OUR PRODUCTS

Liquid Ring Vacuum Pumps:
- 3 CFM to 10,000 CFM

Liquid Ring Compressors:
- up to 110 psig

Heat Transfer Pumps:
- for hot thermal oils
- up to 600°F (320°C)

Systems:
- Package Vacuum Systems with Partial or Total Recirculation
- Customer Engineered Vacuum Solutions

For additional information, please call for a free brochure.

200 Newsome Drive
Yorktown, VA 23692
Tel: 800-335-4243
757-988-3930
Fax: 757-988-3975
www.travaini.com
Travaini Pumps, USA is one of the leading worldwide manufacturers of liquid ring vacuum pumps with single stage (TRS), two stage (TRH), and single stage variported (TRM/TRV) designs. With the experience developed over decades of engineering research, continual in the latest technologically advanced machinery, and sound mechanical know-how, Travaini Pumps’ product is synonymous with high quality, high efficiency, robust construction and maximum reliability.

APPLICATIONS
• CENTRAL VACUUM SYSTEMS
• DEAERATION
• IMPREGNATION
• BOILING PROCESSES
• VACUUM CONDENSING
• DISTILLATION
• DRYING SYSTEMS
• STERILIZATION
• FUSION
• SOIL RECOVERY
• VACUUM HOLD DOWN
• SOIL REMEDIATION

LIQUID HANDLING CAPABILITY
Pumps are capable of handling high volumes of vapors, condensables and liquids, without detrimental consequences to their performance or their mechanical reliability. Pump service liquid can be water or other liquids such as oils, solvents, etc. to satisfy almost any process requirements.

DISCHARGE OIL FREE AIR
With clean water as pump service liquid, the aspirated air (or gas) is “washed clean” within the pump. Contrary to other types of vacuum pumps the discharged air can be completely free of any oils, carbon or plastic particles.

MOUNTING TO NEMA MOTORS
Travaini Pumps standard design may be base-mounted coupled to standard NEMA Motors. Pumps up to 40 HP can be close coupled to C or D flanged NEMA Motors utilizing specially designed attachment flanges. This close-coupled arrangement allows utilization of standard readily available electric motors, eliminates lengthy alignment procedures and costly breakdowns associated with misalignments. Overall dimensions are reduced and engineered baseplates are no longer required.

PRESSURE TO LESS THAN 25 TORR
Liquid ring vacuum pumps, type TRH/TRM/TRV in series with devices such as ejector and/or vacuum boosters can operate at pressures lower than 1 Torr.

FEATURES

QUALITY
Designed and manufactured utilizing ISO 9001 standards, every component is guaranteed for the selected materials, workmanship and performance through scrupulous inspections during production and final testing of finished product.

FEWER COMPONENTS
Through engineered innovations and co-operation with technologically advanced foundries, the pumps are manufactured with less components than typically required. Fewer parts add to the rigidity and toughness of the pumps, they are easier to assemble and maintenance is greatly facilitated.

COMPACT DIMENSIONS
The conventional stuffing boxes construction is eliminated with the Travaini Pumps’ standard design. The shaft length is greatly reduced thus eliminating the potential danger for shaft deflections and vibrations to the mechanical seals which would increase seals and bearing wear.

STANDARD MECHANICAL SEALS
In keeping pace with today’s technology, Travaini Pumps has standardized all pumps to accept unified mechanical seals to DIN 24960 standards. Also available upon request, are constructions with double mechanical seals (tandem or back to back) or cartridge type mechanical seals.

LARGE SELECTION OF MATERIALS
In addition to the standard materials, Travaini Pumps are also available with special materials such as Ni-Resist D2B, Hastelloy B or C, Uranus B6, etc. to meet specific applications.

MECHANICAL RELIABILITY
With the simple design of liquid ring pumps there are no reciprocating parts, no valves or sliding vanes. The impeller is the only rotating component with no metal-to-metal contact. Pump operation has minimal wear, vibration free and noise levels are reduced.
TYPICAL CROSS SECTION OF A TWO STAGE VACUUM PUMP WITH MECHANICAL SEAL

PRINCIPLE OF OPERATION
Gas entering via the suction port is conveyed into the impeller casing AB and trapped in the space between two impeller blades. As the impeller rotates eccentrically to the liquid ring and casing - the volume between the blades increases creating vacuum. As the cycle progresses towards the discharge port the volume decreases as the liquid ring creates compression. This compression continues until the gas is discharged through the discharge port CD. A small amount of seal liquid is discharged with the gas and it is necessary to supply make-up continuously. This makeup liquid also maintains the liquid ring and absorbs the heat energy of compression.

I = Suction phase       II = Compression phase

PARTIAL RECIRCULATION

1. Separator tank
2. Check (non-return) valve
3. Isolating valve
4. Vacuum pump
5. Solenoid valve
6. Electric motor
7. Level indicator
8. Flow control
9. Cooler
10. Solenoid valve for makeup liquid
11. Drain valve
12. Overflow
13. Regulating valve
14. Compound gauge
15. Low level switch
16. Strainer

Pump series TRS close-coupled coupled construction.
When handling saturated air and/or using service liquid with temperature other than 15°C (59°F) the capacity will change substantially (see diagrams on page 16).
The vacuum pumps can operate as compressors at a pressure 2.5 psi maximum higher than standard atmospheric pressure. For working performances contact our Sales Office.

Series: TRV and TRM
Data refers to:
Discharge pressure: Series TRV, TRM 29.2" Hg - 760 Torr
Service liquid: water at 60°F
Specific gravity: 1 kg/dm3
Viscosity: 32 SSSU
Minimum suction pressure: 25 Torr

Inches Hg
mbar
Torr

Vacuum [mbbl]

ACFM INLET DRY AIR CAPACITY

TRH

TRR

TRS

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Specific gravity: 1 kg/dm3
Viscosity: 32 SSSU
Minimum suction pressure: 25 Torr

Inches Hg
mbar
Torr

Vacuum [mbbl]
<table>
<thead>
<tr>
<th>Pump Type</th>
<th>Size</th>
<th>Motor Power</th>
<th>RPM</th>
<th>ACFM</th>
<th>BHP</th>
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<td>1720</td>
<td>1815</td>
<td>1690</td>
<td>1815</td>
<td>1660</td>
</tr>
</tbody>
</table>

The data represents average values for pumps in standard and all iron materials of construction (GH, RZ, F), discharging against atmospheric pressure at sea level (760 Torr). All stainless steel (A3) pumps have 10% less capacity. Capacity in ACFM subject to 10% tolerance handling dry air at 20°C (68°F) and using 15°C (59°F) water as service liquid. When handling 100% saturated air capacity increases substantially (see diagrams on page 16). Break horse power refers to water at 15°C (59°F), used as service liquid and tolerance 10%. For detailed information pls consult the specific performance curves of the requested pump.
### PERFORMANCE OF PUMPS SERIES TRM-TRV

<table>
<thead>
<tr>
<th>Vacuum °Hg</th>
<th>PSHA</th>
<th>12.7</th>
<th>8.7</th>
<th>4.8</th>
<th>2.9</th>
<th>1.5</th>
<th>0.75</th>
<th>0.40</th>
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<tr>
<td>Torr</td>
<td>600</td>
<td>480</td>
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<td>150</td>
<td>80</td>
<td>40</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

The following diagrams allow to make corrections to the published data when using service water at various temperatures and service water temperatures other than 25°C (77°F).

### TECHNICAL INFORMATION

The performance data published for vacuum pumps is based on handling dry air at 20°C (68°F). When handling mixtures of air and water the pump capacity will increase depending on the air/water temperature as well as the service water temperature being used. These diagrams will allow the user to determine the condensing factors when handling saturated air at various temperatures and using service water at 15°C (59°F) or 25°C (77°F).

**Example of two stage vacuum pump that operates at 60 Torr with 40°C (104°F) saturated air and 25°C (77°F) service water temperature.**

<table>
<thead>
<tr>
<th>Qty</th>
<th>Q/B where Qty is the requested capacity and 0.8 the value obtained from diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.25</td>
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<tr>
<td>2</td>
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<tr>
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<tr>
<td>12</td>
<td>13.5</td>
</tr>
<tr>
<td>13</td>
<td>14.5</td>
</tr>
</tbody>
</table>

**Example of double stage vacuum pump that operates at 38 Torr with 22°C (71°F) service water temperature.**

The necessary capacity Q referred to the published data (see page 10) will be:

\[
Q \times 0.8 = Q_{req}
\]

Where Qty is the requested capacity, 2.1 the condensing factor and 0.8 the value obtained from diagrams.

### Effect of service water temperature and saturated air on the capacity of liquid ring vacuum pump.

The performance data published for vacuum pumps is based on using water at 15°C (59°F) as the service liquid. The vapor pressure of the service liquid has a direct influence on pump capacity.

<table>
<thead>
<tr>
<th>TRM-TRV pump only</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>USE MOTOR @ 1.15 S.F.</em></td>
</tr>
</tbody>
</table>

TRM are all motor mounted pumps.
EVACUATION FROM A CLOSED VESSEL

To determine necessary time to change the absolute pressure inside a closed vessel of rated volume \( V \) from \( P_2 \) to \( P_1 \) the following formula has to be used:

\[ t = \frac{V}{Q} \times 60 \times \ln \frac{P_2}{P_1} \quad \text{or} \quad Q = \frac{V}{t} \times 60 \times \ln \frac{P_2}{P_1} \]

where:
- \( t \) = Requested time (minutes)
- \( V \) = Total volume to evacuate (ft\(^3\))
- \( Q \) = Capacity of the vacuum pump (ACFM)
- \( P_1 \) = Final pressure (Torr)
- \( P_2 \) = Starting pressure (Torr)
- \( \ln \) = See below table

PRIMING OF CENTRIFUGAL PUMPS

The liquid ring vacuum pumps are used also for the priming of centrifugal pumps or similar. According to plant design the following formulas are to be used:

\[ a) \quad t = \frac{V_1}{Q} \times 60 \times 2 \times \ln \frac{P_1 - P_2}{P_1} \]
\[ b) \quad t = \frac{V_2}{Q} \times 60 \times 2 \times \ln \frac{P_1 - P_2}{P_1} + \frac{V_3}{Q} \times \ln \frac{P_1 - P_2}{P_1} \]

where:
- \( t \) = Requested time (minutes)
- \( V_1 \) = Total volume of piping (ft\(^3\))
- \( V_2 \) = Total volume of vertical piping (ft\(^3\))
- \( V_3 \) = Total volume of horizontal piping (ft\(^3\))
- \( P_1 \) = Absolute pressure (Torr) at the suction of the pump when the piping is full (generally using water is \( \approx \) barometric pressure [Torr] \( - H \) [m] \( \times 98 \))
- \( P_2 \) = Starting absolute pressure (mbar) inside the piping before priming (generally is the barometric pressure)
- \( Q \) = Capacity of vacuum pump (ACFM)
- \( \ln \) = See below table

Note: The above mentioned formulas are applied when the capacity \( Q \) of vacuum pump between \( P_2 \) and \( P_1 \) is constant; if this is not possible, it is necessary to split calculation in more steps where the capacity \( Q \) could be considered constant.

LOGARITHMIC TABLE

BAROMETRIC PRESSURE VARIATION RELATED TO ALTITUDE

**TECHNICAL DATA**

UNIT CONVERSION AND TECHNICAL DATA FOR VACUUM
ACCESSORIES

SEPARATOR / MANIFOLD
Installed in place of the discharge manifold to separate the seal liquid from the gas. Supplied with pipes and fittings for partial recycle and drain connection. Available in carbon steel or stainless steel AISI 316.

PUMP MOUNTED SEPARATOR
Installed on the discharge branch; it separates the gas/liquid. Complete with pipes and fittings for partial recycle and drain. Available in carbon steel and stainless steel AISI 316.

FREE STANDING SEPARATOR
FOR FULL RECOVERY SYSTEM
Affords excellent separation of gas/liquid mixture. Essential when the seal liquid is recycled in a close circuit and cooled by a heat exchanger. Supplied complete with level gauge, thermometer, drain valve, excess liquid drain valve and connection for pressure gauge. Available in carbon steel and stainless steel AISI 316.

NON-RETURN VALVE WITH LOW PRESSURE DROP
Installed between the suction flange and the counter flange of the suction pipe. Prevents backflow into the system in the event of the pump stopping. It has a very low pressure drop and is ideal for higher vacuum conditions. Available in a variety of materials.

ATMOSPHERIC AIR (or gas)
OPERATED EJECTOR
Provided when suction pressure below 25 Torr are required. Will operate down to 5 Torr. Installed on the suction branch and utilizes air from the atmosphere as motive air. Available in a variety of materials.

AUTOMATIC DRAIN VALVE
Provided to drain the pump casing down to the centre line when the pump is stopped. Prevents starting the pump with the casing full of seal liquid and avoids heavy starting loads. Available in brass with Viton seal ring.

VACUUM RELIEF VALVE
A manually adjustable safety valve. Used to control the degree of vacuum and assist in the prevention of cavitation.

VALVE
Installed in the seal liquid supply pipe in the place of regulating valves. Ensures the correct amount of seal liquid is supplied to the pump irrespective of the supply pressure. Effects economies in the quantity of seal liquid.

VACUUM GAUGES,
PRESSURE GAUGES
AND COMPOUND GAUGES
Continuing research of TRAVAINI PUMPS USA results in product improvements; therefore any specifications may be subject to change without notice.