When improving the performance of mission-critical pumps, John Crane’s customers face challenges, including high heat generation, poor lubrication, abrasion, and barrier system complexities. To solve these problems, we developed a new face treatment, called Up-Stream Pumping, as part of our suite of seal face technology options for rotating equipment. Drawing upon our pioneering gas seal innovations in the 1960s and 1970s, John Crane engineered the Up-Stream Pumping concept for liquid services and launched this new face treatment three decades ago. Today, we answer operators’ toughest challenges, improving seal and pump reliability, preventing unplanned downtime and reducing operating costs across a broad range of process industries.
Starting with Game-Changing Technology
In the 1960s and 1970s, John Crane’s patents for centrifugal compressor mechanical seal designs pioneered the use of non-contacting spiral groove face technology in gas compression applications. These new gas seals revolutionized centrifugal compressor shaft sealing by delivering a step change in compressor reliability and operating costs.

Applying Spiral Groove Technology to Pumps
By the 1980s, John Crane engineers started working with these faces on mechanical seals for pumps, applying that same game-changing innovation to “actively lift” the faces of wet seals. The results were impressive, and the potential for improving pump performance in key process industries was promising. John Crane engineers kept working and launched the TB8000 Up-Stream Pumping seal in 1989. Now—almost three decades later—John Crane remains the only seal company to offer this innovation for pumps.

Three Decades Prove Value
Today, John Crane customers who have applied Up-Stream Pumping face technology have experienced seal life improvements from just two to three months up to five years in some instances. Plus, with the right seal support system and piping plan, reliability issues due to poor water quality are virtually eliminated. With hundreds of installations in the last few decades, John Crane is the best—and only—expert in applying the concept of active lift to mechanical seals for pumps.

How Does It Work?
Mechanical seals require a narrow gap between faces to allow a lubricating film to work; the gap must also be optimized to eliminate leakage. The lubricating film thickness is measured in microns. Debris in process fluids can create deposits, damage faces and cause hang-up. Ultimately, seal life is shortened, and the MTBR of the pump is not acceptable.

The basic concept of John Crane’s solution is that the conventional seal is replaced by a low-volume, high-pressure “pump”—the Up-Stream Pumping seal. This “pump” propels a minute quantity of buffer liquid along the path normally sealed by the mechanical seal faces and into the product side. Because the product side is at a higher pressure than the buffer liquid, this seal is said to pump “up-stream.”

Principles of Active Lift Operation Solve the Problem
An Up-Stream Pumping seal operates on the principle of hydrostatic and hydrodynamic force balances. The spiral groove pattern serves the purpose of a pressure-generating system, directing barrier fluid toward the outside diameter (OD), meeting the resistance of the sealing dam and increasing pressure. This causes the flexibly mounted face to actively “lift,” setting the sealing gap. In this non-contacting mode, liquid is pumped from a low-pressure region to a high-pressure region.

Active lift at a seal interface offers several advantages over the traditional dual-pressurized seal approach:
• The technology is non-contacting and, therefore, the usual pressure (PV) limitations do not apply
• The sealing environment within the seal chamber is cleaner, resulting from positive flow of clean fluid
• Reduced power requirements and environmental contamination
• Self-regulating and tolerant to process pressure variations
• Ability to handle slurries, scaling liquids, abrasives and products with poor lubricity

Up-Stream Pumping Technology combines the benefits of a dual-pressurized and unpressurized seal into one solution, providing the environmental protection of a double-seal arrangement with the inherent safety of a tandem-seal arrangement.

Life Extending Results: Improves seal life MTBR from three months up to five years, depending on application conditions.
Let John Crane’s engineering experts recommend a seal face treatment to solve your most demanding challenges. Together, we will work with you to keep your mission-critical operations up and running with support and guidance from our experienced team. Visit www.johncrane.com and request a quote or consultation with one of our seal face engineering experts today!

“UP-STREAM PUMPING: NEW DEVELOPMENTS IN MECHANICAL SEAL DESIGN” by Afzal Ali with support from Gordon S. Buck and Doug Volden (all John Crane employees). Presented and published in the proceedings of the 6th International Pump Users Symposium, April 1989, Turbomachinery Laboratory, Department of Mechanical Engineering, Texas A&M University, College Station, Texas.

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