

FOR IMMEDIATE RELEASE:

OSCILLATION WELDS PIPELINE FAILURE SOLUTION: NOOK INDUSTRIES BALL SCREW ASSEMBLIES KEY TO PATENT- PENDING PETROLEUM CORROSION TECHNOLOGY.

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The 21st century has presented a technological shift in oil field drilling as most of the easily accessible oil is tapped and well producers are forced to go deeper to procure highly corrosive sour crude oil (H₂S). Sour crude oil is a sulfurous mixture that corrodes the iron in the carbon steel pipe that extracts it and due to that fact, the petroleum industry has been determined to develop drilling technology that can overcome these corrosive effects to produce oil.



In an effort to provide protection from pipeline failure and allow for oil production in new deep water sour oil fields, leading custom automated and robotic equipment manufacturer ARC Specialties, Inc. (Houston, TX) has developed a new cladding technology that controls this corrosion to safely extract and process sour crude. The KLADARC advanced TriPulse™ Hot Wire Gas Tungsten Arc Welding (GTWA) system leverages oscillation welding to deposit a metallurgically lined (or clad) two-layer corrosion-resistant alloy (CRA/Alloy 625) overlay (nominal thickness of 3.5 mm and guaranteeing the 3.0 mm minimum thickness) on clad pipe up to 20 feet in length and inside diameters up to 30 inches. Ultimately, this patent-pending technology reduces oxide inclusions and iron dilution in the cladding process – thus, mitigating the corrosive effects of H₂S.

BALL SCREWS KEY TO OSCILLATION:

Paramount to this 5-axis cladding machine's advancement is the capability to oscillate the arc inside the pipe. This crucial element of oscillation in the process is driven by ball screws manufactured by Nook Industries (Cleveland, OH) Precision Screw Group as part of its Power-Trac™ line of precision ball screw assemblies. With over four decades of experience manufacturing precision ball screws, Nook's precision-rolled ball screw with a double bearing EZZE-MOUNT™ support provided a durable and efficient means of converting rotary motion to linear motion on the dual-torch oscillation axis (x & y) of the machine .



Photo of the Oscillating Slide

Ultimately, the dual-torch oscillation simultaneously overlays two layers of CRA onto the pipe's inner surface and provides a molten "puddle" with longer residence time to bond and eliminate common problems of overlay welding; i.e.-leaving holes that penetrate through the overlay layer and thereby expose the outer steel pipe to corrosive sour crude.



OSCILLATION PROCESS / BALL SCREW STATS:

The dual-torch oscillation process involves feeding CRA wire into a 20' long torch that welds it circumferentially along the inner wall of the steel pipe. The circumferential weld is created by Nook's ball screws wiggling the torch into the pipe back and forth approximately 1" per second, while motorized pipe rollers steadily turn the pipe. The first 20 feet of pipe is coated, then flipped 180 degrees, and then the torch is put back to coat other half of pipes' inside diameter.



Each oscillation places a heavy load on the ball screw with the 20' torch decelerated, stopped, and reversed 120 times a minute with loads running just under 1,000 lbs. during acceleration. The accelerate/decelerate rate is a harsh and rapid speed/load oscillation of .8" at around 1 hertz (Hz) per second. The oscillation process also moves the weld puddle side-by-side which generates approximately 2X the weld yield. Additionally, this single-pass circumferential weld ensures that the CRA overlay is seamless and also allows the pipe to undergo long-radius bending after the overlay process.

According to Dan Allford, President of ARC Specialties, "The oscillation process is a harsh application since it runs and repeats without stopping for hours at a time. Therefore, the reliability and performance of Nook's ball screws is vital and a key basis for our patent-pending process."

Nook provided ARC with its Precision-Rolled Ball Screws and ARC customized them to meet their unique application specifications. Nook offers its ball screw assemblies in a wide range of materials including alloy, stainless steel, titanium, and other exotic metals. Nook's ball screws are available to meet a customer's application performance requirements; i.e.-stainless steel for medical, non-magnetic, non-corrosive applications. Nook also implements a precision rolled manufacturing process vs. grinding which is more efficient and cost effective.

A comprehensive Specification Data Sheets for Nook's Power-Trac™ Ball Screw Assemblies is available for download at: <http://www.nookindustries.com/ball/ballAssemblies.cfm>

RESULTS / CONCLUSION:

A myriad of forces continue to contribute to the need to develop advanced technology to battle sour crude petroleum pipeline corrosion including; demand, environmental concerns, energy independence, and aging infrastructure. For example, many of the sour crude oil reserves located in the Gulf of Mexico reside at very deep subsea locations that present volatile conditions such as high pressures which increase the oil's corrosivity – thus, making corrosion technology crucial to production. Corrosion technology also provides safety and protection from environmental catastrophes resulting from corroded pipelines.

Currently ARC has produced two of its advanced TriPulse™ Hot Wire Gas Tungsten Arc Welding (GTWA) systems that are currently active in the Gulf Coast region – two more are scheduled for delivery in 2010. According to Allford, "Oscillation welding really sets apart our clad quality from the traditional methods of cladding and produces a long-life coating that prevents pipeline failure. KLADARC's cladding technology controls the H₂S corrosion, and trust in Nook's product to coat the pipe is directly related to this crucial feature which allows us to meet stringent Quality Assurance requirements for the Petroleum industry."

View KLADARC demonstration video:
<http://www.youtube.com/watch?v=wSfgZESrO58>

Arc welding with oscillation creates overlay of wider stringer beads



CORPORATE PROFILE:

For over 40 years, Nook Industries, Inc. has been a leading manufacturer of linear motion components and linear motion control systems. Manufacturing one of the most comprehensive selections of integrated linear motion systems in the world, Nook's progressive growth has been achieved through its commitment to quality, continuous improvement, defect prevention, and the use of statistical methods and consistent training to ensure the quality of its products.

Headquartered in Cleveland, Ohio, Nook Industries is an ISO 9001-2008 Registered company that provides controlled motion solutions in a wide range of industries including; transportation, medical/diagnostics, paper, chemical, food/beverage, solar/aerospace, entertainment and communications markets. Clients in these markets rely on the company's products for tooling, product design and engineering flexibility to provide modified standard products to meet their respective application requirements.

Whether the application requires an off-the-shelf linear motion component or an engineered solution tailored to fit your application–Nook provides comprehensive engineering, design and analysis to provide the highest quality linear motion solutions on the market today.

For more detailed information, visit the Nook web site at: www.nookindustries.com or call: 1-800-321-7800

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