

The Use of Pumps in Pharma Flow and Treat Products will be Shaped by Innovation

With the recent growth of the pharmaceutical sector, the medicinal industry requires innovations from industrial pump suppliers. The route to better products and higher profits will ultimately come from the Innovation-TCO-Profitability Causation Loop.

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A Growing Industry

The pharmaceutical industry has grown faster than other industry sectors; it currently spends approximately USD \$10 billion on flow and treat products, see Figure 1. For many years the various pumps have been used for pharmaceutical applications. Now, the research and development of new medication has led to an increased push to determine which pumps are best suited to the pharmaceutical industry.

The rapidly evolving industry has developed new drugs that can treat diseases, such as cancer, without harming patients. The common challenge with these medications is, however, that they utilize the cells from within each individual patient to create a drug, which can therefore only be used by that patient.

Manufacturing these single-patient drugs has been a real struggle for manufacturers because the quantities are small, and it is very difficult to switch from the previous batch to a new one without contamination. This manufacturing difficulty has resulted in an increased use of single use technologies which are both very expensive and vulnerable to damage.

Pharmaceutical Pump Options

There is currently a debate concerning the best pump designs and materials for flow and treat products, as single use pumps are now an alternative to multi use. While there are four main categories of pumps, including: centrifugal, reciprocating, diaphragm, and rotary, rotary pumps are often chosen for these applications. Within rotary there are a number of sub segments including progressive cavity and peristaltic.

For example, SEEPEX CS progressive cavity pump's design features are well suited for applications in the pharmaceutical and cosmetic industry. In order to ensure sterilization, specific design features are sought after, such as:

- CIP and SIP (clean in place and sterilization in place),
- Complies with US 3-A Sanitary Standards and the EHEDG guidelines,

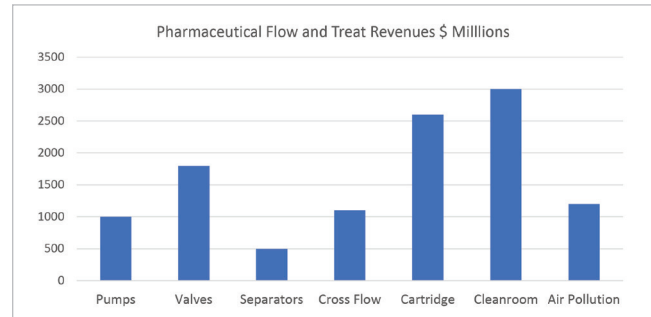


Figure 1.

- Gentle, low-pulsation transfer of sensitive media,
- High metering accuracy,
- High operational safety, and
- Ease of maintenance.

A common challenge in the creation of flow and treat products is the pumping of living cells in a bioreactor. Although peristaltic pumps are suitable for operating bioreactors, continuously pumping (circulating) living, viable cells is a challenge; regular peristaltic pump heads damage the cells over time due to mechanical interaction. If however the peristaltic pump is gentle, and designed for shear sensitive media, the dosing process can be dramatically sped up.

Sealless magnetic drive centrifugal pumps, are another common pump type that have been widely deployed in pharmaceutical-grade freeze drier applications and used by several companies for vaccines, including COVID-19 vaccines.

Freeze drier applications play a critical role in the storage and transportation of vaccines. Pharmaceutical freeze drying is a standard process used to stabilize vaccines and other biologicals; it is also used to increase shelf life. Pumps are used to deliver various cooling mediums to lower product temperatures below freezing. High-pressure vacuum technology is also used to extract water to preserve pharmaceutical products for storage and transport.

Examples of Innovation

Innovations in the pharmaceutical pump industry have played an important role in ensuring that flow and treat products are generated and transported in an efficient and effective manner. Some of these factors include:

- **Reliability** – ensuring that components are designed to handle a wide range of chemicals and solvents.
- **Durability** – using materials and technology that can protect both the pump and the media being transferred.

- **Simple maintenance** – constructed in a way that allows for routine maintenance without the need for special tools or training.
- **Energy efficient**
- **Single use properties** – elements that can be replaced with ease to eliminate the need for complex sterilization and cleaning validation.

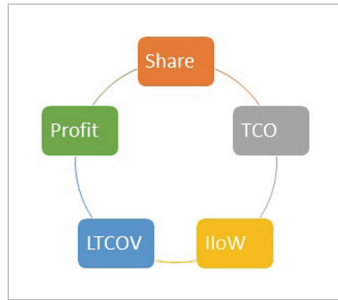


Figure 2.

TCO Evaluations

In the past, manufacturers with many successful installations could use their large market share to validate their equipment. The argument was that if all these users find a product to be the best so will a new purchaser. In the new environment purchasers want accurate cost of ownership evaluations for new and better options. More specifically, the availability of new pumps and materials to meet the new requirements necessitates a new approach to determine which alternative will provide the lowest total cost of ownership.

The media, suppliers, and associations are providing instant access to the latest information. In effect this is an Industrial Internet of Wisdom (IloW) which allows the user to determine which product has the lowest total cost of ownership. What is being created is an Innovation – TCO- Profitability Causation Loop consisting of:

- Market share,
- Total cost of ownership (TCO) for the innovation,
- Industrial Internet of Wisdom (IloW),
- Lowest Total Cost of Ownership Validation (LTCOV),
- Profit margin and total profits.

The TCO for the innovation can now be validated with IloW. LTCOV convinces the customer to pay a higher price for the product. In turn the higher price results in higher profits. Funds are then available for more R&D. This investment leads to new and better products and the cycle continues, as highlighted in steps 1 through 8 below.

1. Develop better pumps through an R&D investment.
2. Determine that this pump reduces the total cost of ownership and quantify the lower total cost of ownership (LTCO).
3. With IloW, validate this LTCO even with higher gross margins than achieved with less novel products.
4. Achieve a high market share due to the LTCOV.
5. The high market share plus the high margins will substantially increase profits.
6. A portion of this profit is directed toward additional R&D.

7. The R&D expenditures are made only with careful analysis of the potential to decrease TCO in market niches selected to maximize profits.
8. The successful development on the next new product results in the continuance of the causation loop.

Summary

The pharmaceutical industry is the leader with R&D expenditures averaging 19% of revenues. The pump industry averages 3%. The large investment in pharma has resulted in remarkable cell and gene therapy treatments and a vaccine for coronavirus.

There are many potential niches for pumps in flow and treat products in the pharmaceutical industry (see Figure 3). There are unique conditions, and therefore unique TCO factors, in each segment. The challenge is to quantify the market size and the LTCOV in each niche.

Pump suppliers need to keep pace with their pharma customers. The Innovation-TCO- Profitability Causation Loop is the recommended route.

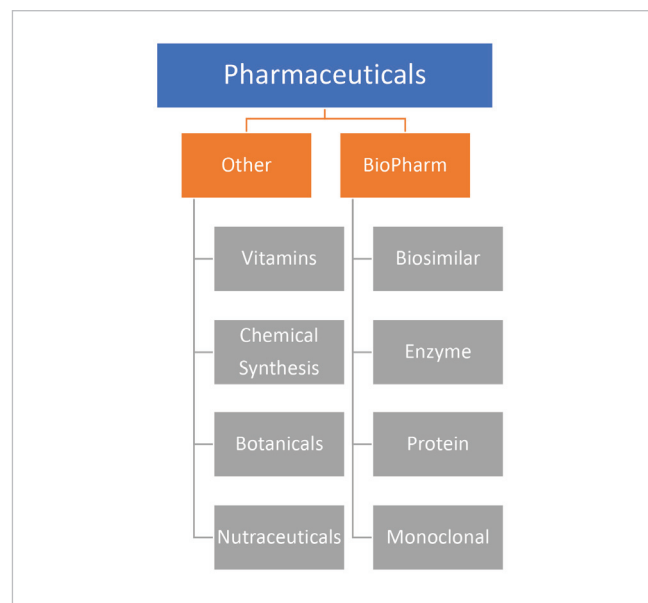


Figure 3.

Reference

1. Pumps: World Market published by the Mcllvaine Company



About the Author

Robert Mcllvaine is the President and Founder of The Mcllvaine Company, which publishes reports across worldwide pump and valve markets. He was a pollution control company executive prior to 1974, when he founded The Mcllvaine Company. He oversees a staff of 30 people in the USA and China.

