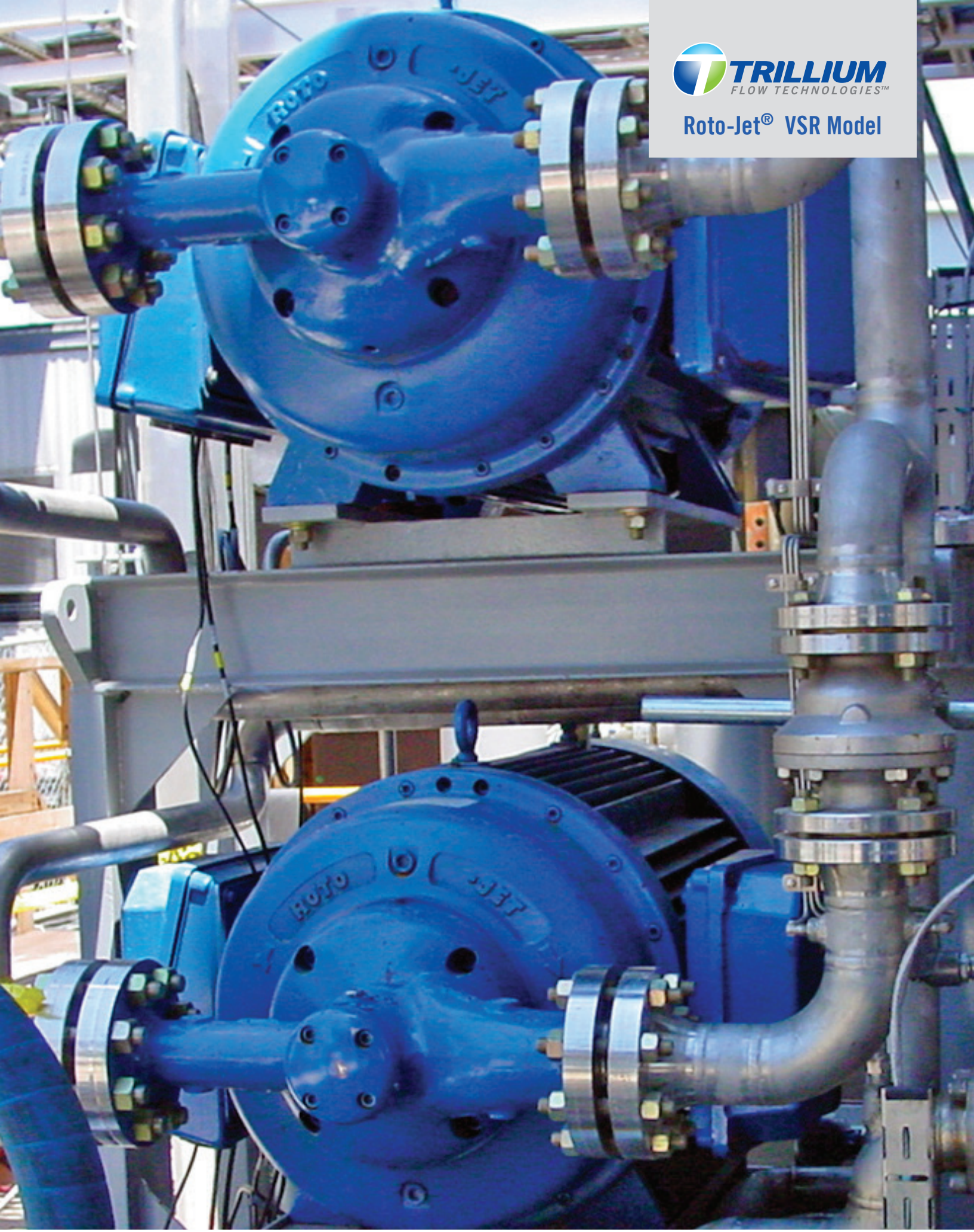


TRILLIUM
FLOW TECHNOLOGIES™

Roto-Jet® VSR Model

Roto-Jet® VSR Pump

The Roto-Jet VSR pump combines the improved energy-efficient, patented hydraulics of existing Roto-Jet pumps with a switched reluctance® motor and controller to create a revolutionary high-pressure pump system. It operates with improved reliability at variable speeds without a gearbox, while reducing maintenance requirements. Additionally, the integrated approach reduces the number of bearings and eliminates all couplings and therefore the need for field alignment. The resulting system is almost one third the size of the standard pump drive-motor package.

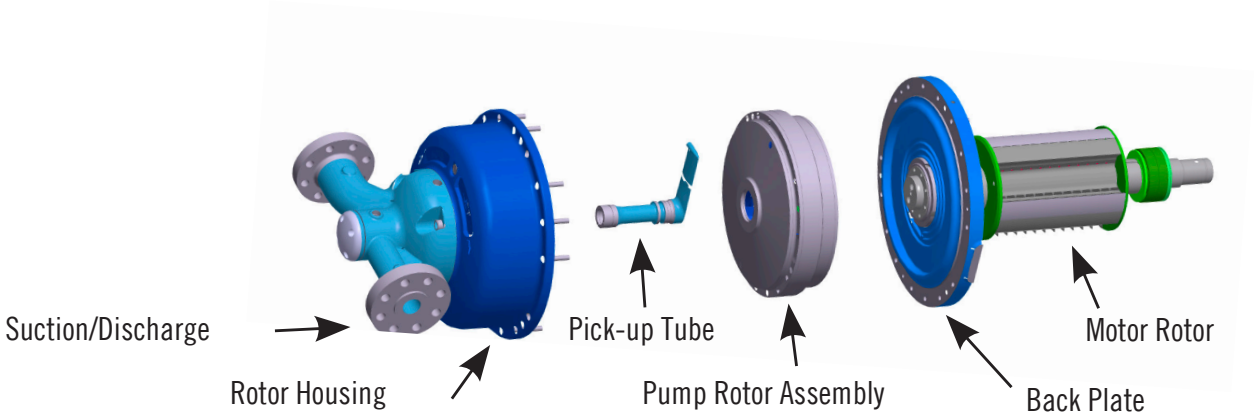
How does the VSR pump provide significant improvements in performance and efficiency?

Being a variable speed system, the operator selects the operating point of the pump to precisely match the process.

The operating point can be selected during installation or at any time in the future when operating requirements change. Also, an infinite number of stops/starts allow the pump to be shut down for any amount of time, which saves energy.

Furthermore, the VSR operates on 50 or 60 cycle voltages, eliminating transformers or the need to rewire the motor. Intelligence within the drive senses the torque provided by the motor and in conjunction with pressure information provides protection against excessive flow conditions. The drive can also detect potential cavitation conditions during run-up and adjusts the rate of speed increase accordingly.

This new single-shaft unit provides automatic pump control, reduces energy costs, and is simple to install and easy to maintain.

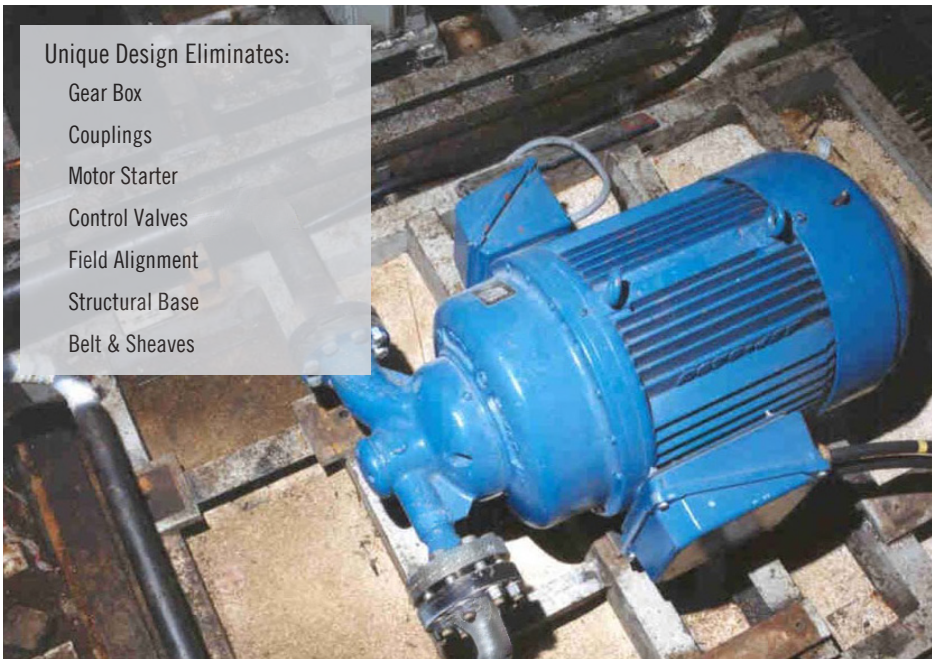


Benefits of the Roto-Jet VSR Pump

- Single-stage pump design provides a wide range of flow and pressure characteristics
- Mechanical integration of direct drive motor eliminates the gearbox and coupling arrangement while also reducing the product footprint
- Redeveloped hydraulic design yields pump efficiencies of up to 68%
- Universal voltage supply 380V – 460V 50/60Hz permits worldwide operation
- No cooling water required for motor or controller
- Single footprint eliminates the uncertainty of coupling mis-alignment
- Meets European CE standards for electromagnetic compatibility and electrical safety
- UL and ATEX approval

Roto-Jet VSR Pump Features

- Variable speed without using variable frequency
- Infinite number of stops and starts
- Operates on 50 or 60 cycle input
- High pressure from a single stage pump
- Space saving design – 60% reduction in length
- Automated control
- Industry leading efficiencies
- High pressure without high speed

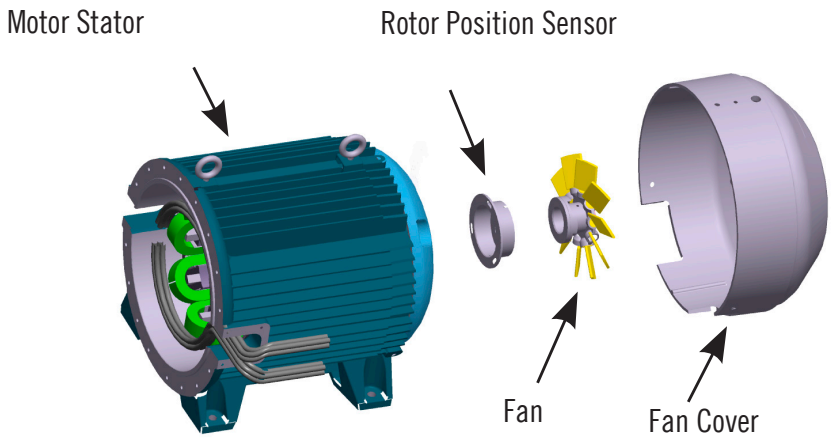


Switched Reluctance® Motor

Switched Reluctance Drives are high-performance variable-speed drive systems and enhance the number of benefits to the VSR product range. Switched Reluctance Drives is a "system" that encompasses both a motor and a power converter. The power converter changes the incoming electrical supply to a steady DC (direct current) voltage, which is then simply switched across alternate sets of coils in the motor to produce rotation.

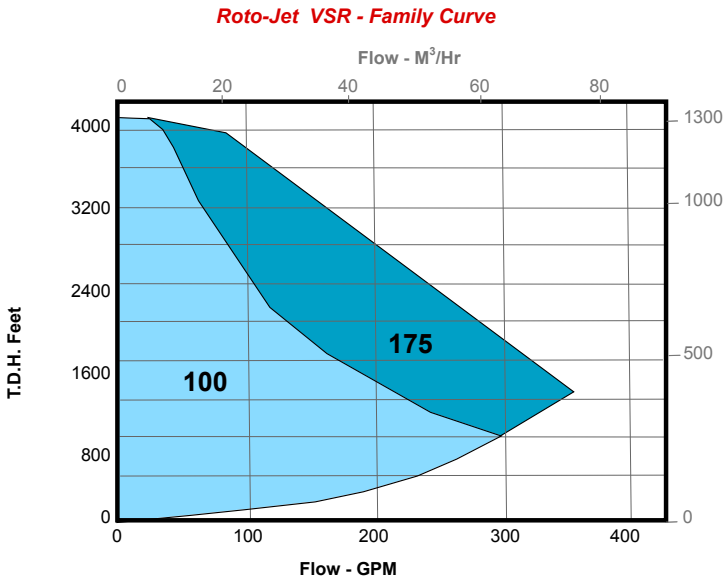
The simple and robust construction of Switched Reluctance Drive motors offers high-performance in a compact package.

- The rotor is extremely robust and reliable, consisting only of a stack of electrical steel laminations mounted directly onto the motor shaft.
- There are no electrical conductors on the rotor at all. Indeed, many of the least reliable parts of other motor technologies (brushes, commutators, and rotor-bars) are simply not present in the SR Drive motor.
- The absence of any electrical conductors on the rotor means that, unlike conventional AC motors which have conductors, there are minimal electrical losses on the SR Drive rotor. This contributes to the high operating efficiency of the system and minimizes rotor heating, a factor that limits the starting ability and bearing/lubricant lifetimes in conventional machines.
- The stator coils have a very short end-turn area which makes for a very compact stator. Since the torque produced by a motor is broadly proportional to the volume of the stator core, these short end-turns allow optimum use to be made of the space envelope available for the whole motor.
- The coils within the motor are independently wound, (i.e. they are wound one at a time prior to being inserted into the stator). Conventional electrical motors use bulkier "distributed" windings which must be wound all at the same time. The SR Drive's independently wound coils avoid the vulnerable phase-overlap area present in conventional motors.
- The electrical and electromagnetic losses in the SR Drive motor are concentrated in the stator and not distributed between rotor and stator as they are in conventional machines. This is an advantage because the stator is in direct thermal contact with the motor frame where the losses are easily dissipated as heat to the surrounding air.



Roto-Jet VSR Pump Performance Capabilities

Max Flow	275 gpm	62 m³/hr
Max Head	4000 ft	1200 m
Max Suction Pressure	50-200 psi	3.5-14 bar
Max Suction Temperature	180° F	82° C
Max Suction Temperature w/Flush	250° F	121° C
Max Speed	5400 rpm	



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Roto-Jet VSR Pump Brochure
Version 3, October 2019