

# ROTAJECTOR SYSTEMS

COMBINATION EJECTOR/ LIQUID RING PUMP VACUUM SYSTEMS

MULTI-STAGE EJECTOR SYSTEMS  
SYSTEMS □ THERMOCOMPRESSORS □  
WATER CHILLERS – CHILL-VACTOR®  
BAROMETRIC CONDENSERS □ LIQUID  
RINGS – SCRUB-VACTOR □ MULTI-STAGE  
LIQUID RING VACUUM PUMPS □ JET B  
□ EDUCTORS □ **CROLL-REYNOLDS** □  
□ COMBINATION EJECTOR/LIQUID  
SYSTEMS □ DISTILLATE RECOVERY  
AND BAROMETRIC CONDENSE  
POWERED VACUUM SYSTEMS □ CO  
D RING VACUUM PUMP SYSTEMS □

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## ENERGY EFFICIENT VACUUM SYSTEMS FOR THE PROCESS INDUSTRIES

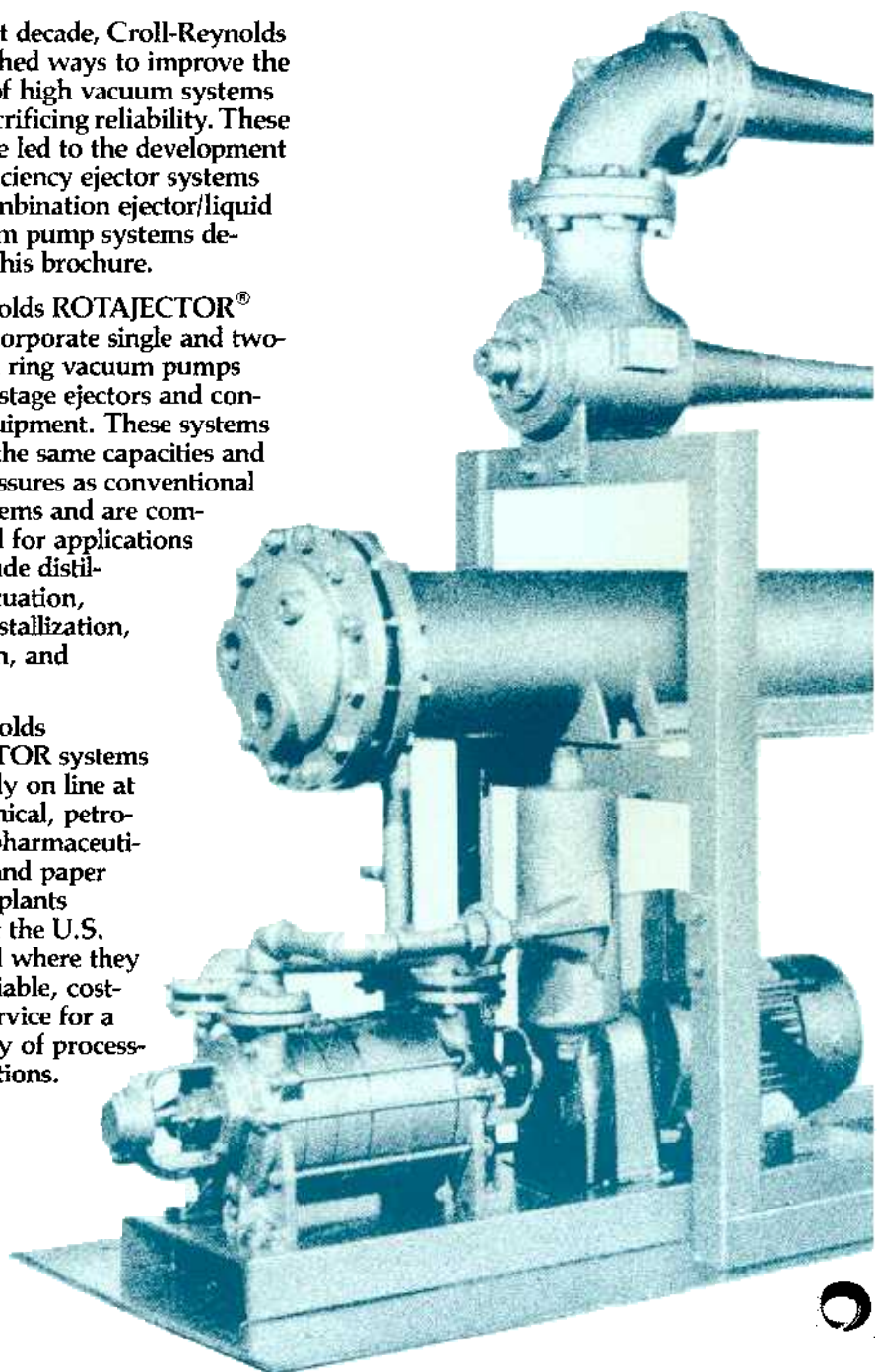
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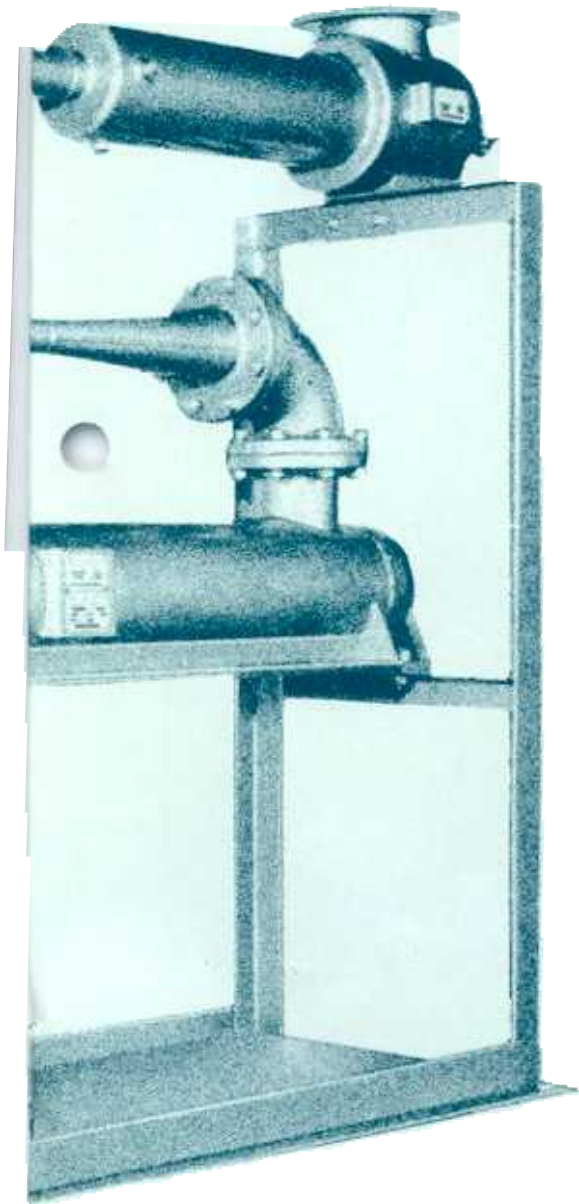
Rising energy costs have emphasized the need for the development of processing equipment which operates at the highest possible efficiencies. High vacuum systems, used extensively by the process industries for a variety of applications, deserve the attention of engineers concerned with reducing energy costs.

For the past decade, Croll-Reynolds has researched ways to improve the efficiency of high vacuum systems without sacrificing reliability. These efforts have led to the development of high efficiency ejector systems and the combination ejector/liquid ring vacuum pump systems described in this brochure.

Croll-Reynolds ROTAJECTOR<sup>®</sup> systems incorporate single and two-stage liquid ring vacuum pumps with multi-stage ejectors and condensing equipment. These systems operate at the same capacities and suction pressures as conventional ejector systems and are commonly used for applications which include distillation, evacuation, drying, crystallization, evaporation, and cooling.

Croll-Reynolds ROTAJECTOR systems are presently on line at major chemical, petrochemical, pharmaceutical, food, and paper processing plants throughout the U.S. and abroad where they provide reliable, cost-effective service for a wide variety of processing applications.





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## **ADVANTAGES VERSUS OIL SEAL VACUUM PUMPS**

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### **1) GREATER RELIABILITY**

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With the exception of multi-stage ejector systems, the ROTAJECTOR is the most reliable of all high vacuum pumping devices. The system has one moving part, the impeller of the liquid ring vacuum pump, which makes no metal to metal contact with the pump casing. The pump has no sliding vanes, pistons, gears, or valves to wear and no filter or oiling systems to service. No vacuum oils, lubricants, or special cooling systems are required for operation. In addition, the system is designed for on-site service and can be easily maintained by plant personnel. Simplicity of design and operation means less downtime, less maintenance and longer service life.

### **2) MORE VERSATILE**

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Like ejector systems, the ROTAJECTOR is versatile in handling a variety of gases and vapors over a wide capacity range. In addition, the system will directly handle slugs of liquid, contaminants and small particulate without installation of expensive separators, traps, and filters normally required with oil seal pumps to prevent mechanical failure and/or oil contamination.

### **3) LESS COSTLY TO PURCHASE AND MAINTAIN**

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Because of their simple design and operation, ROTAJECTOR systems are usually less costly to purchase and maintain than expensive oil seal pumps.

### **4) CUSTOM DESIGNED**

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Each ROTAJECTOR system is custom designed to user specifications. Oil seal pumps are fixed capacity systems and are oftentimes oversized for their intended applications.

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## **VERSUS STEAM EJECTOR SYSTEMS**

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### **1) REDUCED STEAM CONSUMPTION**

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ROTAJECTOR systems have fewer ejector stages than conventional ejector systems, and, therefore, operate with less motive steam. Steam savings are particularly significant when process conditions require a vacuum system to handle high suction loads of non-condensable gases.

### **2) OPERATES WITH LOW PRESSURE STEAM**

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The ejector stages of the system can be operated with steam at pressures as low as 5 psig, eliminating the need for high pressure boilers.

### **3) LOW LEVEL INSTALLATION**

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The ROTAJECTOR is designed for low level operation, eliminating the need for the vacuum towers and high level condensing equipment required for barometrically installed ejector systems.

## OPERATION

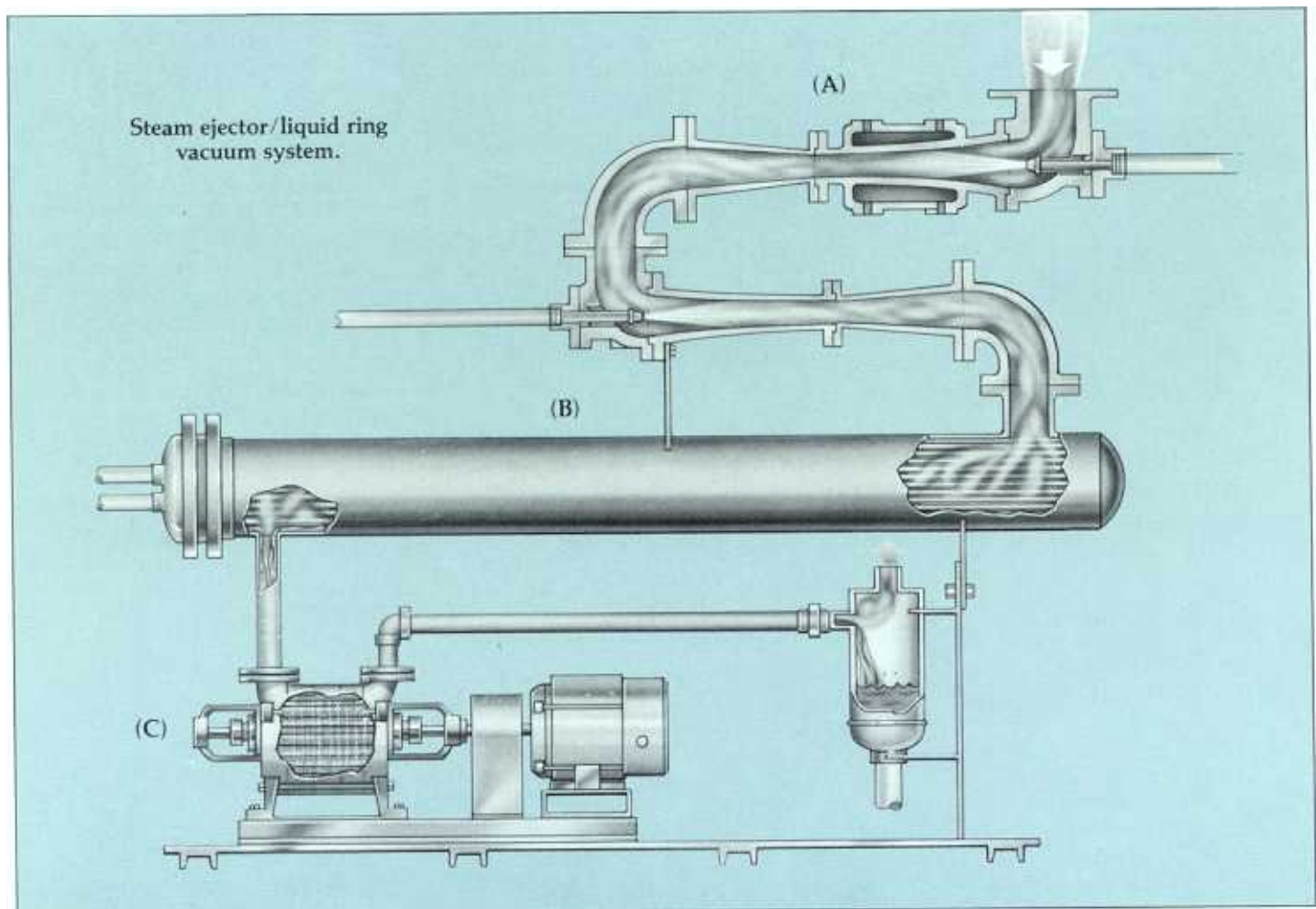
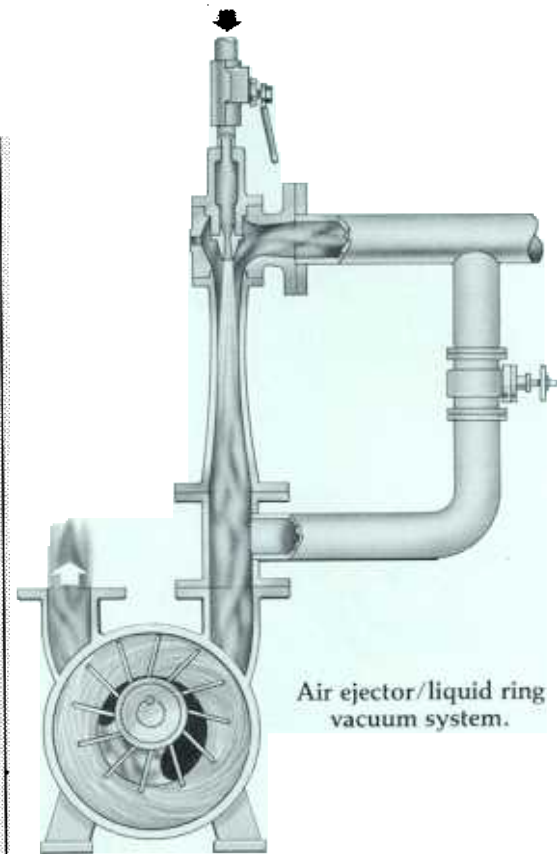
The process gases and/or vapors to be handled by the ROTAJECTOR system are drawn in through the suction inlet of the first stage ejector (A) and compressed by the ejector stages to an interstage condenser. (B) The condenser cools the gases and condenses the vapors, reducing the load to be handled by the liquid ring vacuum pump. (C) The liquid ring vacuum pump serves as the final compression stage(s) and also handles condensate which is normally drained directly into the pump suction port. A pressurized vapor is required for operation of the ejector stages and a continuous flow of sealant is required for operation of the liquid ring pump.

## CR ROTAJECTOR SYSTEMS

**Steam Powered**— Available in two, three, four, and five stage designs, Croll-Reynolds standard systems operate using steam for ejector operation and water as a sealant for the liquid ring vacuum pump stage.

**Air Operated**— Designed for handling small loads at pressures ranging from 5 MM to 25 MM. These systems are often specified when steam is unavailable.

**Process Powered**— Capable of operating at the same suction pressures and capacities as standard ROTAJECTOR systems. CR process powered systems operate using a fluid, compatible with the process stream, as the ejector motive, condensing medium, and liquid ring vacuum pump sealant.



## OPERATION

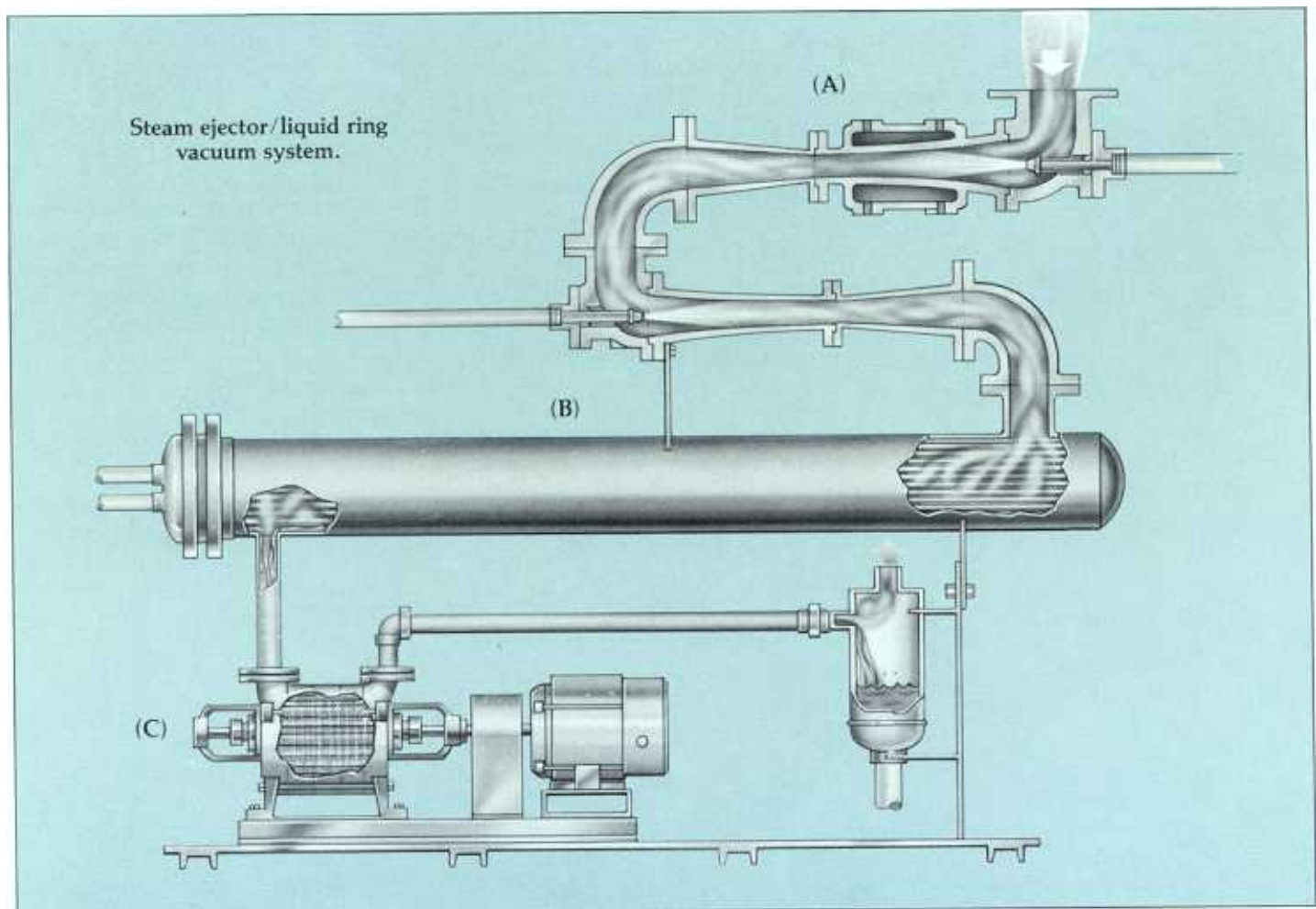
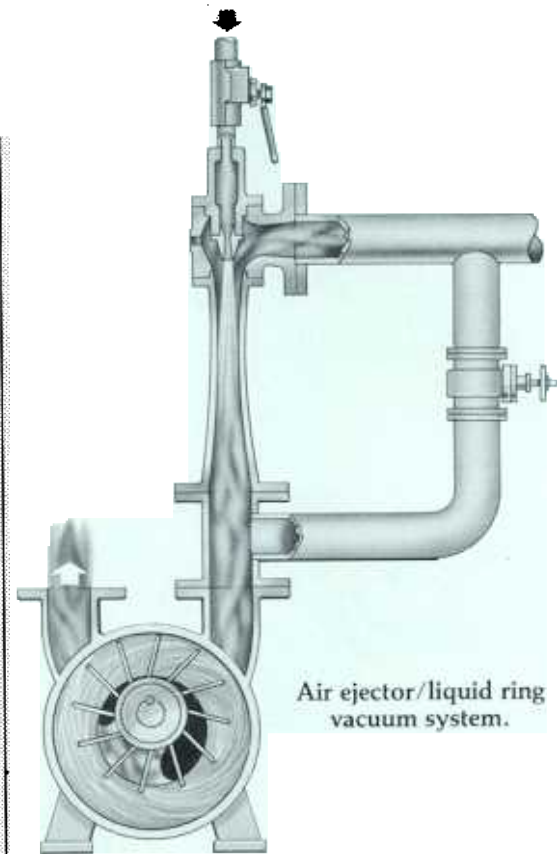
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## CR ROTAJECTOR SYSTEMS

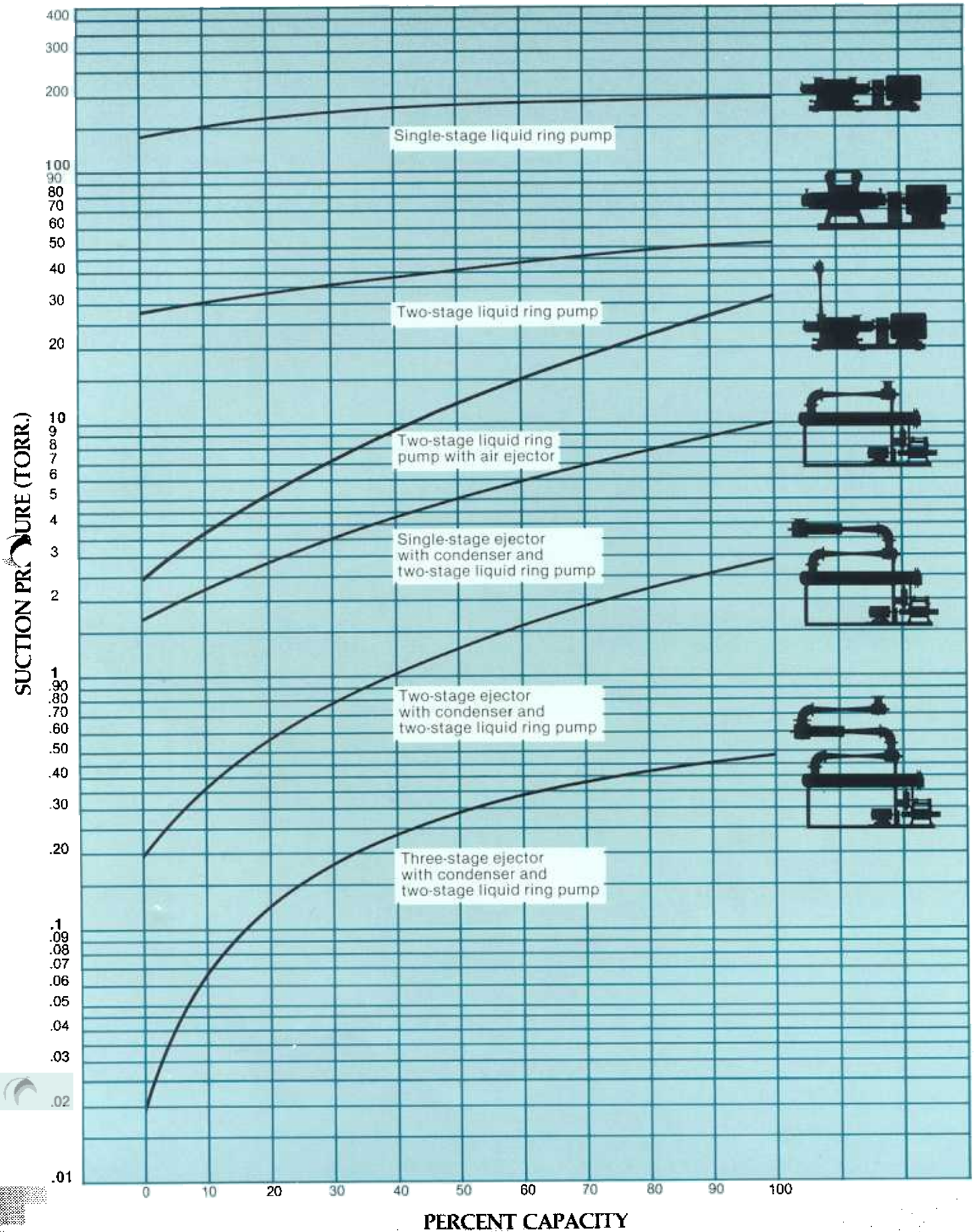
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# ROTAJECTOR VACUUM RANGES



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## GENERAL INFORMATION

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### MATERIALS OF CONSTRUCTION

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#### EJECTORS

Croll-Reynolds ejectors are manufactured from cast iron, carbon steel, stainless steel, graphite, Havg, and a variety of other corrosion resistant plastic and metal materials. Standard ejectors are machined from cast iron and are equipped with stainless steel steam nozzles.

#### LIQUID RING PUMPS

Croll-Reynolds liquid ring pumps are constructed from the following materials for corrosive and non-corrosive service.

**Standard**—cast iron pump casing, bronze impellers, stainless steel impeller shaft.

**Iron**—cast iron pump casing, cast steel or stainless steel impeller and stainless steel impeller shaft.

**Bronze**—bronze pump casing, bronze impeller, and stainless steel impeller shaft.

**Stainless Steel**—type 304 or 316 stainless steel pump casing, impeller and impeller shaft.

#### CONDENSERS

Surface and direct contact condensers are available in a wide variety of materials and are fabricated according to TEMA and ASME code specifications.

The standard material of construction for both surface and direct contact condensers is carbon steel.

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#### PUMP MOTORS

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Croll-Reynolds standard liquid ring vacuum pumps are equipped with totally enclosed, fan cooled, three phase, 230/460 volts, NEMA de-

signed motors. A variety of motor enclosure types to include open drip proof, explosion proof, totally enclosed air over and non-ventilated can be supplied upon request. Pumps can also be equipped with 50 cycle motors.

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#### SHAFT SEALS

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Croll-Reynolds standard pumps are equipped with packed glands. Pumps can be equipped with mechanical seals upon request. Mechanical seals are provided in a variety of corrosion resistant materials and are custom fitted to the pump during assembly.

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#### EJECTOR ACCESSORIES

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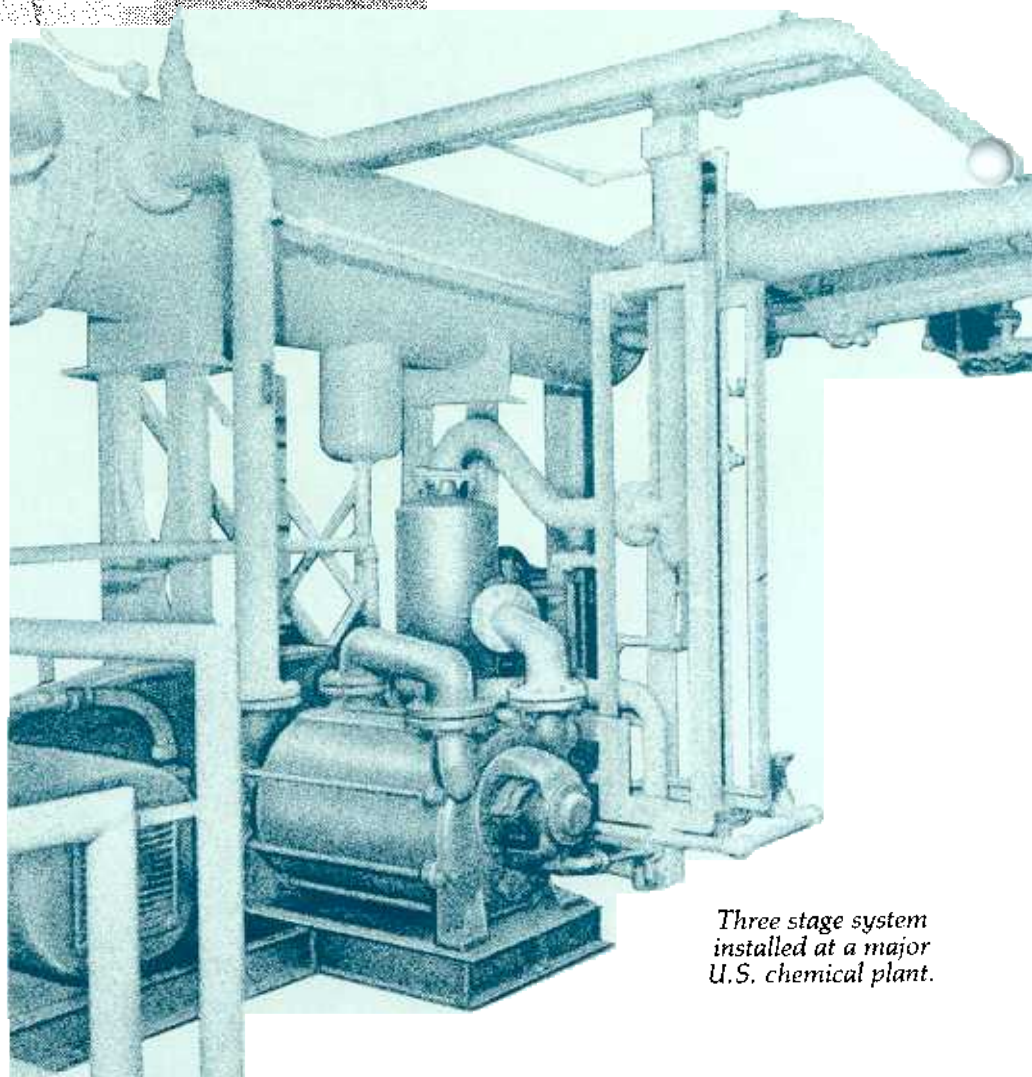
Steam separators, traps, strainers, and valves are available upon request. CR ejector accessories are available in a variety of materials.

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#### LIQUID RING VACUUM PUMP SEALANT SYSTEMS AND ACCESSORIES

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Croll-Reynolds liquid ring pumps can be equipped with once through, partial recovery, and full recovery sealant systems as shown in CR Liquid Ring Vacuum Pump Catalog VP-97.



*Three stage system installed at a major U.S. chemical plant.*

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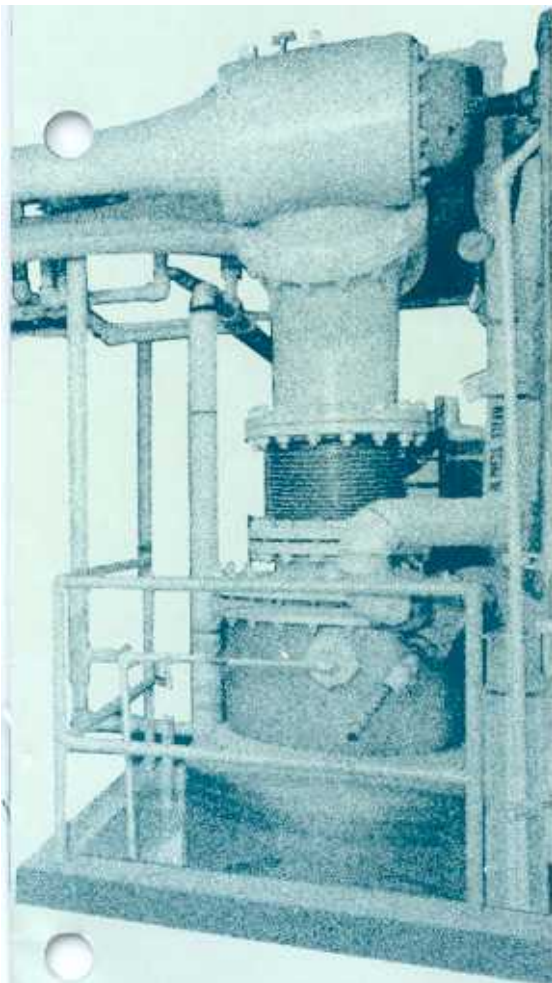
## **CR VACUUM SYSTEMS**

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### **EXPERIENCE**

Croll-Reynolds has pioneered the research and development of combination ejector/liquid ring systems and is the leading supplier of these systems to the process industries. Sixty years of experience in the design and manufacture of high vacuum equipment insures that each system is applied and sized correctly per our customer's specifications.



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### **SINGLE SOURCE RESPONSIBILITY**

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Croll-Reynolds ROTAJECTOR systems combine CR ejectors with CR liquid ring vacuum pumps. Croll-Reynolds takes responsibility for the complete system and guarantees performance to specifications.

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### **CUSTOM DESIGNED**

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Each system is individually custom designed for the specific application. Custom designs insure maximum operating efficiency from both the ejector and liquid ring vacuum pump stages of the system.

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### **PREASSEMBLED SYSTEMS**

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Croll-Reynolds ROTAJECTOR systems can be preassembled and skid mounted for easy installation.

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### **PERFORMANCE TESTED**

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All Croll-Reynolds ROTAJECTOR vacuum systems are performance tested at CR research and testing facilities to insure proper mechanical operation and performance to design.

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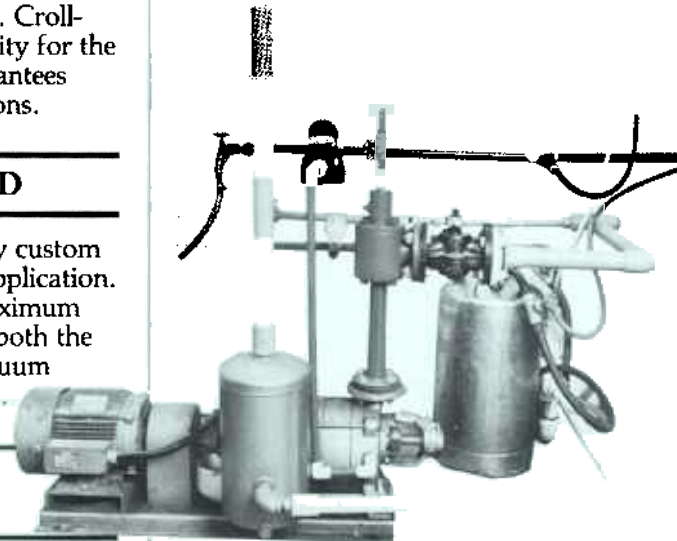
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### **QUALITY**

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Croll-Reynolds has a worldwide reputation for quality vacuum systems. Attention to detail during the design and construction of CR systems insures long, trouble free operation.



*Air ejector/liquid ring system on line at a pharmaceutical plant.*



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## WARRANTY

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Croll-Reynolds ROTAJECTOR systems are warranted against defects in material and workmanship for a period of 12 months after shipment.

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## QUOTATIONS

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All written quotations, unless specified otherwise, will be honored for 30 days from the date on which they are written.

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## TERMS

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Croll-Reynolds standard terms are net cash 30 days from the date of shipment, payable in U.S. dollars.

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## DELIVERY

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Delivery of CR ROTAJECTOR systems is quoted on an individual basis depending on system configuration and materials of construction. Questions concerning shipment status should be directed to the Croll-Reynolds Production Department.

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## INSPECTION AND PERFORMANCE TESTING

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Croll-Reynolds combination systems are inspected and tested prior to shipment. Customer inspection of vacuum systems at Croll-Reynolds facilities will be permitted at no extra charge provided that this inspection does not interfere with production flow. Croll-Reynolds charges a nominal fee for witnessed performance tests based on the time and manpower required to complete such testing. Complete details concerning the

inspection and testing procedures required should be submitted with your original request for quotation.

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## START-UP AND SERVICE CALLS

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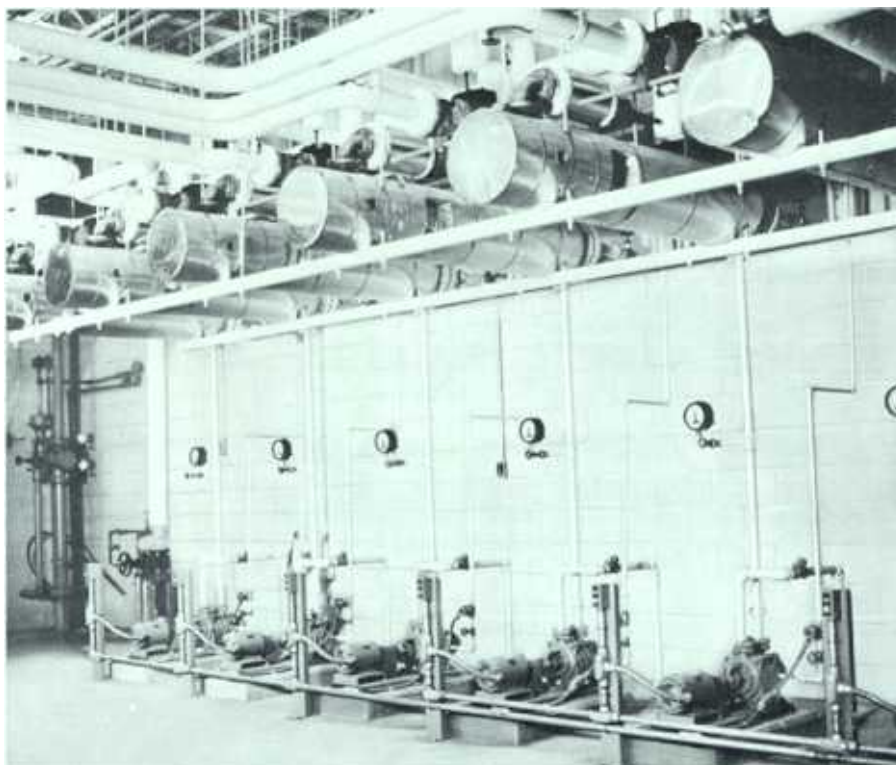
Croll-Reynolds engineers are available to assist your plant personnel with start-up and service of combination systems. Current charges for start-up and service calls are available from our sales offices.

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## PREPARATION FOR SHIPMENT

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Croll-Reynolds vacuum systems are primed and painted for external protection. Liquid ring pumps are lubricated internally with a water soluble oil to insure smooth start-up. Each system is braced and crated for shipment and can be export boxed upon request.



*Six 4-stage ROTAJECTORS on line at a major U.S. chemical plant.*



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