Clock Spring Quarterly

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Pre-Cured Clock Spring and Our New Wet Applied Contour In Combination

Clock Spring Company, L.P. is now in the unique position to be able to offer both our name sake pre-cured Clock Spring composite repair and also a wet applied field lay-up repair. Clock Spring® Contour is the newest of our product offerings. Bespoke repair solutions can be designed for many specific applications. ASME PCC-2 and ISO TS24817 guidelines are utilized along with input from the operators engineering staff to appropriately meet your specific repair needs.

A major international offshore operator with offshore facilities contacted Clock Spring Company, L.P. to provide an engineered composite repair solution for a critical 26" topside production piping system.

The complete pipe work was subject to severe external corrosion and areas affected included: straight pipe lengths, girth welds, pipe support, Tee's, tight radius bends and off takes.

Clock Spring Company, L.P. performed a complete engineering analysis in-house and utilising a combination of our Clock Spring full cured laminate and Clock Spring Contour wet lay up repair products produced a bespoke engineered repair solution for the complete pipe work and complex geometry configurations. Clock Spring Company worked with the operator to facilitate the operators design for a repair in accordance with both ASME PCC-2 and ISO TS24817 guidelines.

Due to the ease, simplicity and speed of installation, the standard Clock Spring 8 layer pre-cured coil format was utilised for all straight piping sections. Due to the severe extent of the corrosion the high compressive strength filler was initially hand applied and then moulded in place whilst curing prior to the coil installation.

The spool feeder installation method was then utilised to install the composite coil to accommodate the minimum clearance requirements between the pipe work and deck grating. In this way pipe, pipe support and girth weld repairs were completed. Within this phase additional repairs were also performed on 12" diameter off take systems.

Phase 2 was to then install Clock Spring Contour repairs to the complex geometry sections and to interface with the straight sections already reinforced with Clock Spring. The Clock Spring Contour system is an engineered repair designed specifically for the repair requirement. The base materials are supplied to the work site in a "component" form and are then mixed and hand applied to form the composite repair around the structure on site.

The utilisation of the various composite repair architectures allows Clock Spring to utilise and provide their individual benefits to our clients of: quicker, safer, timely and complex repairs with complete engineering support from a single source.

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CLOCK SPRING® CONTOUR 270° F INSTALLATION

REFINERY UPTIME IS WHAT ITS ALL ABOUT

With US refineries running at full capacity to keep up with consumer demands, unscheduled shut-downs are being blamed for price increases at the pump. Refinery downtime kills product flow and profit flow affecting the productivity that our nation expects from its limited number of refined product producers. There is no better example of preventative maintenance than thin pipe wall rehabilitation. Stopping potentially dangerous leaks before they bring the refinery down benefits all. From a safety as well as a productivity standpoint composite rehabilitation makes sense. Early this May Clock Spring Co., LP was asked to strengthen a section of a 20" diameter OVHD monel line on a distillation unit that was thinned due to chloride build-up. This line carrying Naptha and HCl, had previously been patched with large monel plates including one inch diameter pressure diverting nipples. The challenge was to perform the repairs without bringing the unit down. This meant repairs on a live line with a temperature of 270°F. The line was very thin and the unit had no chance of making it through to the 2010 planned outage.

Clock Spring company worked with the operator to facilitate the operator's repair design to ISO TS24817 and ASME PCC2 Article 4.1 standards which gave a 4 year composite rehabilitation solution using an elevated resin and pretension fiberglass stitch-mat combination. The unique design of this repair allowed for a 6' section of the line to completely disappear underneath the composite. The analysis proved that Contour provided the required strength in the hoop and axial direction to take the pipe's operational loads. Additional calculations were performed to ensure the composite would also handle the deadweight of the 20' pipe section.

Multiple layers of Contour were wet-out in sets then applied to the 20" line in tapered sections. Using the advanced Contour resin the experienced crew encountered none of the bubbling, blistering or premature setting problems associated with traditional epoxy systems when applied at this temperature. The high line temperature was used to post-cure the system to obtain maximum strength in a short amount of time.

The final results…no downtime and no leaks. The repair was brought in under budget for less than 10% of replacement costs.

CRACK ARRESTORS STOP LONG RUNNING FRACTURE. APPLICATIONS FOR C02 PIPELINE AND CARBON SEQUESTRATION

Clock Spring® refers to a family of related fiber glass-and-resin matrix products developed by NCF Industries Inc. under a contract with the Gas Research Institute (GRI), now called the Gas Technology Institute. It is used to repair blunt defects in pipes or arrest ductile fractures in high-pressure gas pipelines. The system operates by transferring the hoop stress from the defect, through high compressive strength filler material to the composite sleeve (Clock Spring®) wrapped around, and bonded to the pipe. As a Crack Arrestor, the composite absorbs the energy of the fracture arresting the crack.

The composite is e-glass and polyester resin. All the e-glass fibers are continuous strands aligned in the hoop direction providing a tensile strength of 80,000 psi. The resin in the composite protects the glass strands and provides the shape memory that aids in the installation.

There is no need for welding or cutting the pipeline, increasing safety and eliminating environmental risk and release of greenhouse gases. Clock Spring® consists of unidirectional glass embedded in a polyester resin. The final installation will consist of 12 wraps for a repair and 2-12 wraps units placed side-by-side, for arresting cracks.

The Crack Arrestor can be wrapped around new or existing steel pipelines at specified intervals, without cutting the pipe or removing it from service. The strength of the glass fibers and memory of the composite combine to provide the barrier needed to stop the explosive propagation of cracks, limiting repair costs and the potential for damage. In most applications, two units are placed side-by-side to ensure that the crack can be fully arrested.

*These photos illustrate one of many extensive tests performed to validate the Clock Spring Crack Arrestors performance.

PROTECTION FROM THE PIPE SUPPORT

The Clock Spring® Pipe Support Application refers to a two layer composite shell bonded to the pipe, protecting the pipe from wear and eliminating crevice corrosion. For example, an 8 inch line at a metering station has a defect located at the support interface.

The support was first jacked up and skidded out. After the support was removed, it was inspected. Surface rust and debris was then removed and the area was prepared by roughing up existing epoxy paints. Next the area was cleaned with acetone to remove any hydrocarbons and residue.

The adhesive is mixed and applied to the pipe, and between the two sleeves. Two Clock Spring sleeves are applied with the seams at 10 and 2 o'clock. Banding straps are then tightened, forming a secure bond and oozing out the excess adhesive.

After a set up period of 1.5 hours, the banding straps are removed and the support reinstalled. The support areas are primed with two coats of an approved above ground epoxy. Coating needs to be applied since the Clock Spring products are sensitive to UV Rays.

The features of this product over traditional methods are:

- *It can be used on applications with restricted access. A fully wrapped sleeve can be installed with less than 0.25 inches of clearance between the pipe and support.*
- *Pipe movement caused by thermal effects, external loading or seismic activity will not affect bonding or shear strength Between the pipe and support.*
- *The sleeves are uniquely shaped and sized to install 360° Around pipe diameters from 0.75 inches to 56 inches.*

Clock Spring Trainer Training Classes

Date's for 2007	Details
*July 25th & 26th	*This is an intense two day course from 8:30 am till 4:30 pm with a hour lunch break.
*August 15th &16th	
*Sept 19th & 20th	
*Oct 17th &18th	
*November 14th &15th	*With Clock Spring Trainer Certification, you are qualified to certify Clock Spring Installers in the field.
*December 11th &12th	