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Alternative pipe coupling system used in Middle East

An alternative method of joining segments of line pipe for installation was employed this summer for pipeline installation in Abu Dhabi.

The Positive Seal Coupling System, supplied by Jetair International Inc., Houston, is a high-strength alternative to welding for joining 2 to 12 in. OD pipe.

Through last April, the company produced 10,405 couplings for the 124-km, 10-in. pipeline that is part of the Abu Dhabi Onshore Gas Development project.

These were shipped to the Al-Qahtani Pipe Coating terminal in Saudi Arabia where the line pipe was being coated internally and externally. There, the couplings were installed on one end of each joint of pipe.

Positive Seal system

The coupling (Fig. 1), developed in 1979 and first patented in 1982, was originally for use with internally coated pipe, eliminating as it does the need for internal girth weld coating repair. The coupling is also suitable for bare pipe.

Pipe wall-thickness schedules of up to 160 and API 5L Grades through X-60 can be accommodated, says Jetair. Pipeline construction time is significantly reduced in part because the positive seal pipeline connection requires no X-ray.

Minimal pipe-end preparation is required. And there is no ID size restriction to product flow or pigging operations, no loss of pipe length during make up, and no stress fatigue or cracking of pipe ends.

The coupling connection has 100% pressure, stress, and load capability under ANSI/ASME Piping Codes B31.3, B31.4, B31.8, and under CAN/CSA-Zl83, Z184 and complies with the requirements of U.S. Department of Transportation 49 CFR Parts 192 and 195.

The patented positive seal coupling uses a press-on mechanical metal-to-metal interference fit and features a coupling with finely machined internal serrations. The tapered interference fit of the coupling ID is machined smaller than the OD of the line pipe it is designed to join.

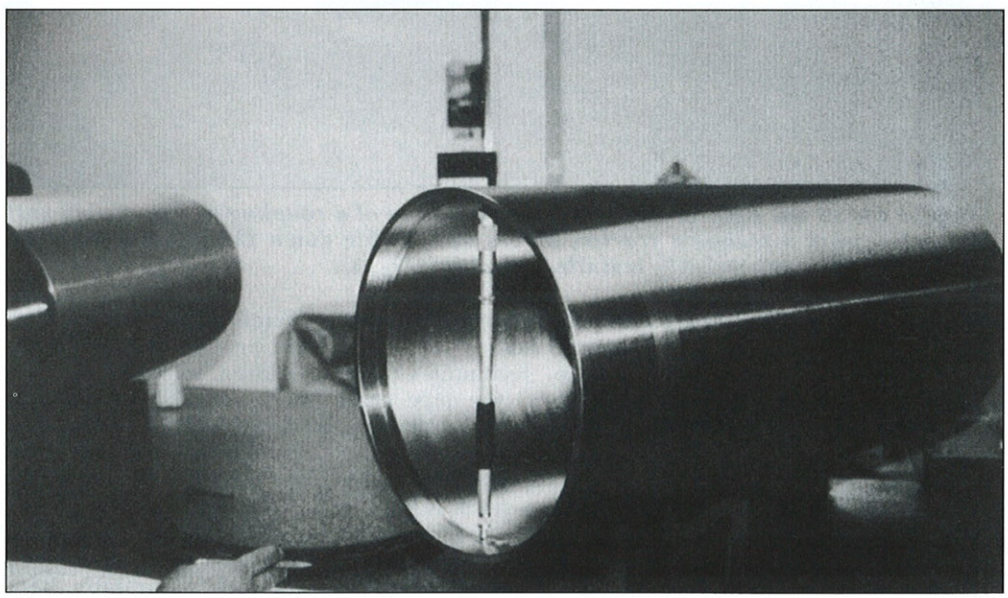
This controlled interference fit, in conjunction with the serrations on the ID surface of the coupling, says the company, produces a connection that exceeds the minimum yield specifications of the pipe itself.

Installation

Before the pipe ends are connected, a sealant, normally a specially formulated epoxy, is applied to the OD surface of the pipe ends and the ID surface of the coupling.

With a patented Positive Seal Field Joining unit, the pipe is then hydraulically pressed into the coupling to a premarked insertion depth - one half of the coupling length - producing a connection with a metal-to-metal seal (Fig. 2).

The epoxy serves as a lubricant, preventing metal galling during coupling installation, and cures to form a secondary seal around the pipe ends and throughout the ID of the coupling. A shaped spacer-ring gasket is



A Positive Seal Coupling undergoes inspection before shipment (Fig. 1).

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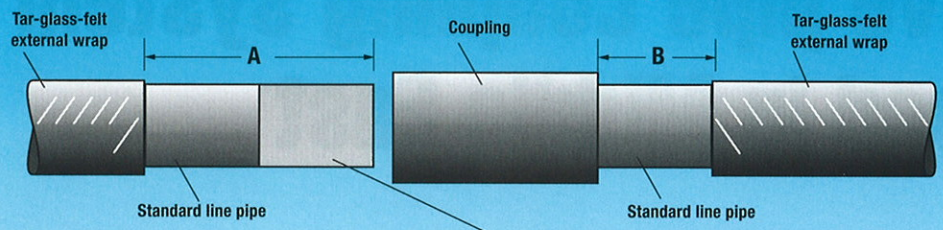
Fig. 2

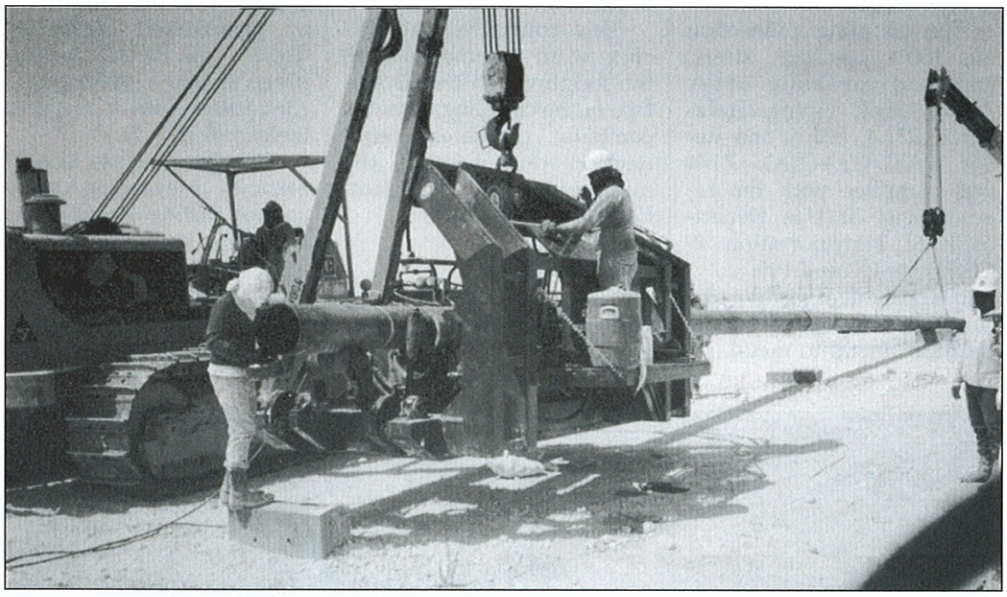
TYPICAL COUPLING CONFIGURATION

Pipe size, in.		Dimensions, in.*	
Nominal	O.D.	A	B
2	2 3/8	26	8
2 1/2	2 7/8	26	8
3	3 1/2	30	10
4	4 1/2	30	10
6	6 5/8	36	12
8	8 5/8	36	12
10	10 3/4	42	12
12	12 3/4	42	12



Note: *This shaded area must be cleaned with M.E.K. or an equivalent solvent to prevent mixture of tar with epoxy and should be 50% of the length of the coupling.*

*Currently, these are the standard line pipe sizes that can be joined by Positive Seal Couplings.



The pipe end of one joint is prepared for installation of a coupling as the joining unit, suspended from a sidboom tractor, moves up. Visible down the pipeline from the machine is the most recently installed coupling (Fig. 3).

also used between the pipe ends to form a redundant seal in the pipe connection.

With no overlapping of pipe ends, each joint retains its original length.

Jetair says that other joining methods, such as the "bell and spicket" method, can reduce pipe up to 1 ft/connection in insertion depth alone, as well as reducing line pipe ID, with a resulting reduction in flow characteristics.

Those techniques also "cold work" the pipe ends which produces longitudinal stress risers in the "bell" as a result of the swedging operation. Stress risers cause the loss of expensive pipe due to "split ends" and increase the chances of sulfide-stress cracking and corrosion.

Because the Positive Seal Coupling System completely eliminates the need for welding, pipelines can be built with the benefit of internal coating which protects them from corrosive fluids and enhances product flow.

The internal pipe coating also prevents formation of iron oxides, iron sulfides, and other common bare-pipe contaminants.

The coupling system is used extensively in highly corrosive pipeline applications including CO_2 injection, water injection, brine-water disposal wells, plus the produced fluids of oil, saltwater, and natural gas containing H_2S and CO_2.

Joining unit; economics

The Positive Seal Field Joining unit is portable with its own hydraulic power source. It holds in place the pipe end that is to be inserted, then presses it into the coupling with hydraulic rams and clamping slips.

The pipe slips and coupling backups maintain true alignment during insertion and ensure a strong, lasting connection, says Jetair.

The joining unit is suspended by a sideboom tractor and easily moves down the pipeline from one coupling insertion to the next (Fig. 3). For marine pipeline installation, the unit can be transported on a barge.

Jetair manufactures the joining units in several different models to handle a variety of line pipe.

At present, Jetair manufactures couplings and equipment for pipeline construction through 12-in. nominal pipe size, with plans for future expansion to accommodate pipe sizes through 16-in.

The economics of using the coupling system derive in part from there being no pipe loss experienced with the couplings. Additionally, the pipeline operator is spared costly X-raying of welded connections'

With the joining unit performing the actual line pipe assembly when the positive seal process is used, expensive and unnecessary man-hours are saved.

With coupling insertion taking only 60 sec to complete, pipe lay rates are much faster than with welded connections. The heavier the pipe wall, the more economical the Positive Seal Couplings, says Jetair, compared with welded pipe, coated or uncoated. ▪