



Vacuum Pumps & Systems for the Power Industry



**Reliability
Efficiency
Service**

SIHI Pumps
www.sihi-pumps.com

Global Leadership in Liquid Ring Technology

- ▲ Over 4,500,000 pumps and systems installed worldwide!
- ▲ Manufacturing liquid ring pumps since 1920
- ▲ Serving demanding industries, including Power, Refinery, Petrochemical, Polymer Processing, Oil & Gas, Mining and Wastewater
- ▲ Global Manufacturing, Engineering, Service and Support
- ▲ Applications, Design and Systems Expertise



Engineered Systems in final stages of assembly in our Grand Island, NY plant

80 Years of Quality and Innovation

Sihi is a world leading designer and manufacturer of liquid ring pumps and systems, with over 80 years of experience. Our steady growth has been the reward for delivering proven technology, innovation and reliability to satisfied customers around the world. Sihi's reputation as a premier supplier of well-designed products and an outstanding level of service has been built on our mission to provide the very best in engineered solutions and lasting value. We are a preferred supplier to the refinery, petrochemical, polymer, pharmaceutical, oil & gas and power industries and we continue to grow due to our commitment and dedication. Quality, dependability, value and service are our most important products and our customers are our most important assets.



Our design engineers utilize the latest in 3D system modeling and state-of-the-art process simulation software to optimize our system designs for reliability and efficiency

Power Market Experience

As a global leader in the electric utility industry, SIHI has hundreds of installations in conventional, geothermal and nuclear steam power plants worldwide—so we understand your needs. Main steam condenser air removal is critical to efficient plant operation, and an application in which we excel, but we also cover the entire gamut of power plant applications, including water-box and pump priming, condenser hogging, deaeration, flue gas desulfurization and fly-ash conveying. We also have a significant installation list of pumps and systems in nuclear plants around the world. All systems supplied to North American customers are designed and built in the USA to meet your most exacting design specifications.



Three large, piped & wired liquid ring condenser evacuation packages ready for delivery to an electric power facility

Full Conformance to HEI Standards

- ▲ SIHI condenser evacuation systems are designed to meet or exceed all applicable HEI performance specifications
- ▲ Designed for 1"HgA or main condenser design pressure, whichever is lower, and 7.5°F sub-cooling
- ▲ As main condenser pressure rises due to excess air leakage, pump SCFM also increases, keeping the condenser operating closer to design, with a beneficial impact on net heat rate
- ▲ Designed for fully automatic Hogging, Holding and Standby operation, and continuous duty – 24/7
- ▲ Each system is individually tested to HEI specifications
- ▲ All systems include a full 2-year warranty



SIHI 2-Stage Liquid Ring Pumps

The heart of our condenser evacuation package is our rugged, low-maintenance, two-stage liquid ring vacuum pump. It is the ideal solution for handling liquid carryover, condensate and large volumes of water vapor. It performs seamlessly and automatically through condenser hogging and holding. The positive displacement characteristics of SIHI liquid ring vacuum pumps result in significantly increased performance even as air in-leakage increases, so your condenser will continue to operate closer to the design point. Our liquid ring pump tracks condenser performance as cooling water temperature varies, since it uses main condenser circulating water for cooling. You can begin condenser hogging without waiting for full steam pressure, which is ideal for plants that need to come online quickly. Two-stage liquid ring pumps are naturally suited for main condenser evacuation service and provide long life and optimum performance for your steam turbine condenser system.

For over eighty years, SIHI rotors have been constructed from high strength steel and iron materials, enabling us to maximize both volumetric efficiency and dependability



The Key to Performance!

SIHI 2-Stage liquid ring vacuum pumps are the standard for reliability and efficiency in power applications for good reason. Their ability to condense water vapor and tolerate liquid carryover makes them ideal for condenser air removal service. But, only the *cool* thrive and survive. Because water temperature is so important to liquid ring reliability and performance, SIHI pumps are designed to fully utilize available cooling water supply. A few degrees difference in seal water temperature can result in huge performance penalties, especially at normal condenser operating pressures, and can spell the difference between a pump that cavitates and fails, and one that runs maintenance-free over an extended period. This is a *significant advantage*, particularly on condenser air removal service, and one that cannot be overemphasized.



System Design Features

Liquid Ring Vacuum Pump

2-stage design for high vacuum operation
Meets HEI requirements without cavitation
High seal flow rates for maximum condensing
One unit for both hogging and holding

ANSI B31.1 Power Piping

All piping conforms to ANSI B31.1 Power Piping code
No copper alloy components

2-Phase Discharge Separator

Built to ASME and ASTM Specifications
Gauge glass with integral isolation valves
Check valve with manual override handle
Rotometer verifies amount of non-condensable load
Level switches and make up water line

Plate & Frame Heat Exchanger

Low-approach, high efficiency heat transfer
Corrosion resistant, low maintenance design
Expandable design provides system flexibility
Optional shell & tube models available

Seal Liquid Recirculation Pump

Includes high efficiency motor
Maximizes heat transfer in heat exchanger
Efficiently atomizes in suction inlet spray

Automated Inlet Shut-off Valve

Actuated fail-close valve isolates system from condenser
Bubble-tight valve for positive shutoff
Vacuum Switch enables automated control
Differential pressure switch for standby operation

Inlet Spray Nozzle

Condenses water vapor prior to vacuum pump inlet
Increases ability to handle non-condensable load

Coupling Drive

Direct drive motors for simple system designs
Gear drive units for 125 HP and larger
Low maintenance flexible couplings

Rugged Power Plant Duty Motor

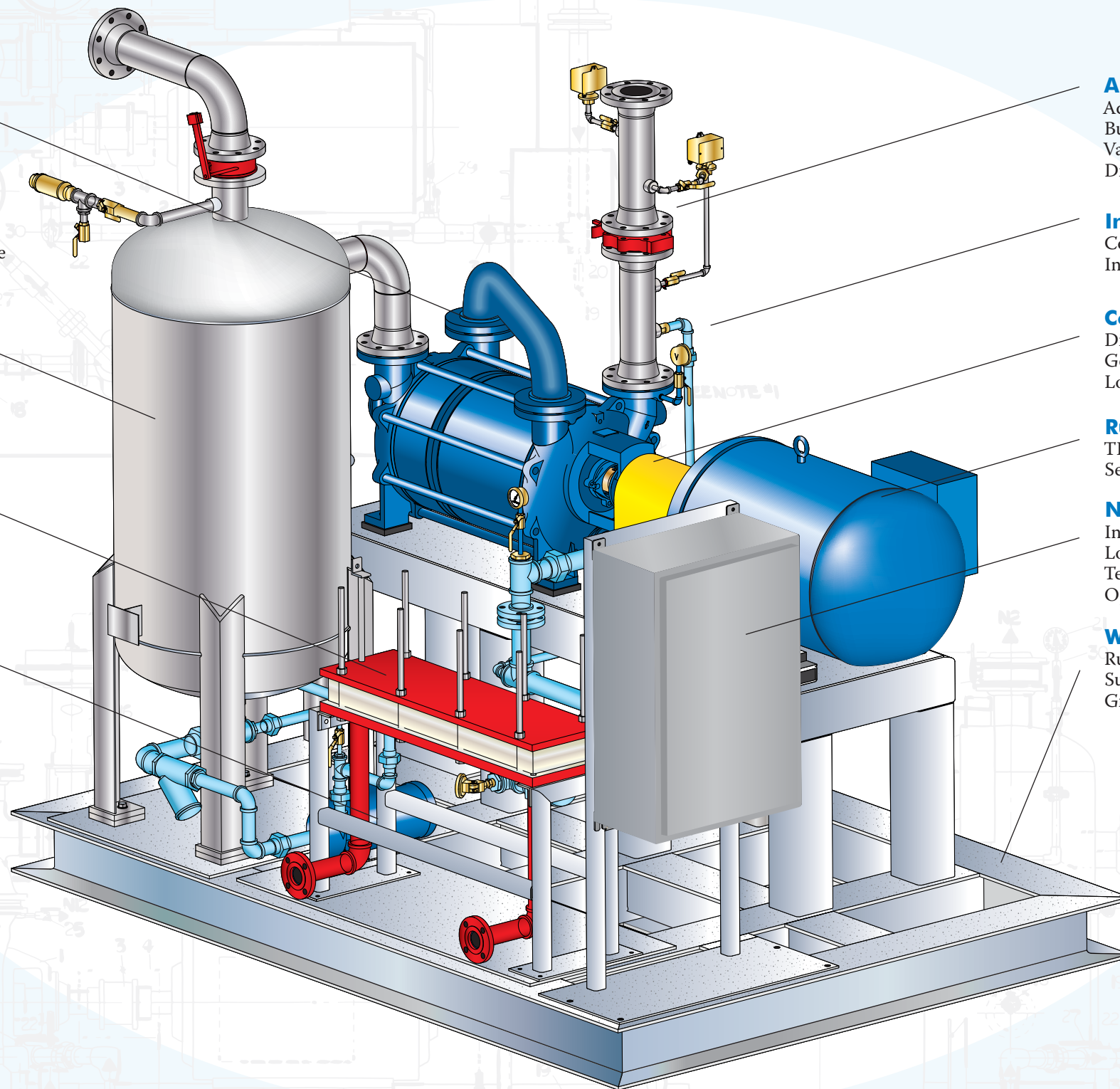
TEFC, High Efficiency, 1.15 Service Factor is standard
Selections available to meet your plant specifications

NEMA 4 Control Panel

Includes wiring to all components on skid
Logic control for automated operation
Terminal strips for remote connections & alarms
Optional Starters, transformers and disconnects

Welded Steel Base Plate

Rugged, self-supporting construction
Suitable for concrete foundation mounting
Grout-ready design



SIHI Dedicated Hogging Packages

SIHI hogging systems utilize our rugged single stage vacuum pumps and meet all HEI standards for main condenser shell side evacuation. They're the ideal solution for peaking plants or whenever you need to get online fast. Like our Condenser Evacuation Systems, they come piped, wired and ready to go, and since they don't need steam, you can begin hogging before your boilers are up to full steam pressure.

SIHI 2-Stage Liquid Ring Vacuum Pump

Heavy duty, 2-stage liquid ring vacuum pumps are the key component of our Condenser Evacuation Systems. These slow running, low noise pumps have no metal-to-metal contact, need no internal lubrication and are low maintenance. They operate automatically for both hogging to holding. Pumps are iron or stainless steel construction with no copper alloys, and come standard with packing or optional mechanical seals.



SIHI Standard Models

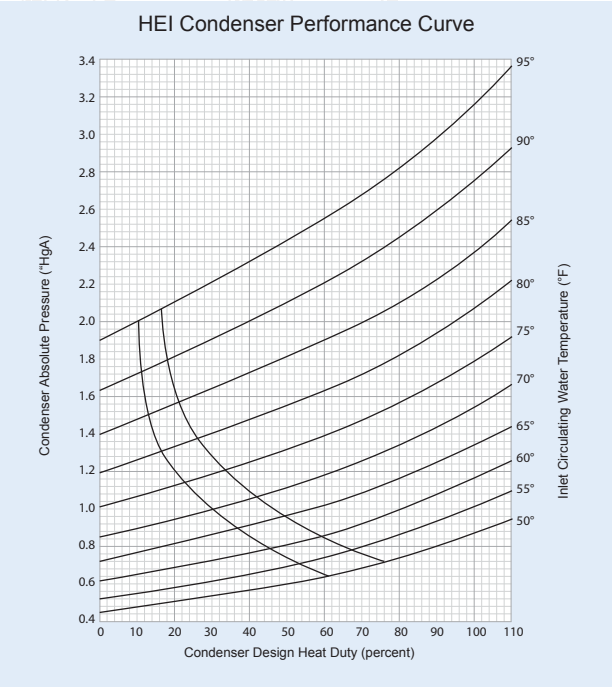
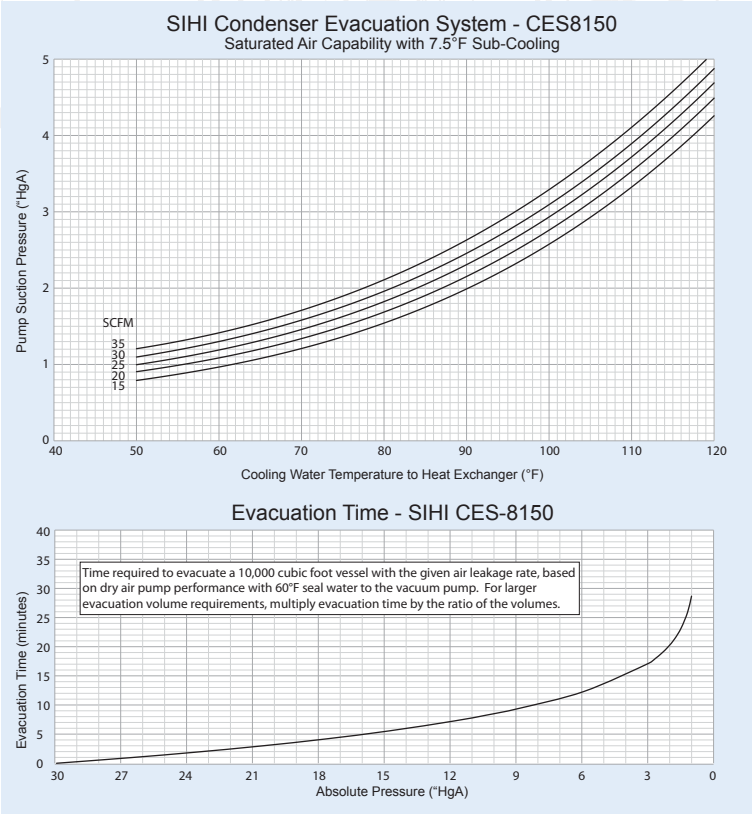
System Model	Pump Speed	Motor HP	Drive Type	SCFM Range ¹	Hogging Time ²
CES7044	880	30	Direct	3 - 7.5	31.6
CES7066	880	40	Direct	3 - 10	20.5
CES7079	880	50	Direct	5 - 15	16.9
CES8103	580	60	Direct	10 - 20	13.1
CES8128	580	75	Direct	15 - 25	11.2
CES8150	700	100	Direct	15 - 30	8.4
CES9176	480	125	Gear	20 - 35	7.2
CES9206	480	125	Gear	25 - 45	6.3

1) per HEI standards at 1"HgA 2) time in minutes to evacuate 10,000 ft³ volume with no leakage

Typical Performance Data

Typical Performance Data for given leakage rate				
SCFM	Required Cooling Water Temp. (°F)			
	1"HgA	1.5"HgA	2"HgA	2.5"HgA
4	63	79	91	100
5	63	79	90	99
7.5	61	77	89	98
10	61	78	90	99
15	61	78	90	99
17.5	58	76	88	98
20	59	77	89	99
25	59	77	89	98

We Provide All the Data You Need - (CES8150 sample data shown below)



Condenser Performance Curves predict condenser vacuum under given steam loads, circulating water temperatures, cleanliness factor etc. We can compare our vacuum pump curves to your condenser curve for the best possible selection.

Selecting an Optimal System

Selecting the best vacuum system for your condenser involves a thorough understanding of anticipated plant loading, seasonal factors, condenser performance and design point, the effect of condenser pressure on turbine efficiency and other factors. Our engineers can assist you in estimating your needs until you are ready for in-depth analysis.

SIHI uses sophisticated sizing and selection programs to model performance using your precise operating conditions. Our systems can be specified to meet your performance and equipment requirements. Please contact us for a complete system evaluation and certified engineering data.



Packaged systems ready for shipment to a power plant

Service If You Need It

Customers choose SIHI Liquid Ring Vacuum pumps for their efficiency, exceptional performance characteristics, reliability and low maintenance. They operate at low speeds and cool temperatures, and require no internal lubrication since they utilize a water seal. They have liberal clearances and have no metal-to-metal contact. This insures long life and trouble-free service. When you do need assistance, we have the service facilities, staff and experience you need.

In addition to three factory-owned service centers in North America, we have over 100 authorized service centers strategically located around the world. We staff a 24/7 *Emergency Hot-Line* for the rare occasion when you need help NOW!

So, whatever your challenge, we have you covered.

Power Applications Served

SIHI has vacuum and compressor products for most applications found in conventional, geothermal and nuclear power plants.

- ▲ Main Condenser Air Removal Packages
- ▲ Main Condenser Hogging Packages
- ▲ Water Box Priming Systems
- ▲ Boiler Feedwater Deaeration Systems
- ▲ Exhaust Gas Compressors for Nuclear Plants
- ▲ Degassifier Vacuum Pumps for Nuclear Reactors
- ▲ Fly-Ash Conveying Systems
- ▲ Flue Gas Desulfurization and Vacuum Filtration
- ▲ Stainless Steel Pumps for Geothermal Plants



Call the Experts

Experience the SIHI difference. Contact us today for literature, engineering data, technical presentations, an in-depth plant survey or just to learn more about us. You'll be glad you did.

716.773.6450 www.sihi-pumps.com

SIHI ~ The Smart, Economical Choice
Quality • Reliability • Expertise • Support • Value



SIHI Pumps...providing custom engineered solutions & systems for over 80 years.

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