged in the underwater market by introducing the preformed helical wire gripping concept that could be used on underwater cable terminations and protection hardware for use in the oceanographic industry. Soon after, the company developed a reputation for excellence by designing and manufacturing highly reliable underwater cable assemblies and cable protection systems.

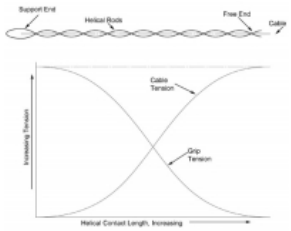
Today, PMI continues to carry on a tradition of excellence with the underlying philosophy of delivering highly reliable products and cable systems capable of withstanding the harshest conditions of the ocean.

Located in Cleveland, Ohio, PMI designs, manufactures and tests innovative products for solving underwater cable, wire rope and tension member application problems. PMI is committed to providing the most robust cable systems and hardware available to the military, commercial and scientific communities. From

"The EVERGRIP™ termination used with sidescan sonar"



"PMI CABLE GRIP™ termination used to anchor a tow cable to the back deck of a vessel to perform load testing"



"Figure shows load transition from a cable to the helical grip"

initial product concept through quality assurance testing, PMI is a complete underwater cable system facility offering solutions for all types of applications in the marine industry including cable installation, defence and surveillance, monitoring and fisheries, ROVs and ocean equipment, salvage, search and recovery operations, seismic and survey exploration and more.

The helical technology that PMI introduced to the marine industry in the 1960s was not a new concept. It has been used since the 1940s to protect overhead electric utility power conductors from damage at support points due to clamping stresses, arc-over, heating and vibration fatigue. The original idea was to pre-form rods into a helix with an inside diameter smaller than the outside diameter. The thinking was that helically preformed rods applied over the conductor could provide a secure fit without end clamps to protect the conductor from abrasion and fatigue.

PMI saw a need for the same type of protection in underwater cables and repurposed the helical technology to meet that demand. PMI's early success led to research and design of new applications and ideas for applying the helical gripping concept to underwater cables. Early in the laboratory testing stage, it was observed that helical formed rods had a gripping effect. When more accurate and extensive information was obtained from laboratory testing, it became possible to determine design parameters that made possible efficient gripping characteristics. The basic design of these gripping devices is predicated on the concept of developing low unit pressure over a large area to develop high total force.

For many years, the helical gripping concept was proven through extensive laboratory testing and industry-wide field use on armoured and jacketed cables as well as wire rope. As the oceanographic market expanded, PMI recognised a need for robust cable terminations and hardware that would survive the harsh conditions of the marine environment.

The gripping principles of PMI's products are based on the geometry and behaviour of helically preformed wires. This principle is the foundation for the success and survivability that PMI provides in its products.

Three products that utilise the PMI helical gripping concept are the DYNA-HANGER™ suspension system (DHSS) and the EVERGRIP™ and STOPPER/CABLE GRIP™ terminations.

The DYNA-HANGER™ suspension system is a highly-reliable, cable-mounted attachment point for seismic streamers, paravanes, surface and subsurface floats, cable depressors and wherever a mid-span termination is required.

Today's 3D marine seismic operators have seen an increased demand for data from their clients. This demand has resulted in increased vessel speeds and more multi-streaming towing. Some of the newest vessels can tow up to 24 streamers. The industry has pushed for a low profile, full-strength cable termination that can grip a faired lead-in and provide bend protection. Originally introduced in the 1980s, the DHSS has evolved to meet the ever-growing demands of the marine seismic industry.

Seismic operators really appreciate the versatility of the DHSS, which offers two degrees of freedom with respect to the cable axis. The housing accepts a collar assembly which can rotate 360 degrees around the cable axis. In addition, it has a pair of trunnion mounted arms which articulate fore and aft. These two degrees of freedom allow the lead-in cable to rotate freely under axial load while letting the arms align with the cross loading.

If the versatility of the DHSS isn't enough, add to that the superior holding power, and you have an indispensable tool for towing applications that plays a vital role in protecting your expensive cable investments. Lateral loads from the spreader ropes are transferred from the DHSS housing to helical rods captured beneath it and then along the cable. Loads up to 100% of the cable's rated breaking strength can be developed without slippage. The multiple rod layers of the DHSS provide cable bend protection and eliminate localised clamping forces resulting in a high-performance attachment that does not degrade cable life.

Another feature of the DHSS is that the collar assembly can easily be removed allowing the housing and rods to be reeled directly onto the cable drum, which makes for easy deck storage.

The DHSS is an engineered system that has been laboratory tested and field proven by PMI. It is rated in most applications for a 17-ton working load and has been subjected to 50 tons of tension without mechanical failure. As lead-in technology advances, PMI continues to develop new designs and offer reliable solutions for underwater cable protection and survivability.

The EVERGRIP™ termination is a full-strength, field installable termination. Designed to hold 100% of the cable's rated breaking strength, it protects against fatigue of the cable system under severe dynamic conditions. The cable or wire rope extends through the termination intact without cutting or modification of the cable; no cable preparation, special training, or tools are required to install it.

STOPPER/CABLE GRIP™ terminations are ideal for getting a quick grip on your cable. The reliable, unique helical grip design offers both standard and custom options to fit most wire rope and E/M cables. These grips are corrosion resistant, field installable and offer superior holding strength.

Because there are many varieties of cables and cable system applications used in the marine industry, PMI has designs for electro-optical-mechanical cables, rope and hose assemblies and can incorporate all types of electrical and optical connectors into the final assembly. Though many standard products are available, PMI's experienced engineers can also design custom solutions to fit even the toughest applications.

PMI also boasts a state-of-the-art testing lab that simulates at-sea environmental conditions. PMI's services are tailored to each customer's individual needs. Because PMI does not manufacture cable or electrical connectors, they offer a unique and unbiased approach to testing. From raw cable, hardware or termination devices to a full-length cable assembly, PMI can perform tests such as tension, hydrostatic pressure, bend-over-shave, fatigue flexing and many more. With more than a dozen testing machines, PMI can also perform design verification and acceptance testing.

Through their laboratory and testing services, the experienced staff at PMI identifies causes of cable system problems and demonstrates the survivability of possible solutions. Customers are welcome to witness the testing anytime and confidentiality is guaranteed.

More at www.pmiind.com

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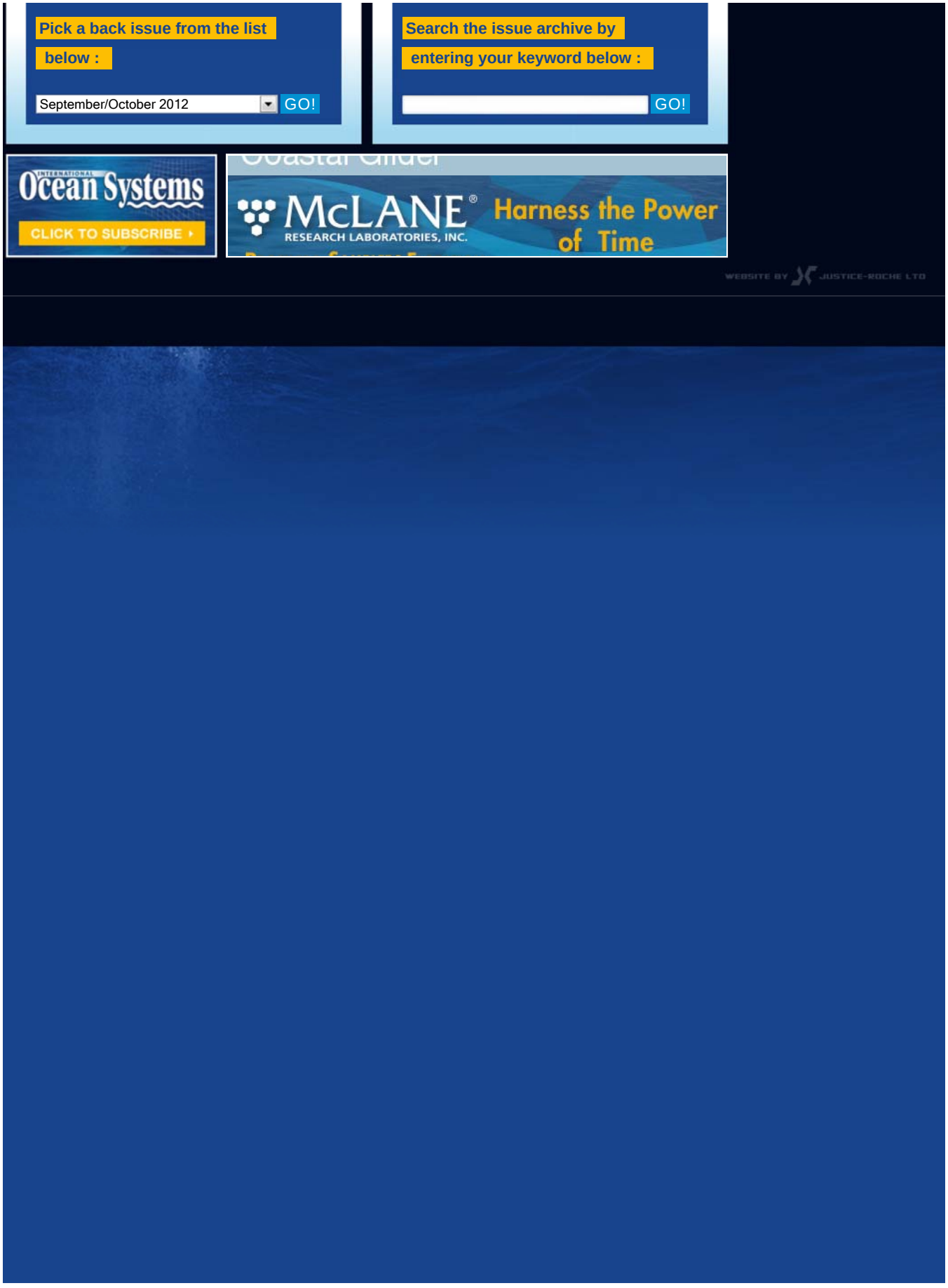
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