SIHI®
Engineered Vacuum and Compressor Systems

Experience In Motion
Flowserve is the driving force in the global industrial pump marketplace. No other pump company in the world has the depth or breadth of expertise in the successful application of pre-engineered, engineered, and special purpose pumps and systems.

Life Cycle Cost Solutions
Flowserve provides pumping solutions that permit customers to reduce total life cycle costs and improve productivity, profitability and pumping system reliability.

Market-Focused Customer Support
Product and industry specialists develop effective proposals and solutions directed toward market and customer preferences. They offer technical advice and assistance throughout each stage of the product life cycle, beginning with the initial inquiry.

Broad Product Lines
Flowserve offers a wide range of complementary pump types, from pre-engineered process pumps to highly engineered and special purpose pumps and systems. Pumps are built to recognized global standards and customer specifications.

Pump designs include:
- Single-stage process
- Between bearings single-stage
- Between bearings multistage
- Vertical
- Submersible motor
- Positive displacement
- Vacuum & Compressor
- Nuclear
- Specialty

Product Brands of Distinction
ACEC™ Centrifugal Pumps
Aldrich™ Pumps
Byron Jackson® Pumps
Calder™ Energy Recovery Devices
Cameron™ Pumps
Durco® Process Pumps
Flowserve® Pumps
IDP® Pumps
INNOMAG® Sealless Pumps
Lawrence Pumps®
Niigata Worthington™ Pumps
Pacific® Pumps
Pleuger® Pumps
Scienco™ Pumps
Sier-Bath® Rotary Pumps
SIHI® Pumps
TKL™ Pumps
United Centrifugal® Pumps
Western Land Roller™ Irrigation Pumps
Wilson-Snyder® Pumps
Worthington® Pumps
Worthington Simpson™ Pumps
Typical Applications

- Distillation
- Degassing
- Drying
- Condenser exhaust
- Evaporation
- Gas compression
- Filtration
- Solvent recovery
- Central vacuum
- And many more

More than a pump...

Design and manufacture of high quality vacuum pumping systems for almost 100 years strengthens the ability of SIHI® to provide customer-centric engineered solutions on a global scale.

Application knowledge and consultation form the basis of optimised product selection, simple process integration, and long-term reliability.

Life-Cycle Cost understanding is a fundamental consideration when matching products with processes. Power consumption, integration, reliability, and maintainability are all considered throughout the concept-to-integration process.

Ongoing innovation guarantees that the strong client base benefits from the latest proven technology. Importantly, customer satisfaction is the mechanism that drives the continual improvement program.

Cross Border Project Competence

Competence centres have been strategically appointed to lead the customised systems procedure on a global level. The result is local service, on a worldwide basis, that has the capability of providing high-end service to our customers. Engineering excellence, project management, and communication supports an on-time product that complies with legislation and operational guide-lines.

Customised high-quality systems range from small water boosting skids through to extensive recovery systems complete with onerous FAT testing, documentation, and site commissioning.

API, NACE, ASME, ISO, and DIN are all examples of technical standards and directives that can be employed.

Industries/Markets

- Chemicals
- Pharmaceuticals
- Petrochemicals
- Food
- Power
- Water treatment
- Surface coating
- Beverage
- Bio fuels
- Healthcare
Application fit

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<th>Evaporation</th>
<th>Distillation</th>
<th>Condenser Exhaust</th>
<th>Depassing</th>
<th>Recovery Systems (Gas &amp; Vapor)</th>
<th>Central Vacuum</th>
<th>Drying</th>
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Flexible options

- Variable speed drive
- Condition monitoring IPS Detect
- Exotic materials
-Magnetically driven
- Mechanical sealing
- High end sealant systems
- Distributed Control System (DCS)
- ...

WNH-Roots Blower
GPV-Ejector
SIHI® Dry-Vacuum
Liquid ring vacuum system
...cool, robust and cost effective

Reliability, that has stood the test of time, ensures this generation of vacuum machine is positioned to tackle the most demanding applications.

**Performance range:**
- up to 100 000 m³/h (58 858 cfm)
- $10^{-3}$ mbar (7 x $10^{-4}$ Torr) up to atmospheric pressure

**Optimisation:**
- Condensers & heat exchangers
- Lobular boosters
- Gas & steam ejectors
- Valves & instrumentation
- Vessels & pipe-work
- DCS Integration
- Scrubber systems and solvent recovery
- Exotic materials
- Engineered sealant systems
- Seal-less, magnetically driven versions

Packaged systems are supplied on a rigid base frame and provide easy integration into your process. Water, power, effluent, and pollution are all considered during system design.

**Benefits**
- Extremely robust
- Cool operation
- Superior liquid, vapour and solids handling
- High Volumetric flow-rate
- Simple maintenance
- Effective heat exchanger
- ATEX Category 1 without flame-arresters

Water doesn’t need to be the Liquid Ring...
- Water is conventional, clean, and accessible
- Oil can run hotter, and resist internal condensation
- Hydrocarbons can be chilled to promote process-condensation for subsequent recovery
No oil lubrication, mechanical seals, gearbox, or rotor coating underpin the reasons why the SIHI® Dry is so simple to operate and maintain.

A calm and quiet appearance illustrates just how easy this machine tackles today’s advanced applications.

Performance range:
- up to 10,000 m³/h (5886 cfm)
- < 10⁻³ mbar (7 x 10⁻⁴ Torr) without Booster

Optimisation:
- Condensers & heat exchangers
- Lobular boosters
- Valves & instrumentation
- DCS Integration
- Scrubber systems and solvent recovery
- CIP (Clean in Place)

Benefits
- Superior vacuum
- Lubrication-free
- Low energy (power) costs
- Extremely quiet
- ATEX Category 1 and 2
- Very tolerant to carry-over
- Simple maintenance
- Remote Self-Diagnostics

Attention to detail is illustrated by the style of the SIHI® Dry systems. Embedded touch-screen control can be integrated through WiFi for remote access and off-site diagnostic checks. Award winning technology for a better future!

Service & repair must be easy...
- Simple Condition-Based (self) diagnostic checks
- Clean-in-place approach to internal deposits
- Simple component replacement if necessary
Dependable compression, even when faced with some of the fiercest and thermally unstable processes, makes Liquid-Ring technology invaluable.

**Performance range:**
- up to 10,000 m³/h (5886 cfm)
- Atmospheric up to 12 barg (174 psig)

**Optimisation:**
- Condensers & heat exchangers
- Valves & instrumentation
- Vessels & pipe-work
- DCS Integration
- Scrubber systems and solvent recovery
- Exotic materials
- Engineered sealant systems
- Seal-less, magnetically driven versions

Packaged systems are supplied on a rigid base frame and provide easy integration into your process. Thermal sensitivity, water, power, and effluent are all considered during system design.

**Benefits**
- Cool Operation
- Highly corrosion resistant
- Extremely Robust
- Superior liquid, vapour and solids handling
- Simple maintenance
- Effective heat exchanger
- ATEX

Water doesn’t need to be the Liquid Ring...
- Water is conventional, clean, and accessible
- Oil can run hotter, and resist internal condensation
- Hydrocarbons can be chilled to promote process-condensation for subsequent collection
Whether its purpose is for recycling of process vapours or VOC emission control, this simple cell holds the answer to safe and reliable recovery. Highly effective separation ensures that a pure substance is recovered without the need for regeneration and/or cleaning. The desired element readily permeates through the membrane, and can be recovered, while clean inert gas passes freely over to atmosphere.

**How does the membrane work?**

The SIHI® membrane materials are designed to efficiently separate a process media from inert gas for the purpose of recycling or recovery.

Mixed process gasses and/or vapours are passed over a special polymeric material. The desired element readily permeates through the membrane, and can be recovered, while inert gas passes freely over to atmosphere.

**Benefits**

- Simple, small, compact
- Very long lifetime
- Highly effective
- No regeneration necessary
- Pure substance recovery
- No power required
- Versatile for most Solvents, Monomers, Esters, Aldehydes, Nitriles, Aromatics or Aqua.

**Typical solvents that can be recovered:**

- Methylene Chloride
- Vinyl Chloride Monomer
- Ethylene and Propylene derivatives
- Hydrocarbon (VOC) solvents
Understanding the process

• 100 years of experience
• Staff trained to communicate at all levels
• Deep application knowledge
  … Solutions with minimal customer effort

Optimum product range

• Unique process can be treated with simplicity
• Reduced cost of design, manufacture, and documentation
• Predictable site testing and commissioning
  … Customised solutions for standard capital costs

Design

• Advanced design tools
• Highest level of machine efficiency
• Long lasting reliability
  … Reduced energy, maintenance, and environmental costs

Manufacturing

• Centre of excellence structure
• High level of skill and competence
  Ongoing people and process development
  … Reduced integration costs

Testing & Documentation

• Factory and Site Acceptance Tests
• Certified documentation
• Witnessed customised testing
  … Reduced validation and commissioning costs

Quality assurance

• Total Quality Management
• ISO9000
• Rigorous health and safety culture
  … Long term security

Aftermarket – a local approach

• Dedication to process uptime
• Locally positioned service & technical centres
• Easy access to support, on a worldwide level
  … Highest level of customer care

Features

• One Supplier
• Compact Design
• Customised Solution
• High-End Quality
• Project Management
• FAT Testing
• International & EU Standards

Benefits

• Low Handling Cost
• Simple Installation
• Optimised Process
• Reliability
• On-Time Production
• Successful Integration
• Compliance
Typically, 90% of the total life cycle cost (LCC) of a pumping system is accumulated after the equipment is purchased and installed. Flowserve has developed a comprehensive suite of solutions aimed at providing customers with unprecedented value and cost savings throughout the life span of the pumping system. These solutions account for every facet of life cycle cost, including:

**Capital Expenses**
- Initial purchase
- Installation

**Operating Expenses**
- Energy consumption
- Maintenance
- Production losses
- Environmental
- Inventory
- Operating
- Removal

*Innovative Life Cycle Cost Solutions*
- New Pump Selection
- Turnkey Engineering and Field Service
- Energy Management
- Pump Availability
- Proactive Maintenance
- Inventory Management

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![Pie chart showing typical pump life cycle costs]

Typical Pump Life Cycle Costs

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<thead>
<tr>
<th>Category</th>
<th>Cost Percentage</th>
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<tbody>
<tr>
<td>Energy</td>
<td>44%</td>
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<tr>
<td>Maintenance and Repair</td>
<td>17%</td>
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<tr>
<td>Loss of Production</td>
<td>12%</td>
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<tr>
<td>Purchase and Installation</td>
<td>16%</td>
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<tr>
<td>Operational</td>
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<tr>
<td>Decontamination and Removal</td>
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1 While exact values may differ, these percentages are consistent with those published by leading pump manufacturers and end users, as well as industry associations and government agencies worldwide.