

Why Material Selection Matters in Corrosive Pumping Applications



When a pump fails prematurely, one potential cause of failure can be traced back to a decision made before installation: material selection, namely metals.

In wastewater, construction, and marine environments, the liquid being pumped will impact submersible pump components, both mechanically and chemically. The right material choice directly affects service life, downtime, and total cost of ownership.

When evaluating a pump, components are typically constructed from metals for strength and durability. However, different metals have tradeoffs in terms of cost, chemical resistance, machinability, strength, and durability. When comparing common materials at glance, cast iron is cost-effective and structurally strong; it performs well in neutral pH applications. In corrosive environments, however, high or low pH liquids and aggressive chemicals can quickly compromise casings and motor housings, increasing the likelihood of repair or replacement.

For broader protection, 304 stainless steel is widely used in industrial applications due to its high corrosion resistant composition and formability. Made with roughly

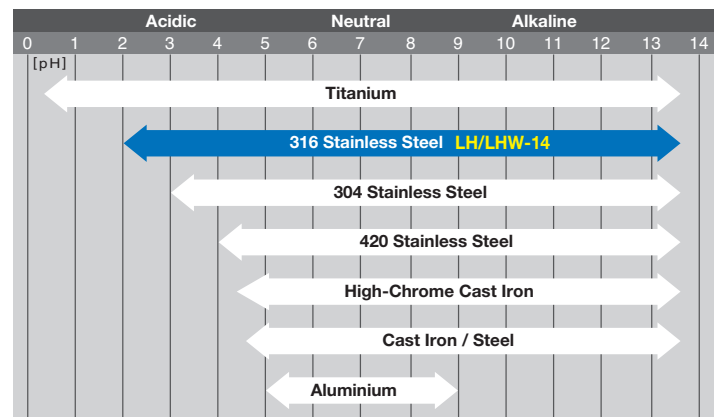
18% chromium and 8% nickel, 304 stainless steel can handle liquids as low as 3 pH. When wastewater contains unspecified chemicals, operators tend to default to stainless steel, with 304 serving as a practical starting point. If additional resistance is not required, it can deliver strong performance at a lower price than higher grade materials.

When applications involve strong acids or chlorides, 316 stainless steel is often recommended. A key difference between 304 stainless steel and 316 stainless steel is the inclusion of molybdenum; 316 stainless steel offers strong resistance to acids, chemicals, and pitting or crevice corrosion due to a composition of roughly 2-3% molybdenum. 316 stainless steel is well suited for environments approaching 2 pH, including coastal applications and chemical heavy wastewater.



Material selection matters—corrosion-resistant metals extend pump life across demanding pH environments.

pH Values and Corrosion Resistance of Tsurumi Pumps



The above data is a rough indication for sulfuric acid (H₂SO₄) and sodium hydroxide (NaOH). Metals are affected by the type of acid/alkali, seal material, painting and abrasive environment.

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Choosing the right pump materials for corrosive environments is critical to maximizing service life, minimizing downtime, and controlling total cost of ownership.

In saltwater, brackish water, or high chlorine laden conditions, titanium serves as a preferred solution. Unlike stainless steel, which is an alloy, titanium is an elemental metal with inherent corrosion resistance. It forms a stable oxide layer that protects against calcium chlorides and other chemicals that may attack stainless steel. Titanium is significantly lighter and more corrosion resistant than stainless steel, but it is also more expensive and difficult to machine. In many pump designs, titanium is used selectively for motor housings and fasteners, while other wetted components may be constructed from engineered plastics to manage cost.

Balancing Performance, Cost, and Risk

If replacing a failed pump and unsure of what material to select, understanding how the previous unit failed is critical. Users should cross-reference the composition of the chemicals in the wastewater with a chemical compatibility chart to evaluate the effectiveness of various materials. In situations where exact chemical composition is unknown, 304 stainless steel is often used as a starting point due to

its broad chemical resistance. Without detailed application data, material selection becomes a real-world test, and users must continually monitor the pump and be prepared for the possibility of iterative adjustments.

From a pricing standpoint, stainless steel and titanium are typically a higher price point than cast iron. For short duration uses, repeatedly replacing lower-cost pumps may be more economical than investing in premium materials. Exploring chemical resistant coatings is an additional factor to be evaluated when comparing cost and pump lifespan. In long term applications, corrosion-related downtime and component replacement can quickly outweigh initial savings.

It is also important to evaluate other pump materials that are in contact with the liquid, such as buna or Viton gaskets, ABS and other plastics, and PVC or neoprene for cables.

Effective material selection begins with understanding the environment. When corrosion risk is properly evaluated, service life improves, maintenance decreases, and costly downtime can be avoided.

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ABOUT TSURUMI

Tsurumi (America), Inc., a division of Tsurumi Manufacturing, was founded in 1979. Headquartered in Glendale Heights, Illinois, Tsurumi (America), Inc. has bases in Quebec, Canada; El Paso, Texas; and Salt Lake City. Globally, Tsurumi is active in 45 countries and has been an innovator in the pump industry since 1924. Tsurumi (America) is a provider of leading pumping technology in construction, civil engineering, mining, industrial wastewater, municipal wastewater, sewage treatment, flood control and scenery creation fields. Tsurumi products are backed by independent, third-party verification. Beyond leading pump technology, Tsurumi (America) is recognized for its robust distribution network and one of the largest on-hand inventories in North America.