Duplex, Double-Acting Piston Pumps
**Increase Oil Production**
- Reduce Back Pressure on Formation to Increase Inflow into the Wellbore
- Rod Pumping Systems
- PC Pumping Systems
- Flowing Wells
- Submersible Pumps

**New Pool Tie-Ins**
- **New Battery vs. Multiphase Pumping (MP)**
  - Lower Cost for MP
  - MP Environmentally Friendly (No Flaring)
  - MP Moves Water To a Central Facility, Reducing The Number of Water Disposal Wells
  - Water Injection Issue

**Battery Consolidation**
- Reduces Operating Costs
- MP Environmentally Friendly
- May Be Economical When Facility Upgrades Required
- Tank or Vessel Replacement
- Disposal Well Problems
- Pump or Compressor Repairs Required

**Multiphase Pumping vs. Line Looping**
- MP May Be Less Expensive Than Line Looping
- Line Looping Does Not Consume Power
- MP May Reduce Pressure Lower Than Line Looping
- MP May Be Moved

**Eliminate Hydrates**
- Reducing Flowline Pressures May Lower Operating Costs, Including Costs Associated with Hydrate Formation
**Multiphase Transfer Pumps**

*Rotating Right’s* multiphase transfer pump (MTP) is a duplex, double-acting piston pump that is capable of handling up to 250,000 BOEPD of water, oil and gas mixtures. Our pump can handle up to 99.5% Gas Volume Fraction (GVF) continuously, and up to 100% gas on an intermittent basis. This pump can be designed up to 700 PSI differential pressure and up to 1,440 PSIG working pressure. With our design, the pump operates at a very low speed (less than 15 RPM) and can handle solids, high temperatures and high amounts of H2S. Our housing, pistons and liners can be made from a variety of materials to suit your pumping application. Our shaft sealing is a very simple design that is used on thousands of critical wells throughout the world.

*Rotating Right’s* employees have over 25 years of experience in the design, manufacturing and installation of multiphase piston pumps and systems. We have the engineering, design and drafting experience and capability to build complete turnkey housed and piped, multiphase pump packages.

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**Multiphase Transfer Pump History:**

- 1987 – Original concept developed
- 1988 – Prototype tested in Steelman, Saskatchewan
- 1989 – MTP built for Rainbow Lake
- 1991 – Patent granted for MTP pump design
- 2005 – Duplex pump design developed
- 2008 – Rotating Right obtains licence from IOR
- 2008 – First Duplex MTP built and tested
The Rotating Right MultiPhase Transfer Pump (MTP) is designed for high gas volume fraction (GVF) wells, by trapping liquid in the pump at the end of the stroke (see Figure 1) to reduce the gas expansion and maintain a seal between the piston and liner. During the stroke, the fluid enters the pump through a suction valve (see Figure 2) in one pumping chamber and is discharged through the discharge valve in the opposite pumping chamber. Gas is discharged from the pump prior to the liquid.

At the end of the stroke (see figure 1) the gas has been displaced from the pump leaving liquid in the pump chamber. With very little gas remaining in the pump, high volumetric efficiencies can be maintained, even at high GVFs.

The Rotating Right MultiPhase Transfer Pump (MTP) is especially suited for high temperatures and high gas fraction applications.
Rotating Right MTP Sizing Example

Oil Rate: 50 M3/DAY
Water Rate: 50 M3/DAY
Gas Rate: 15,000 M3/DAY
Desired Inlet Pressure: 50 PSIG
Discharge Pressure: 350 PSIG

In the Graph above, the curved line is the production curve for a particular pump; in this case a pump with a 9" OD pistion, pumping a given O / W / G fluid combination at a given pressure and temperature. We wish to determine the equivalent inlet flow rate, the pump speed and the power required to pump the fluid of 100% liquid, at the same temperature.

Selection Procedure:
1) From the right vertical axis select your inlet pressure, trace a horizontal line to where it intersects the curved line.
2) From that intersection, trace a vertical line down to the horizontal axis.
3) Where the vertical line intersects the horizontal axis indicates the equivalent inlet flow rate.
4) Follow that vertical line back up to where it intersects any of the differential pressure lines (the diagonal lines rising from the bottom left corner.)
5) From that intersection point, trace a horizontal line to the left axis.
6) Where that horizontal line intersects the left axis indicates the power required.

So, in the example above, given a suction pressure of 50 PSI, and a differential pressure of 300 PSI, the pump will require 140 HP to pump an equivalent flow rate of 3600 M3/DAY of 100% liquid fluid.
Rotating Right is proud to be ISO 9001-2000 Certified, this Quality Management System ensures you will receive top quality service, exceptional workmanship and all required documentation for every pump or system we offer.

We have procedures in place from your initial contact with us through to after sales service that is second to none.

We pride ourselves on providing quotations and documentation in a timely and professional manner with the technical expertise our customers have come to rely on.
Combined Gas Laws (Boyle’s, Charle’s and Gay-Lussac's)

\[ \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}, \text{ Where:} \]

- \( T_1 \) = Standard Temperature (460 Rankine When Using F Scale and 273 Kelvin When Using C Scale)
- \( T_2 \) = Actual Gas Temperature = \((460 + F)\) Rankine or \((273 + C)\) Kelvin
- \( P_1 \) = Atmospheric Pressure 14.7 PSI or 101 kPa
- \( P_2 \) = Inlet Gauge Pressure + Atmospheric (PSI or kPa)
- \( V_1 \) = Gas Volume at Standard Pressure and Temperature (14.7 PSI and 460 Rankine or 101 kPa and 273 Kelvin)
- \( V_2 \) = Gas Volume at \( P_2 \) Pressure and \( T_2 \) Temperature

**To Determine \( V_2 \):**

Insert Client-Supplied Information to Solve Equation

**Metric:**

\[ V_2 = 10000 \times 101 \times 273 = 790.6 \text{ M3/DAY} \times (1050 + 101) \times (273 + 30) \]

**US:**

\[ V_2 = 356617 \times 14.7 \times 460 = 26816 \text{ Actual Cubic Feet/Day} \times (150 + 14.7) \times (460 + 86) \]

Add All Components Together to Arrive at the Total Volume the Pump Must Handle.

**Technical Formulas**

- \( \text{M3/DAY} = \text{GPM} \times 0.18345 \)
- \( \text{KPA} = \text{PSI} \div 0.145 \)
- \( \text{HP} = \text{KW} \times 0.746 \)
- \( \text{INCHES} = \text{MM} \times 25.4 \)
- \( \text{USGPM} = \text{FT3/DAY} \times 0.0052 \)

- \( \text{BPD} = \text{M3/DAY} \times 6.2897 \)
- \( \text{PSI} = \text{Feet of Head} \times 2.307 \times \text{SG} \)
- \( \text{M3} = \text{FT3} \times 35.315 \)
- \( \text{BAR} = \text{PSI} \times 14.5 \)
- \( \text{USGPM} = \text{BPD} \times 0.0292 \)
USER ADVANTAGES

- Simplex and Duplex Pump Designs
- 99.5% GVF Continuous up to 100%
- Differential Pressures to 700 PSIG
- Up to 1,440 PSIG Working Pressure
- Variety of Materials of Construction
- Sizes to 250,000 BOEPD
- Slow Speeds
- High Temperature Capability

Turnkey Solutions

Rotating Right employees have over 25 years of experience in the design, manufacturing and installation of multiphase transfer pumps. We have the engineering, design and drafting experience and capability to build complete turnkey housed and piped multiphase pump packages.