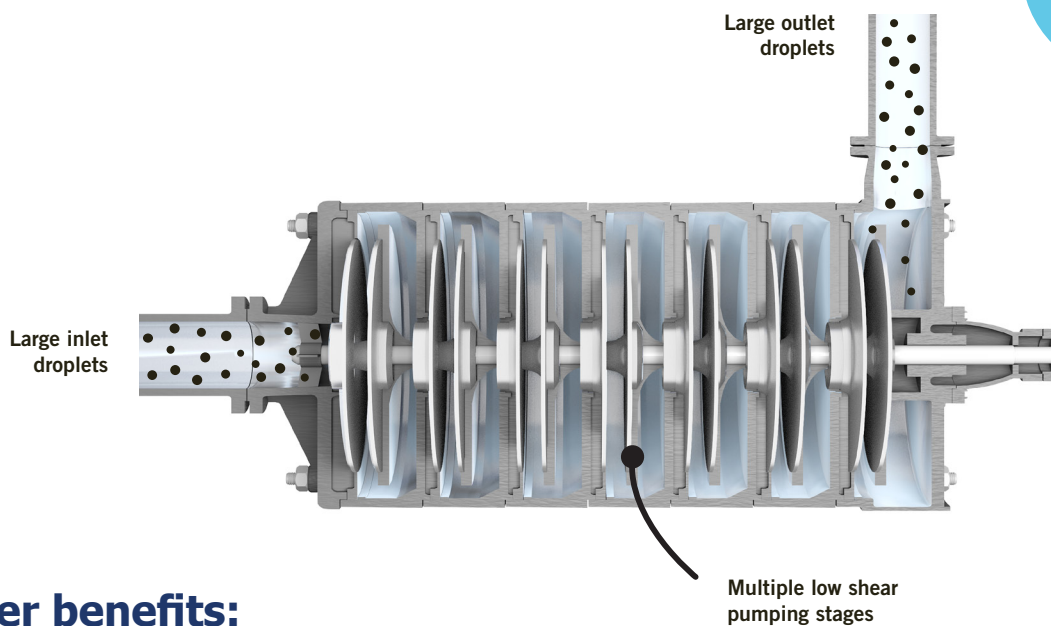
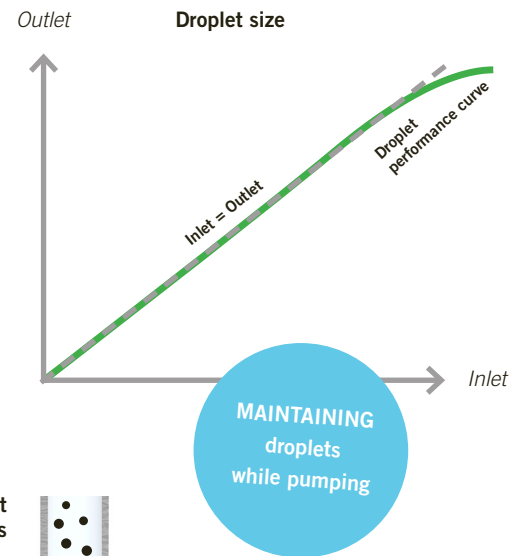


TYPHONIX LOW SHEAR PUMP

By controlling the level of turbulence in a pumped flow, droplet breaking is avoided. Typhonix provides highly hydraulic efficient Low Shear multistage centrifugal pumps for produced water and other petroleum applications.



User benefits:

- Energy efficient produced water treatment and increased capability to handle process upsets and variations in produced water quality.
- Cleaner produced water and reduced oil and chemical discharges to the sea.
- Increased reliability, reduced maintenance and increased lifetime compared to positive displacement pumps.
- No noise protection enclosures and no pressure relief valve systems (normally required for positive displacement pumps).
- Smaller and lighter than eccentric screw pumps.
- High hydraulic efficiency.

Type designation:	Low Shear multistage centrifugal pump
Typhonix Model:	HZAR - Low Shear
Capabilities:	25 - 400 m ³ /h 3 - 20 bar
Specification:	API STD 610
In preference to:	Progressive cavity pumps - Eccentric screw - Twin screw - Lobe - Piston Single-stage centrifugal pumps
Typical application:	- Produced water - Drain/Slop water - Reject streams - Other mixed flow process streams

Comparison of produced water pumps:

Features	Single-stage centrifugal pumps	Eccentric screw pumps	Low Shear centrifugal pumps	Comments (below)
Low shear	☆ ☆ ☆	★ ★ ★	★ ★ ★	a*
Lifetime (MTBF)	★ ★ ☆	★ ☆ ☆	★ ★ ★	b*
Maintenance	★ ★ ★	★ ☆ ☆	★ ★ ★	c*
Vibration	★ ★ ☆	★ ☆ ☆	★ ★ ★	d*
Noise	★ ★ ☆	★ ☆ ☆	★ ★ ★	e*
Erosion resistance	★ ★ ☆	★ ☆ ☆	★ ★ ★	f*
Efficiency	★ ☆ ☆	★ ★ ★	★ ★ ★	g*
Operating range	★ ☆ ☆	★ ★ ★	★ ★ ☆	h*
System complexity	★ ★ ★	★ ☆ ☆	★ ★ ★	i*
Size and weight	★ ★ ★	★ ☆ ☆	★ ★ ☆	j*

Comments:

- a*: New, eccentric screw pumps have a low shear effect. During operation in produced water applications, however, the internal slip flow of the pumps gradually increases due to wear. Therefore, after some time (e.g. 1000 hours) the eccentric screw pumps have reduced low shear performance. In comparison, the droplet shearing performance of the Low Shear pumps does not change with operational time.
- b*: Like single-stage centrifugal pumps, the multistage Low Shear pumps complies with API 610 and have guaranteed service life of twenty years. Generally, the Low Shear pumps are high pressure multistage pumps operating at maximum 1200 rpm, while bearings etc. are sized for 1750 rpm. In addition, forces on shaft are only 1/3 of the normal.
- c*: According to API 610, the Low Shear pumps guarantee two years on uninterrupted service. Generally, the Low Shear pumps have low maintenance requirements in comparison with eccentric screw pumps, which require stator replacements and yearly service on gear boxes.
- d*: With Low Shear pumps the flow velocities and rpm are low, resulting in low vibration compared to both single-stage centrifugal pumps and eccentric screw pumps.
- e*: With Low Shear pumps the flow velocities and rpm are low, resulting in low noise (about 60 dBA). In comparison, eccentric screw pumps use noisy gear boxes and often require sound enclosures.
- f*: None of the pumps handle large amounts of sand or solid particles without wear. At normal particle content, however, the Low Shear pumps are more erosion resistant than the single stage pumps due to 1) low impeller speed, 2) low differential pressure across wear rings and 3) low flow velocities in impellers, diffusers and back vanes. Eccentric screw pumps have significant erosion when solids are present in produced water applications.
- g*: New, the eccentric screw pumps have high hydraulic efficiency. During operation in produced water applications, however, the efficiency is often reduced due to stator/rotor wear. At pump heads below 50-60 m the Low Shear centrifugal pumps and the single-stage centrifugal pumps have similar efficiency. When pump head increases, the Low Shear pumps have higher efficiency than the single-stage.
- h*: Due to the hydraulic features and pump curve shape, the Low Shear pumps have a larger operational window (higher turndown) than the single-stage pumps. This favours the use of variable speed drive (VSD). Eccentric screw pumps are normally operated with VSD.
- i*: Centrifugal pumps simplify installation by not requiring the relief valve systems associated with eccentric screw pumps. Further drawbacks of relief valve systems are yearly services, additional piping and occasional requirement for heat tracing.
- j*: Low Shear multistage centrifugal pumps are larger and heavier than single-stage centrifugal pumps, but smaller and lighter than eccentric screw pumps.