Variable Speed Transmissions

for High Speed and/or High Power Applications

fans ♦ pumps ♦ compressors ♦ blowers

Minimize

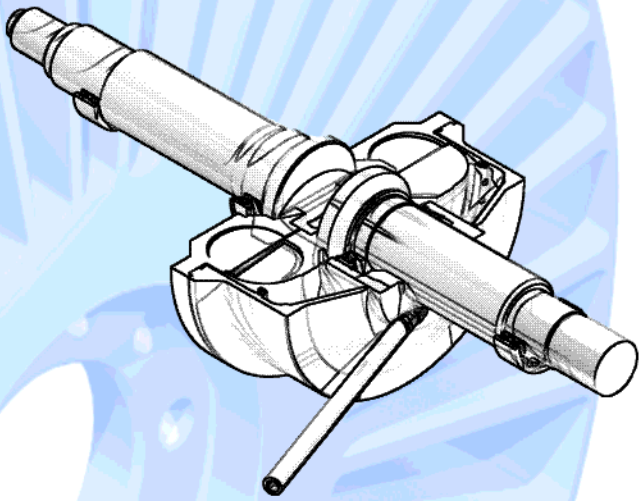
Capital costs
Operating costs
Downtime
Maintenance
Vibration
Starting torque
Motor size
Noise

Improve

Reliability
Efficiency
Turndown
Process control
Stepless speed changes
Space requirements
Start-up / warm-up

Replace

Steam turbines
Flow control valves
Louvers/Inlet guide vanes
Pressure reducing valves
Expensive VFDs
Hot or radioactive piping



TRI Catalog: Model FH/FV Geared Fluid Drives

Power to 40,000 HP (30 MW) ♦ Output Speeds to 15,000 RPM
Suitable for API rated applications

Transmission & Bearing Corp.
A Division of Turbo Research, Inc.

Tel: 800-363-8571 or 610-363-8570 Fax: 610-524-6326 E-mail: sales@turboresearch.com www.turboresearch.com

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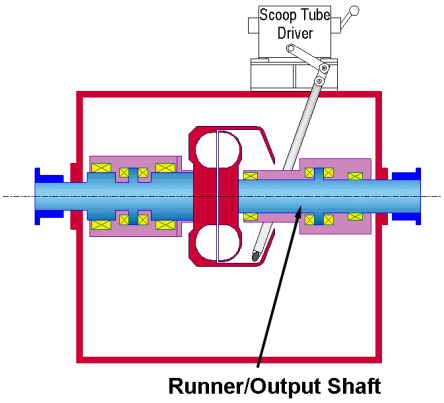
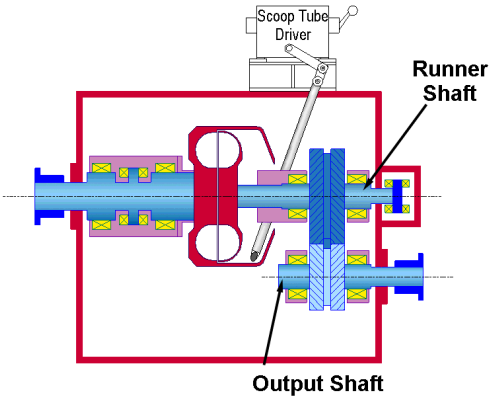
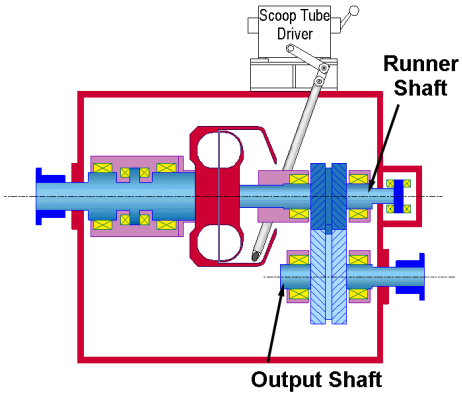
Model FH/FV Fluid Drives Arrangements



Model FH-1
Direct Drive



Model FH-2
Speed Increaser



Model FH-3
Speed Decreaser

■ Speed increasing or speed reducing gear ratios of 6 to 1 accomplished in a single pinion/gear assembly.

■ Stable bearing designs, either elliptical, pressure dam, or tilting pad are available.

■ For maximum reliability and a minimal physical size, external oil reservoirs, pumps, and conditioning systems are preferred. TRI patent 5,315,825 covers certain oil system features. (internal pumps are available upon request)

■ Overload protection is accomplished by temperature switches and active controls to provide rapid alarm, tripping, and restart capability without maintenance on the fluid drive.

■ A range of temperature and vibration instrumentation is available, selected and installed to suit customer's requirements.

■ For high power and high turndown speed ratio conditions, heavy duty TRI impeller and runners are used. These indefinite life impellers are manufactured via a CNC process from alloy steel forgings per TRI patent 5,311,811. They feature a monolithic integral reinforcing ring between the vanes.

■ Speed turndown ratios of 5 to 1 are typical.

■ For ultra high speed applications, a second gear set is used on the input side. Efficiency is reduced by 1.8%.

TRI Fluid Drives are the most efficient and simplest designs available today for providing variable speed power. TRI will design and optimize each unit to meet the specific needs of the application.

Testing Per API

The TRI Geared Fluid Drived can be tested to full speed or partial load conditions in the LUFKIN Test Facility. Complete test records to meet API requirements are available.

High Performance/API Gearing

LUFKIN gearing is incorporated into TRI fluid drives. LUFKIN specializes in high speed, high performance gearing via state-of-the-art technology. LUFKIN's extensive application list includes over 800 API rated installations.

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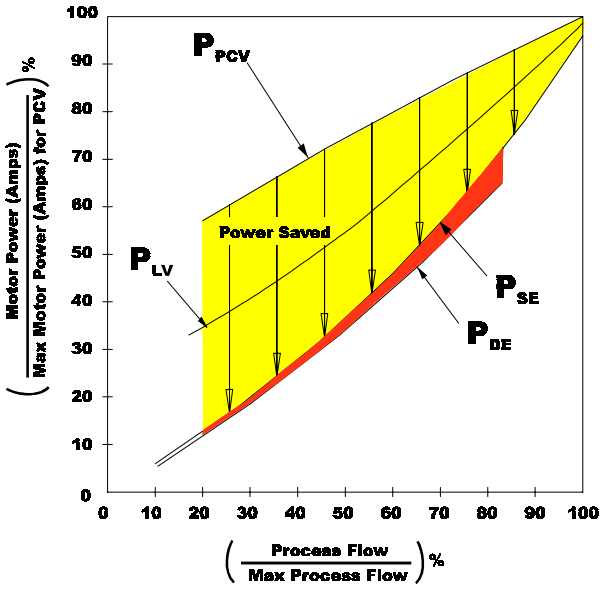
Variable Speed Fluid Drives Improve Power Efficiency

Comparison of electrical power consumed by induction motors driving the same fan/pump/compressor with and without a variable speed fluid drive.



P_{PCV}: Electric power to a motor, flow controlled by a discharge flow control valve

P_{LV}: Electric power to a motor, flow controlled by louvers or inlet guide vanes

P_{SE}: Electric power to a motor, flow controlled by a TRI single element (standard) fluid drive transmission

P_{DE}: Electric power to a motor, flow controlled by a TRI dual element (high efficiency) fluid drive transmission

↓ Power saved using a single element fluid drive

Additional power saved using a dual element fluid drive

Example 1. A standard motor is directly coupled to a pump, both rotating together at constant speed. A discharge pressure control valve (PCV) is used to control downstream pressure or flow. In this case, substantial power is consumed by throttling losses of the flow through the PCV.

Example 2. A standard motor is driving a fluid drive transmission, which drives the pump from Example 1 at variable speed with ***no*** discharge PCV. Varying the speed of the pump varies the downstream pressure/flow. In this case, because there is no PCV, there are no throttling losses.

Clearly, the electrical power consumed by the motor for the pump with PCV is much higher than when a fluid drive transmission is used. There are some losses in the fluid drive transmission, but these are small compared to the throttling losses across a discharge pressure control valve.

The difference between the two power consumption lines represents the power saved by using a fluid drive transmission – typically above 30% of the motor nameplate rating. Additional savings result from the use of a smaller motor.

TRI offers high-efficiency fluid drive transmissions that reduce the power consumed over most of the operating range. As shown here, the high efficiency point occurs at 83% of the maximum flow, which is the normal operating point for the process represented here.

TRI's application base includes over 400,000 hp of installed variable speed fluid drives with fleet reliability in excess of 99.5%

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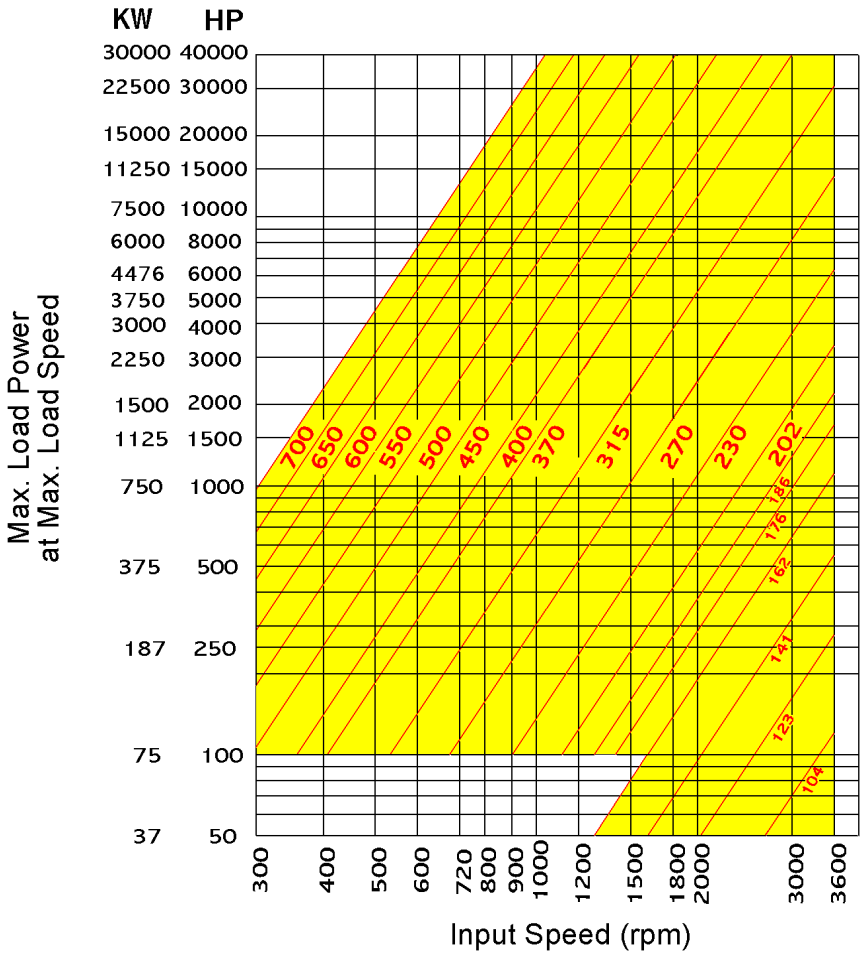
Sizing Chart - Standard Model FH/FV Fluid Drives



Sizing Example: A fan is to be driven initially at 1000 hp and 1400 rpm. After an expansion of the plant, the fans normal operating point will be 1800 hp and 1700 rpm. Select a standard size 315 fluid drive and a standard size induction motor: 2000 HP, 1800 rpm.

The sizing chart is to be used as a guide in selecting the proper size fluid drive transmission. To optimize the efficiency and installation spacing, fluid drive sizes other than those shown can be manufactured and supplied by TRI.

Contact TRI for final selection of fluid drive transmissions, motors, oil systems, and load equipment.

TRI Packaged Equipment Trains

TRI supplies packaged equipment trains including the drive motor, a TRI variable speed fluid drive transmission, load equipment (pump, fan, blower, compressor), and couplings. TRI builds basic or full API rated oil systems to suit the applications. TRI provides system design, manufacturing, assembly, testing and installation supervision.

More...

TRI offers engineering services and many styles of bearings and fluid drives. For additional catalogs please contact TRI

Engineering Services and Products for Large Rotating Machinery
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