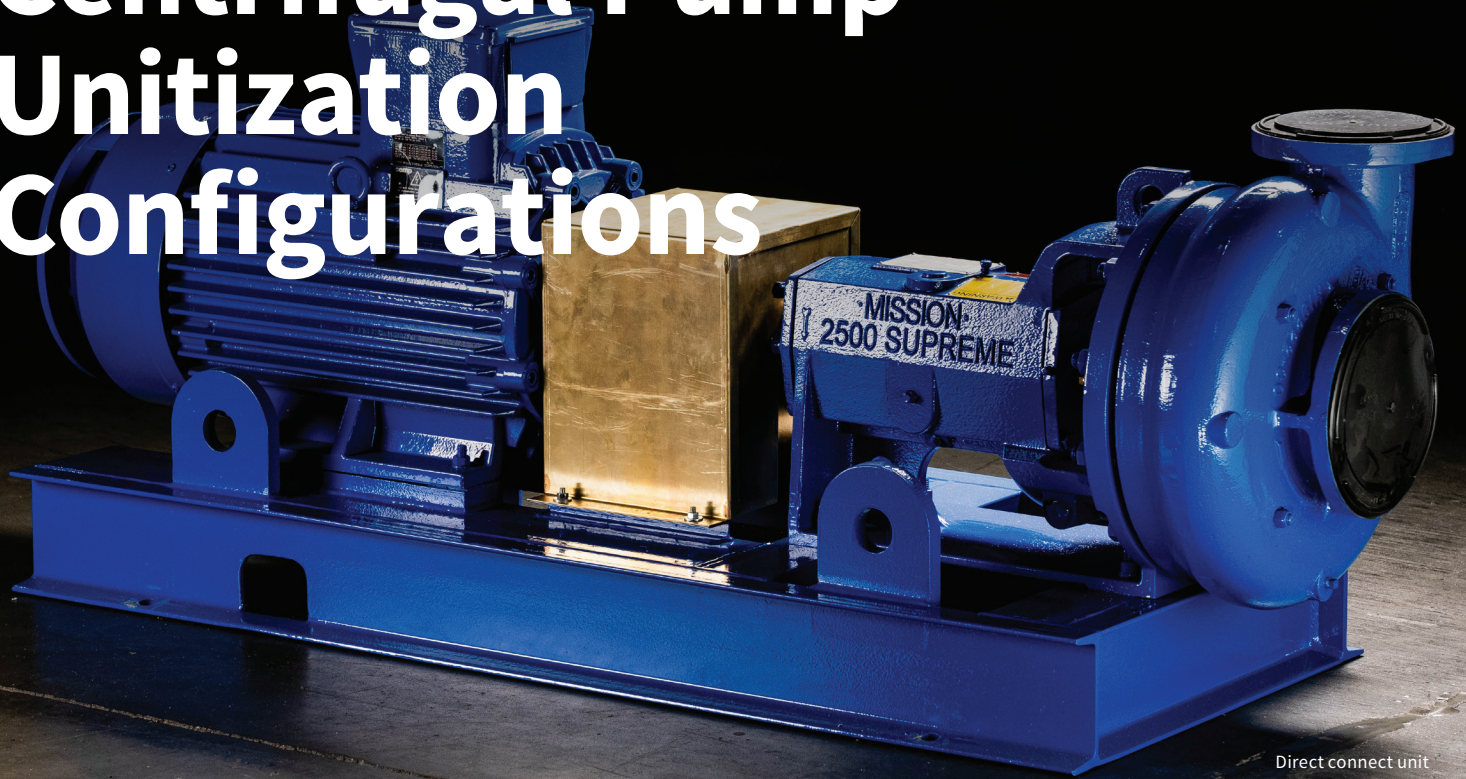


Centrifugal Pump Unitization Configurations



Direct connect unit

National Oilwell Varco provides a wide range of unitization services for centrifugal pumps. Centrifugal pumps can be configured with electric motors or diesel engines. Unitization services are offered as direct connect, belt driven or close coupled and can be designed for mounting in a horizontal or vertical position. All National Oilwell Varco bases feature milled mounting holes with through bolts rather than drilling and tapping into the base. Shown are standard configurations; however, custom design and unitization services are available.

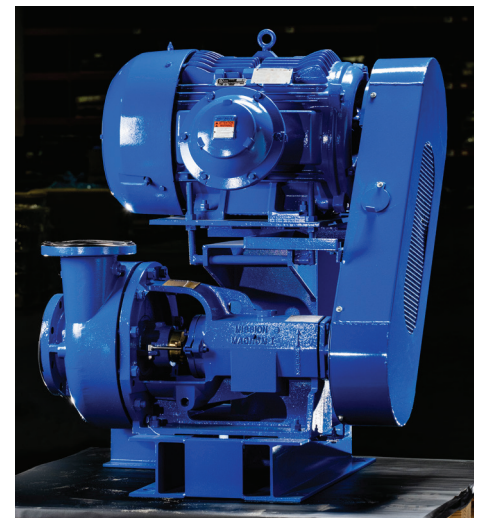
The most common unit is an electric driven, direct connected horizontal design. These units have steel oilfield bases designed to achieve proper pump and motor alignment with minimal shimming required. The units are equipped with sturdy coupling guards mounted on risers. Bases are primed prior to top coat. Pump, motor, and base is assembled and a top coat is applied.

Diesel driven units are available and are often utilized for fire fighting systems or where power availability is an issue.

Optional features available are the same as electric driven units and, in addition, these units can be mounted on dual axle trailers. Intrinsically safe engines with air starters are available for hazardous locations.

Belt driven units allow the pump to be sized with the maximum impeller size. A larger impeller size allows the pump to be operated at the lowest possible speed that meets the operating requirements. Lower speed results in less wear and lower maintenance costs. Pump speed can be altered by changing sheave size. This is very useful when piping changes or a sizing error has occurred. By changing the sheaves the pump can produce more or less pressure head to meet the needs of the application. The most common configuration is a top mount belt driven

unit. This unit offers the benefit of a much-reduced footprint that conserves valuable floor space. The National Oilwell Varco top mount design also allows the pump body to be removed for service without disconnecting the casing from the suction and discharge piping.

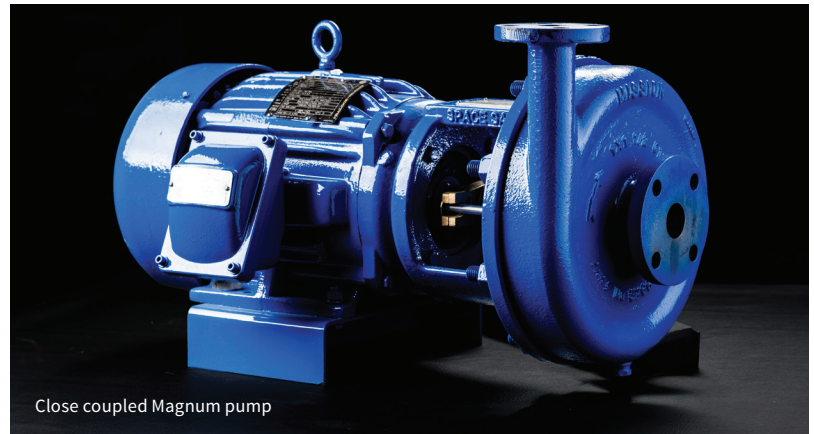


Top mount belt drive

Centrifugal Pump Unitization Configurations

Electric driven vertical units are available for applications where deck space is a premium. These units utilize standard p-base motors and the impeller bolts directly to the motor shaft. This eliminates the coupling and alignment issues.

The close coupled Magnum and close coupled 2500 Supreme are the latest design. This configuration requires the least amount of cubical space. These also utilize p-base motors eliminating coupling and alignment issues. The view at bottom, lower right, shows the close coupled design together with the standard direct connect configuration.



Optional features

- Companion flanges
- Custom paint colors
- Documentation booklets
- Expansion joints
- Galvanized base and guard
- Lifting bails and/or headache racks
- Non-sparking coupling guards
- Performance testing
- Seal welding
- Starter wiring
- Starters mounted on base
- Three-part paint system

Diesel unit standard equipment

- Alternator
- Ammeter
- Battery
- Break over ends
- Clutch PTO
- Electric start
- Fuel tank
- High temp/low oil safety shutdown
- Muffler with rain cap
- Oil pressure gauge
- Tach/hour meter
- Temperature gauge

Standard unitization

Horizontal

- Electric motor direct drive
- Electric motor belt drive
- Multi-cylinder direct drive
- Multi-cylinder belt drive
- Close coupled electric motor drive

Vertical

- Electric motor direct drive

Top mount

- Electric motor belt drive

Custom configurations

Available