

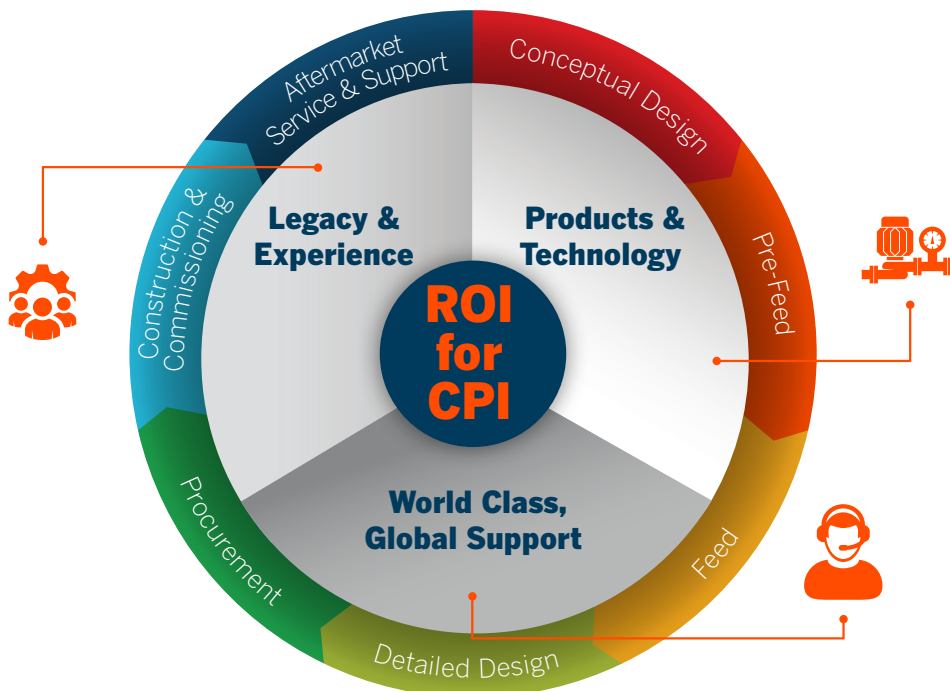
PUMPS & SYSTEMS

The Leading Magazine for Pump Users Worldwide

Tips for Selecting Pumps in Chemical Processing Applications

By Sundyne's Michael Romano, March 2022

A Guide for Choosing Equipment that is Safer, Greener and will Improve TCO



Pumps play a critical role in chemical processing applications. They move the precursor materials that are needed to make thousands of products that people use every day.

The chemical industry is one of the first industries to return to pre-pandemic production levels. Extensive demand in China, India and North America is fueling this growth. As demand for products in other markets returns to normal, the chemical processing industry (CPI) plays a related role because glass, plastics, vinyl and thousands of other materials made with chemical processing are essential. Below is a look at some of the faster growing segments of the CPI.

Chlor-Alkali:

Almost half the world's chemicals depend on Chlor-alkali products, which come from salt. Chlorine and caustic soda are produced when

an electrical current is introduced into an aqueous salt brine solution. Chlorine is used in 15,000 commercially traded compounds (including bleach, plastics, vinyl and many others). Caustic soda (sodium hydroxide) is used to make 10,000 different products—including paper, textiles, aluminum, detergents—and for water treatment. A wide range of different pumps and compressors are used in the Chlor-alkali process.

Isocyanates:

Isocyanates are the raw materials that make up polyurethane products. They are used throughout the automotive industry to make paints, surface coatings, foams, car seats and rubber. Isocyanates are pervasive in the construction industry via varnishes and building insulation materials. They're also used to make a wide variety of packaging materials.

Agricultural Chemicals:

Chemical agents like herbicides and insecticides control crop-harming insects and weeds. Nitrogen-based fertilizers (like ammonium nitrate and urea) are produced from natural gas. Typically, American Petroleum Institute (API) 610 multi-stage pumps or sealless mag-drive pumps are used in these processes, as well as API 617 centrifugal compressors.

Polycarbonates:

Polycarbonates (PC) are thermoplastic polymers that are easily molded but virtually unbreakable. Their durability and low-scratch resistance makes them ideal for windows, lenses in eyewear, automotive windshields and other components. Each year, almost 3 million tons of polycarbonate are produced globally. PC is manufactured by dissolving chlorinated solvents in water. It is a toxic process that is corrosive to the pumps handling the input materials. As a result, sealless pumps are a preferred option for PC manufacturing.

Inorganic Specialty Chemicals:

Water, salts, acids and bases form the bulk of the inorganic chemical market. These chemicals are commonly produced by hundreds of manufacturers and are used in virtually every industry. As an example, sulfuric acid is the most produced chemical in the world.



Plastics & Polymers:

Hundreds of chemical companies use base chemicals to make polyethylene for bottles and containers; polypropylene for packaging; polyvinyl chloride for piping and construction materials; and polystyrene for toys, recreation equipment and appliances. These plastics and polymers represent more than half of the CPI industry's output worldwide.

What Are the Requirements for Pumps Used in These Applications?

Solutions specific to a user's requirements:

Chemical companies move some of the harshest materials on the planet. Leaks not only cause health and safety issues, but plant downtime is to be avoided at all costs. As a result, CPI manufacturers have differing needs, ranging from standard "off-the-shelf" pumps to highly engineered equipment that is designed specifically to their flow, pressure/head and material handling requirements. Pump manufacturers that best serve the CPI should have the ability to support both ends of the product spectrum. They should work with users in a consultative fashion for the design, construction, testing and commissioning of equipment. A pump manufacturer's quality and testing processes should be rigorous, regardless of whether the product is off-the-shelf or not, in order to ensure that there are no surprises for the customer once the equipment is installed onsite.

Leak-free handling via sealless pump designs:

Many of the compounds used throughout the CPI are classified as human carcinogens. Effects of hazardous exposure can include lung problems and severe irritation to eyes, nose and skin. For the pumps handling these substances, leaks must be avoided. As a result, sealless magnetic drive pumps are commonly used. With sealless pumps, there are no leaks or emissions to the atmosphere, offering a cleaner working environment with a reduced probability of accidents. Standards play a key role in the CPI, assuring customers that performance and safety requirements are met while also guaranteeing interoperability throughout a plant. Pumps should adhere to all American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME) and International Organization for Standardization (ISO) standards—for petrochemical applications, sealless pumps should comply with API 685 standards.

Chemical resistance:

The precursor materials pumped in CPI applications are toxic and aggressive, so the pumps used should feature corrosion-resistant containment shells. Lined pumps with ethylene tetrafluoroethylene (ETFE) containment shells are a preferred option for CPI applications. This configuration resists corrosion and provides durability for a pump's internals that can last for years. As an example, the chemical polymers used to coat the electrodes in lithium-ion batteries

are extremely harsh in nature, and they have a reputation for corroding pump internals. It takes materials like ETFE to stand up to highly corrosive chemicals. For higher temperature applications, metallic pumps are required. A wide range of materials (including stainless steel, alloy 20 or alloy C) with silicon carbide internal bearings should be available, as it takes a comprehensive portfolio to address the wide range of needs in the CPI.

EHS and ESG:

Environmental, health and safety (EHS) and environmental, social and governance (ESG) issues are more important than ever before. Many CPI companies use ESH and ESG scores as criteria for purchasing pumps and compressors. Shareholders and employees at these companies also care about these issues; so, it is essential that equipment manufacturers provide updates relating to EHS and ESG.

Aftermarket support:

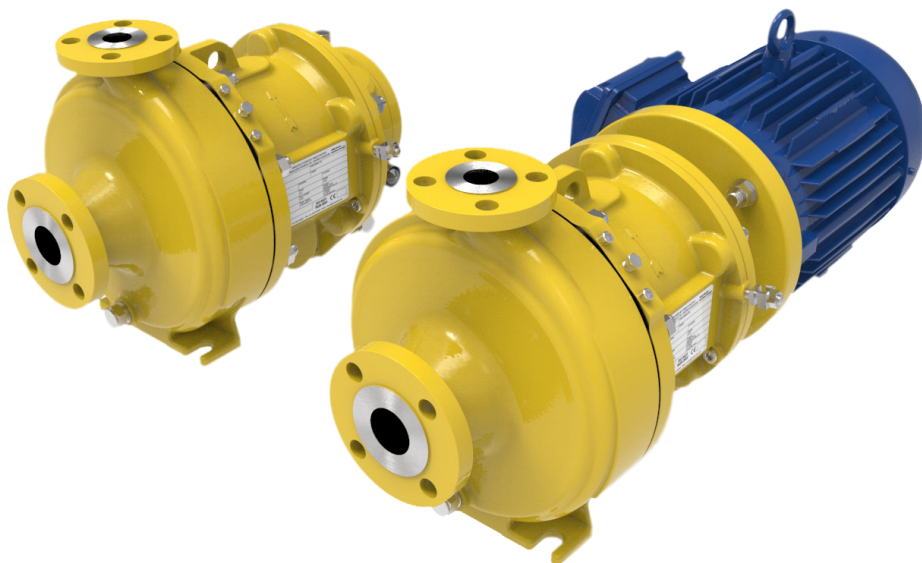
Pumps in chemical plants can run for decades. Equipment manufacturers should be proactive when it comes to rerates, exchanges and service in general. Equipment manufacturers should have a global team of service centers that can provide local support, anywhere in the world. They should not wait for problems to arise before proactively engaging with users. Exchange programs for the key elements (such as the mechanical seal and gearbox) offer great opportunities for pump manufacturers to connect with end users at appropriate times when equipment is nearing service milestones. A pump manufacturer's channel partners should proactively make sure that users are always aware of their options to keep equipment running at peak performance.

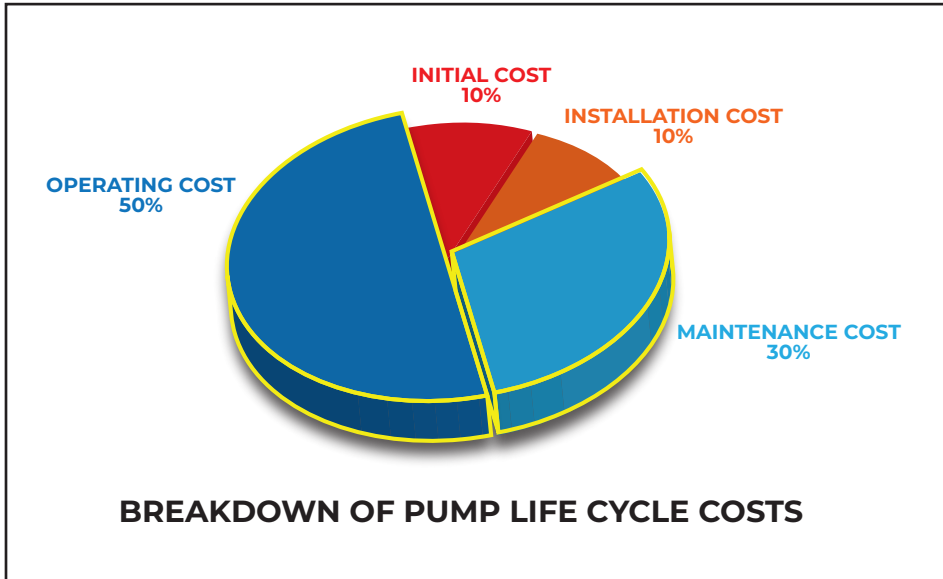
Flexibility to address changing conditions:

Chemical manufacturers face challenges when a plant's process conditions change. For two years, plants (in almost every industry) have either reduced capacity or quickly ramped up capacity. As process conditions change, equipment needs to be tuned and re-rated. It is important for pump manufacturers to make flexible equipment that can be easily adapted to address changing plant requirements.

Availability despite supply chain issues:

Every business today faces supply chain issues. CPI users that require highly





engineered equipment (as opposed to standard “off-the-shelf” pumps) should consider the lead times associated with conceptual design, procurement, construction, testing and commissioning. Equipment providers can mitigate long delivery times by manufacturing equipment on multiple continents. It is imperative to have a manufacturing presence in both North America and Europe.

Examining the total cost of ownership

About 10% of the cost for equipment is the initial purchase. Another 10% comes from the installation.

Almost 50% of the total lifetime costs are operating expenses (i.e. the power bill). Single-stage pumps can deliver multistage performance. Efficient designs should be specified where smaller motors can be used to save on power costs.

Roughly 30% of equipment total cost of ownership (TCO) is due to maintenance costs. To increase pump reliability and to reduce maintenance costs, equipment used in the CPI must be engineered to run at its best efficiency point (BEP). The use of corrosion-resistant materials and secondary containment options extends meantime between maintenance (MTBM) intervals, while also reducing the need for unplanned

maintenance. There is also a wide range of ancillary financial benefits that come from deploying sealless pumps for CPI applications—eliminating seals means there are no seal support systems to maintain. In addition to simplifying installations and reducing spare part inventories, this also enables maintenance resources to be deployed elsewhere in the plant. Eliminating leaks and emissions reduces additional risks with Environmental Protection Agency (EPA) monitoring. Minimizing the probability of accidents reduces a plant’s liability, which can help to reduce insurance costs.

When it comes to deploying pumps for CPI applications, operators should seek equipment that is safer for operations and better for the environment, and they should seek solutions that offer the best total value. The eight criteria presented in this article provide operators with a useful guide to evaluate and select the right pumps for chemical processing applications.



Michael Romano is Sundryne's Global Strategic Accounts senior director. Romano can be reached at michael.romano@sundryne.com. For more information, visit www.sundryne.com.