

# PUMP DESIGN REIMAGINED



Solve 3 Hygienic Pump  
Processing Challenges with  
Unibloc<sup>®</sup> CleanPlus<sup>™</sup> Pumps

# Hidden Costs Lurk at the Heart of the Industrial Processes: The Indispensable Transfer Pump



**It's 2 a.m. Your phone rings. Production has stopped completely. A rotor bolt backed out during operation, causing catastrophic pump failure. An entire product batch is at risk, and replacement parts won't arrive until tomorrow afternoon.**

Transfer pumps form the backbone of processing operations across pharmaceutical, cosmetic, and tanker truck industries. Yet these critical assets frequently become sources of expensive downtime, contamination risks, and maintenance headaches.

When these essential pumps fail, the consequences trigger a cascade of problems: emergency maintenance calls, production delays, product loss, and frustrated teams scrambling to minimize damage. The financial drain from a poorly designed pump extends far beyond its purchase price.

Unibloc® Hygienic Technologies recognizes these costly realities and engineered its CleanPlus™ pump solution to directly combat three critical challenges:



## Preventable Catastrophic Failures

A rotor bolt torqued incorrectly can lead to crushed sleeves, deflected shafts, or the bolt backing out during operation—causing noisy, destructive pump failure.



## Time Theft

Clean-Out-of-Place (COP) applications, traditional lobe pumps require up to two hours for routine cleaning and maintenance. When maintenance crews spend six times longer than necessary on pump cleaning, the labor cost multiplies across every cleaning cycle



## Hidden Contamination Risks

When plastic components wear inside a pump, microscopic particles can enter your product stream, potentially triggering costly recalls and regulatory scrutiny.

## The Evolution of Hygienic Pump design

Hygienic pump technology has evolved monumentally over the past several decades in response to every nightmare we've just described – the demands for operational efficiency, product purity, and regulatory compliance with sanitary conditions. This progress has been significantly fueled by the cross-pollination of design principles across diverse processing sectors from the stringent demands of food and beverage to the precision needs of pharmaceuticals. Each sector has contributed distinctive requirements and solutions that can benefit the others.

UHT engineers developed their specialized hygienic pump design in the demanding food and beverage industry, where the Unibloc® QuickStrip® FoodFirst line established simplified maintenance, plastic contamination prevention, and operational reliability.

The food and beverage industry has been a notable driver of advancements in hygienic pump design due to its combination of uncompromising sanitation requirements, high production volumes, and severe cost implications for downtime or contamination. These pressures created an environment where innovative approaches to pump design became necessary rather than optional.

Subsequently, industry analysis and customer feedback revealed that the same technical and hygienic challenges addressed in food processing exist across pharmaceutical, personal care products, cosmetics, and chemical processing sectors, although with additional requirements specific to these applications. To transfer pump technology from the food industry to industrial applications, UHT engineers had to address several additional considerations:

1. **Integration with Clean-in-Place (CIP) systems, which have become standard in many industrial processing environments.**
2. **Capability to handle materials at elevated processing temperatures, often exceeding 350°F (177°C).**
3. **Simplified maintenance procedures adaptable to various levels of technical training.**
4. **Improved methods to enhance reliability, specifically designed for equipment that runs continuously.**
5. **Compatibility with a wider range of chemical compounds and viscosities.**

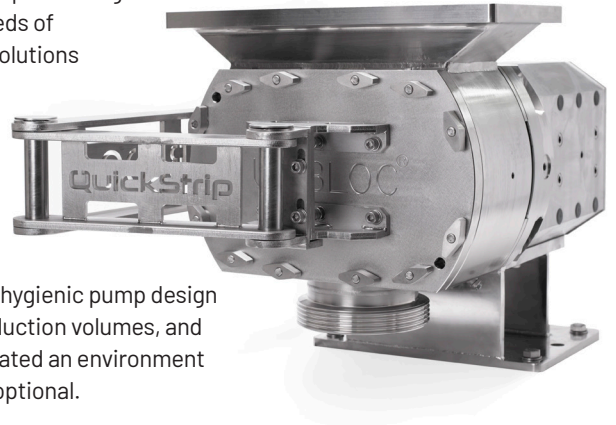
This technology transfer—where innovations developed for one industry segment are adapted and enhanced for others—leverages proven advancements. Similar examples can be seen in valve technologies, instrumentation systems, and control architectures, where solutions initially developed for one application area gradually migrate to others as their benefits become apparent.

## Rotor Design and Reliability

When examining the factors affecting operational efficiency, several indispensable areas of pump design merit careful consideration. The first of these is how the rotor bolts are designed and maintained.

For instance, pressure spikes in the flow of product into the pump exert radial force on the rotor shaft, which can lead to shaft flexing and seal failure. Seal failures are not just messy—they cause costly downtime, product waste, and missed deliveries.

What's more, given the tight spacing between rotor and housing (necessary for efficiency), even a small flex in the shaft could result in the rotor galling the housing, which could lead to crevices for bacteria. In hygienic applications, any galling will compel managers to take the pump out of service and pay for costly repairs. This is why traditional lobe pump designs secure the rotors to the shaft using rotor bolts.



This common approach to securing the rotors creates a delicate balance. Maintenance technicians must torque bolts carefully to specification: excessive torque can crush sleeves or cause shaft deflection, leading to leaks and housing damage, while insufficient torque risks bolts backing out during operation. Unfortunately, technicians are not always well trained and are often in a hurry.

The complexity of torquing rotor bolts translates directly into operational inefficiencies:

- **Potential for catastrophic pump failure if procedures aren't followed precisely.**
- **The need for specialized torque tools and personnel training.**
- **An additional maintenance step.**

Alternative pump designs have explored securing methods that eliminate threaded fasteners entirely. For COP pumps, UHT developed a bolt-free solution that eliminates the risk of improper rotor bolt torquing and associated damage.

That original QuickStrip pump design, successfully deployed in thousands of pumps still in service, uses a cover-mounted bushing to stabilize the rotor. The bushing is easy to clean in COP applications, but it is incompatible with Clean-in-Place (CIP) applications that require unhindered access to cleaning solutions.



## Clean-in-Place Compatibility

CIP processes represent a standard cleaning approach in many applications. In designing a QuickStrip pump capable of both CIP and COP processes, UHT engineers considered the problem: how could they stabilize the bolt-free rotor in a design that is CIP-able? The engineering solution had to simultaneously solve two competing requirements:

1. **Ensure cleaning solutions can access all product-contact surfaces during CIP cycles.**
2. **Maintain shaft stability to prevent deflection during pressure fluctuations.**

Their answer is the patented FlushCap® bearing. Located in the pump cover, the FlushCap ensures the rotor has proper clearance with the cover. As its name suggests, the cap is flush with the cover, allowing cleaning solutions to penetrate the space.

Implemented in Unibloc QuickStrip pumps, the FlushCap bearing extends the benefits of a bolt-free rotor to CIP applications.



## Considerations for Product Purity

Product purity represents a vital concern in pharmaceutical, biotech, personal care products, and cosmetic applications.

Pump designs often incorporate PTFE (Teflon) rotors. According to pharmaceutical industry experts, PTFE particulate contamination from equipment failure is among the causes of product recalls, attracting regulatory scrutiny and potentially damaging a company's reputation.

As plastic rotors wear, microscopic particles can enter process flows, sometimes remaining undetected until late-stage quality control. Scientific studies have detected the presence of microplastics in human blood, and health concerns are growing.

All-metal rotors offer an alternative approach that eliminates the risks associated with plastic. Unibloc CleanPlus rotors are milled from a single billet of stainless-steel, avoiding weld transitions that could harbor product or bacteria.



## Maintenance Time Management

While CIP processes are ideal for many applications, certain high-viscosity applications still require manual cleaning. In these scenarios, the time required for pump disassembly and cleaning becomes an essential operational factor.

With traditional pump designs, manual cleaning is a labor-intensive process typically requiring:

- Specialized tools for disassembly.
- Multiple components to track and clean.
- Complex reassembly procedures.
- Skilled personnel with specific training.
- Extended downtime for the cleaning process.

This complexity translates directly into increased operational costs, with cleaning times often extending to two hours or more per pump.

Engineering advances in quick-disassembly designs have demonstrated major potential to transform cleaning processes. A Unibloc QuickStrip pump eliminates the need for tools, minimizes component counts, and uses one-way designs that cannot be installed backward. These innovations can reduce manual cleaning cycle times by up to 83%, offering substantial advantages for facilities where frequent manual cleaning is required.

Even in applications where cleaning is automated (CIP), the Unibloc QuickStrip design enables occasional maintenance to be performed swiftly and easily.



## Total Cost of Ownership

When evaluating industrial pumps, the initial purchase price represents only a fraction of the total lifecycle cost. A comprehensive assessment must include maintenance labor, downtime costs, replacement parts, training requirements, and risk factors.

While the initial acquisition cost of Unibloc CleanPlus pumps may be higher than conventional alternatives, the total cost of ownership analysis reveals significant advantages across five critical areas:

	<b>Maintenance Labor:</b> Traditional pumps require two hours per cleaning cycle, while Unibloc CleanPlus pumps need just 20 minutes. With weekly cleaning, this translates to approximately 450 labor hours saved over five years.
	<b>Downtime Costs:</b> Traditional pumps carry a higher risk of catastrophic failure, while Unibloc CleanPlus pumps eliminate the risk of rotor bolt failures. Prevention of even one major failure can justify the entire cost differential.
	<b>Replacement Parts:</b> Traditional pumps require a higher inventory of multiple components, while Unibloc CleanPlus pumps feature a simplified design with fewer parts, reducing inventory carrying costs and eliminating emergency part orders.
	<b>Training Requirements:</b> Traditional pumps demand specialized training for proper torquing and assembly, while Unibloc CleanPlus pumps offer intuitive design with one-way assembly, reducing training costs and allowing greater flexibility in staff assignment.
	<b>Risk Factors:</b> Traditional pumps present higher contamination risk and failure probability, while CleanPlus pumps enhance product purity and eliminate key failure modes, reducing the risk of batch rejection and regulatory issues.

## Real-World Case Studies

The Unibloc QuickStrip CleanPlus pump design has demonstrated its value across multiple industrial applications:



### Pharmaceutical Processing

A manufacturer of sterile injectables was experiencing frequent pump failures due to improper rotor bolt torquing during maintenance cycles. After switching to Unibloc CleanPlus pumps, they eliminated this failure mode entirely and reduced their cleaning time by 70%, allowing for increased production capacity without adding maintenance staff.



### Cosmetic Manufacturing

A producer of high-end creams and lotions faced challenges with PTFE contamination from conventional pump rotors. The switch to Unibloc CleanPlus pumps with all-stainless construction eliminated this risk while also enabling faster changeovers between product formulations, increasing production flexibility.



### Tanker fleet operations

A chemical transport company struggled with extended cleaning times between loads, limiting equipment utilization. By adopting CleanPlus pumps with the QuickStrip design, they reduced cleaning times from hours to minutes, improving fleet utilization and reducing driver waiting time.

## Unibloc CleanPlus™ Pumps

The Unibloc CleanPlus™ pump line offers compelling versatility across a wide range of application requirements with port sizes from 1-inch to 8-inches, flow rates up to 500 gallons per minute (1900 liters per minute), and temperature capability up to 400°F (204°C). All units feature full CIP compatibility, FDA-compliant materials of construction, and 316L stainless-steel product-contact surfaces.

## Conclusion: The Future of Hygienic Pump Design

The Unibloc CleanPlus pump line represents a significant advancement in hygienic pump technology, addressing longstanding limitations in conventional designs. By eliminating rotor bolts, incorporating all-stainless construction, enabling full CIP compatibility, and dramatically reducing maintenance time, these pumps deliver measurable operational improvements for industrial processors.



For maintenance managers, process engineers, and operations directors facing pump-related challenges, the Unibloc CleanPlus line offers a proven solution based on a design that has been battle-tested in thousands of installations across demanding applications.

As processing operations continue to focus on efficiency, reliability, and product purity, innovations like the Unibloc CleanPlus pump demonstrate how rethinking traditional equipment design can deliver substantial returns on investment through reduced operating costs and enhanced performance.



## About Unibloc® Hygienic Technologies

An experienced participant in flow control technology and performance, Unibloc Hygienic Technologies offers precision-engineered positive displacement pumps, AODD pumps, drum pumps, and other highly engineered products for demanding hygienic flow control applications. UHT serves a variety of hygienic industries, including food, beverage, bakery/confection, meat and poultry, brewery, pharmaceutical, and transportation, under the Unibloc®, Flotronic®, Hygenitec™, and Standard Pump subsidiary brands. UHT's highly efficient, easy-to-maintain products help customers fight downtime, achieve a lower cost of operation, and meet deadlines with confidence. For more information, visit [unibloctech.com](http://unibloctech.com) or contact a UHT representative to discuss your specific application requirements.

Unibloc Hygienic Technologies provides a broad portfolio of powerful solutions for companies around the world.



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