

**Fluid Sealing Association
Excellence in Environmental Protection
1st Annual Awards Contest**

**Entry/ FSA Division: Compression Packings
Featuring: JamPak, a product of Teadit N.A., Inc.**

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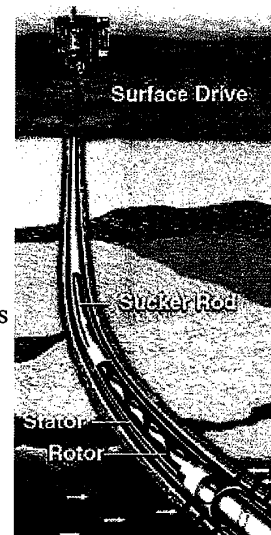
Introduction:

Weatherford PC Pump Ltd. is an OEM manufacturer and supplier of Progressing Cavity Pumps used by the Oil Field Industry. A description of this equipment and its operation is described in the next section. The problem addressed in this Case is “stuffing box” fluid leakage into the environment. This traditionally occurred in three situations. The first situation was due to the necessity of “allowed controlled leakage” to provide lubrication to stuffing box packing, the second was when normally used braided packing degraded in its normal life cycle and the third occurred during each downtime period when worn packing was replaced with fresh packing. Teadit’s JamPak solved these problems, as it requires no lubrication and can be injected into the stuffing box at the first sign of a leak, while the pump continues in operation.

PCP System Overview:

Progressing Cavity Pumping (PCP) Systems typically consist of a surface drive, drive string and down hole PC pump. The PC pump is comprised of a single helical-shaped rotor that turns inside a double helical elastomer-lined stator. The stator is attached to the production tubing string and remains stationary during pumping. In most cases the rotor is attached to a sucker rod string that is suspended and rotated by the surface drive.

As the rotor turns eccentrically in the stator, a series of sealed cavities form and progress from the inlet to the discharge end of the pump. The result is a non-pulsating positive displacement flow with a discharge rate proportional to the size of the cavity, rotational speed of the rotor and the differential pressure across the pump.



JamPak:

JamPak injectable pump packing and valve sealant was developed by Teadit as a malleable packing material that can be injected while a pump or valve is operating without interrupting production. It is made from a blend of high-tech, non-asbestos, non-hazardous synthetic fibers and carefully selected blends of greases, oils and other proprietary binders. It is this unique blend of fibers and binding agents that allow the system to be run virtually leak free. Jampak does not depend on product leakage for lubrication; frictional heat buildup that so often leads to compression packing failure is eliminated.

Prior to start-up, JamPak sealants are easily applied with any flat-bladed tool, such as a putty knife or wide-bladed screwdriver. The material can even be finger-packed into the stuffing box. An anti-extrusion ring of the appropriate braided packing (Teadit 2070) is placed in the bottom of the stuffing box around the shaft. A top ring of the same material is put in place to "cap" the sealant-loaded box. This box is further capped by a spring-loaded, steel follower.

When repacking becomes necessary, you do not have to remove the old packing. Simply incrementally back-off the spring load and add more sealant by using the JamPak injection gun to inject new packing through a fitting installed on the drivehead stuffing box.

Case History:

Weatherford did a moderate re-design of the stuffing box for its Progressing Cavity Pumps, to enable the injection of JamPak.

A Progressing Cavity Pump is driven by the rotational force transmitted from a drivehead at the surface down to the pump, through an extremely long sucker rod (up to several thousands of meters). The resultant pumping action forces produced fluid to the surface where it encounters the stuffing box and then is forced to flow through surface pipes to storage or refining facilities.

The stuffing boxes are positioned on the pump driver at the ground surface, to provide a dynamic seal around the rotating rod as it pierces the containment wall of the transmitted fluid. These boxes have been traditionally packed with braided packing. Normally, lubrication is required for braided packing and a controlled amount of fluid leakage is allowed to provide this lubrication. Typically, for this purpose, about one liter of produced fluid is released monthly from each well. There are currently over 20,000 wells throughout the world produced by PCP's meaning any reduction in this fluid leakage would have great impact. JamPak requires no lubrication and therefore eliminates this leakage to the environment.

Design Criteria:

- 1) The properties of produced fluid vary within each oilfield location and certainly, around the world. Typically, the crude produced by the PCP's is extremely viscous (as low as 7 or 8 API) and this produced fluid may include combinations of up to 80% water and up to 40% fine sand by volume.
- 2) Above ground, positioned on top of each well, there is a large stack-up of various pieces of equipment. This condition provides a propensity for misalignments between the surface driverhead and the pump on the bottom of the drive string. Misalignment leads to extreme side loads on conventional braiding packing rings and creates potential leakage paths. Also, misalignment generally produces vibration frequencies within the drive string, considering the variable speeds (20 to 500RPM) experienced during operation.
- 3) Very low maintenance per well is demanded as the operator may be required to daily maintain 50 to 60 completed well systems that may be spread over an area of many square miles. The downtime required to change out a conventional braided packing set can be several hours, resulting in serious lost oil production (potentially, 100+

barrels) plus the cost of outside crews needed to assist restarting of the wells and cleaning up of any spillage.

The Solution:

A search was conducted to uncover non-oilfield, fluid-sealing situations with very similar requirements as those detailed above. They found similar operating conditions existing in the Marine Industry as well as the Pulp and Paper Industry where leakage problems had been greatly alleviated by the application of JamPak injectable packing.

Following a re-evaluation of all operating requirements and a good look at the current stuffing box design, it was decided to moderately redesign the stuffing box to accommodate the use of JamPak. Only a single injection point needed to be drilled into the existing housings. A retrofit system was created to allow modification of existing systems to accept the injectable packing by simply replacing the internal spacers and rings with new properly fitted spacers and the JamPak/ 2-ring System.

Teadit JamPak 27 injectable packing was introduced into the stuffing box between two bullrings of Teadit 2070, giving an overall sealing height equal to five rings of conventional braided packing versus the traditional design of 7 rings. There were several optional combinations available for the injectable packing but the JamPak 27/ 2070 Ring combination yielded the best test results.

Benefits:

The benefits of this system were immediate:

- The amount of produced fluid leakage from each of the stuffing boxes was minimized to almost zero as the spring-loaded Cap (top Gland) tightens down as the new packing systems gradually depletes. Periodically, maintenance personnel incrementally back-off the spring load and inject sufficient JamPak to replace depleted material. All this is accomplished without any leakage. Also, there is no longer a need to allow some leakage to provide lubrication.
- Any leakage due to misalignment was removed as the putty-like consistency of the JamPak 27 allowed it to move to fill any voids.
- While the past use of braided packing required retightening of the Cap nearly every other day and the replacement of packing sets every 1 to 2 weeks, the new injectable design has reduced Cap tightening to once every 2 weeks. Once the cap bottoms out, additional JamPak is injected into the stuffing box without having to replace the complete packing assembly.
- The new packing scheme on most units has not needed replacement in the twelve plus months since retrofitting began.

The realization of success was immediate. In the past 16 months over 800 stuffing boxes in the field have been retrofitted for the new system using Teadit Jam Pak 27 and Teadit 2070 packing rings. The number of new units being ordered with the Injectable Packing Systems has risen to more than 20% of all conventional stuffing boxes shipped and this percentage is growing as customers increasingly learn of and experience the new design.

Case Summary:

By introducing the Teadit JamPak Injectable Packing system to the Progressing Cavity Pump Stuffing Boxes, the amount of produced oil leaking to the environment has been tremendously reduced. Additionally the amount of maintenance required by these stuffing boxes has been greatly reduced, meaning less production down time and the elimination of cost associated with cleaning up spillage. With the ease of retrofit, there are minimal costs involved in order to modify existing equipment.