

LEVITRONIX®
PUMP SYSTEMS

**HIGHEST CELL
VIABILITY IN
PERFUSION**

DON'T LET A PUMP DESTROY YOUR CELLS

Perfusion establishes the benchmark for high product yield in downstream processing. High cell viability and density should therefore be the major objective.

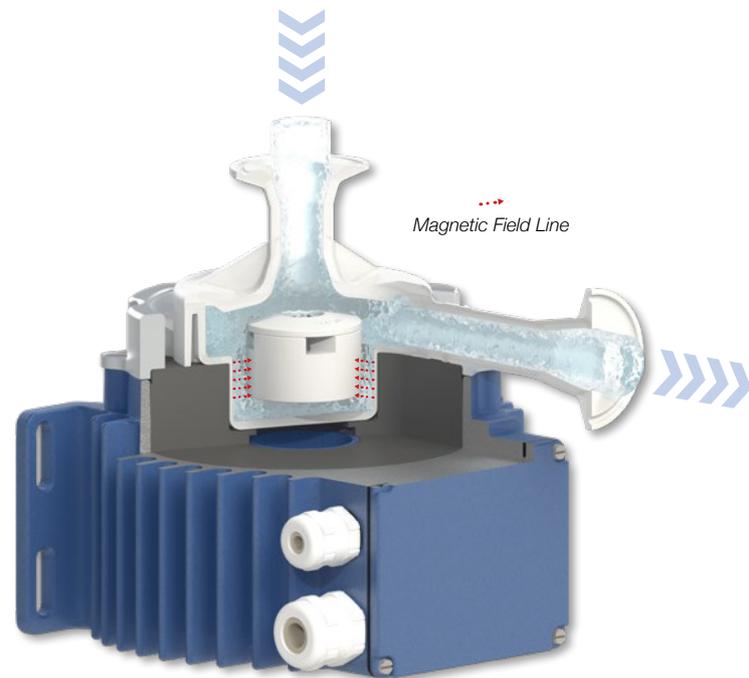
Peristaltic pump systems cause cell damage due to mechanical stress of tube compression. Furthermore, these systems bear the risk of a catastrophic tube rupture due to a possible pressure build-up or tube wear.

Levitronix® pump systems are designed for demanding perfusion applications where ultra low shear and safe processing ensure the highest yield.

ADVANTAGES OF A LEVITRONIX® PUMP SYSTEM

Lowest Shear // Highest Cell Viability

The magnetic levitation technology guarantees that no pump components come in contact with one another enabling a continuous and smooth flow. Additionally, the pump design ensures that no proteins are trapped or damaged by tube compression, eliminating virtually all shear.



The very large gap between the rotor and pump housing guarantees that no cell is being damaged or trapped.

Intrinsically Safe //

Keep Your Product Safe – No More Build Up Pressure or Tube Ruptures

Levitronix® pump systems deliver a pulsation free flow, independent of actual flow or pressure. With optional pressure or flow sensors, the Levitronix® control unit will keep the pressure / TMP or flux constant, independent of fluid or filter properties.

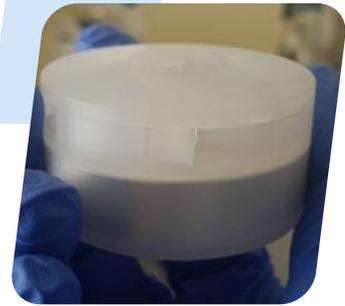
Extremely Long Lifetime // Ideal for Continuous Processing

Due to the constant gap between the impeller and the pump housing, no friction or wear occurs, resulting in a virtually unlimited lifetime.

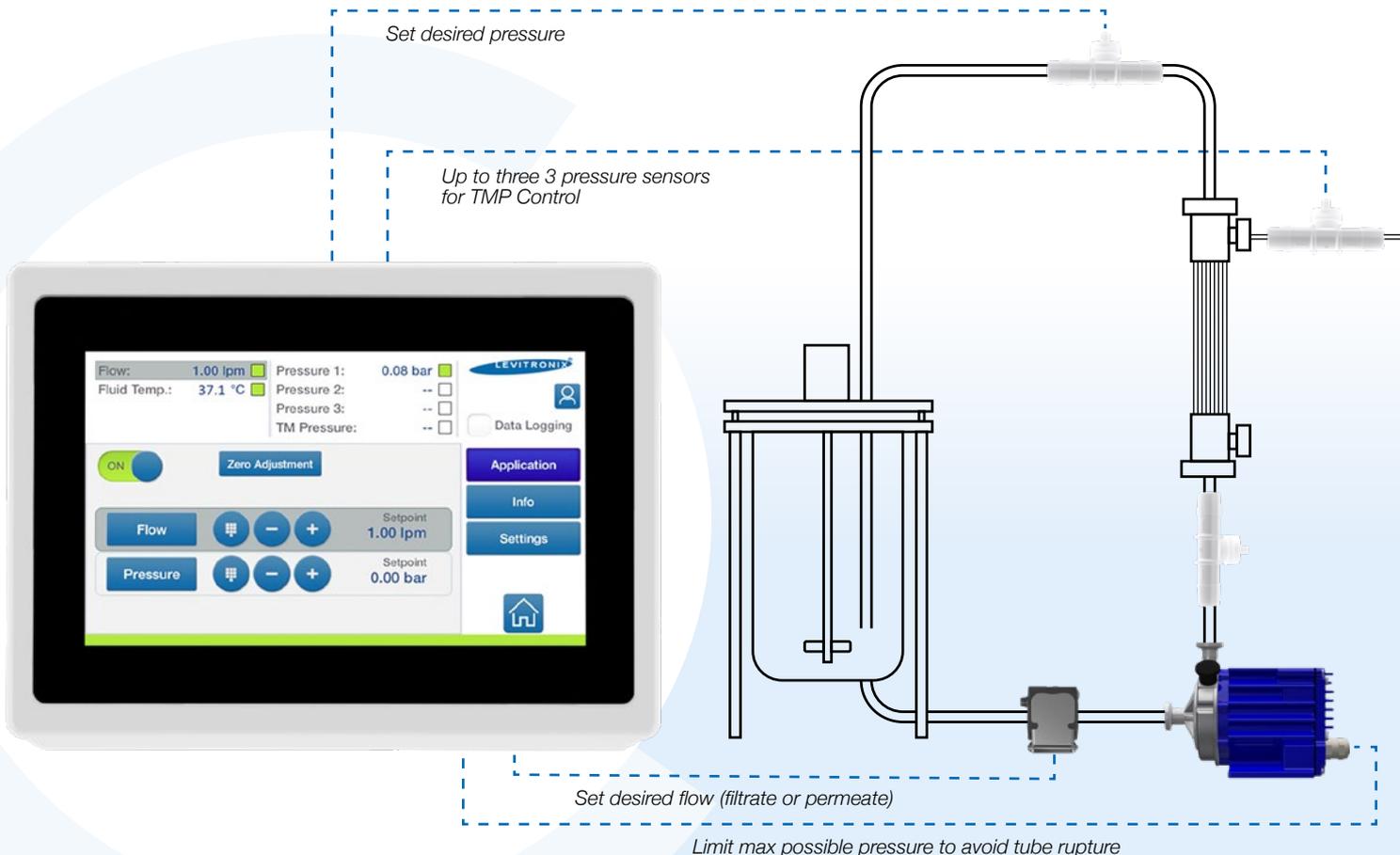
Automated Process Control // Easiest Process Control with the Levitronix® Console

The Levitronix® console offers the option of easy and accurate control of filtrate, and permeate flow, pressure and even TMP. Connect multiple flow sensors and pressure sensors to the console and let the system run at the desired process values, all with a single intuitive control unit.

No sign of wear - Levitronix PuraLev 600 SU impeller after 2 years constant operation



Tube rupture in a peristaltic pump after few days of operation



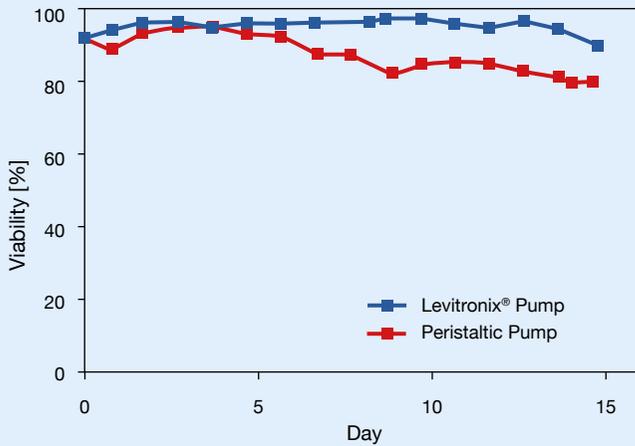
INDUSTRY SUCCESS STORY WITH LEVITRONIX®

Thanks to a worldwide customer satisfaction, Levitronix pump systems are the industry standard in TFF perfusion and make TFF the preferred choice over ATF. A study* by Boehringer Ingelheim compares TFF perfusion with a peristaltic pump to TFF perfusion with a Levitronix pump. Additionally, TFF perfusion with Levitronix is compared to ATF. The results show a massive process improvement in TFF perfusion with a Levitronix pump system.



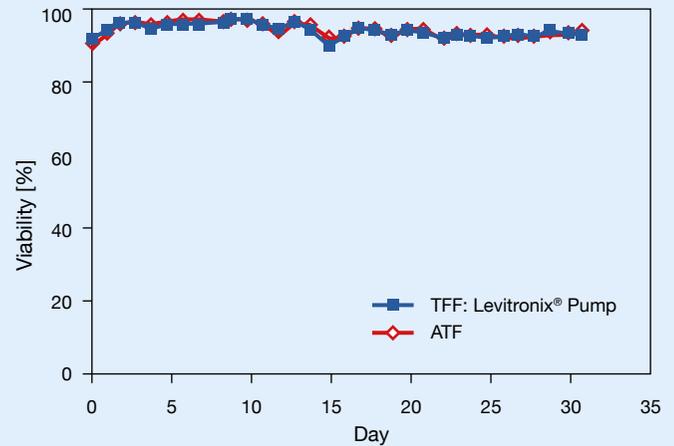
*Wang et al.; Shear contributions to cell culture performance and product recovery in ATF and TFF perfusion systems; Journal of Biotechnology 246 (2017): 52 – 60

LEVITRONIX® VS. PERISTALTIC PUMP SYSTEMS



Higher Cell Viability in TFF Perfusion with Levitronix than with a Peristaltic Pump

TFF (WITH LEVITRONIX®) VS. ATF



Cell viability over time for a TFF perfusion system with Levitronix and an ATF system

“The peristaltic pump used in typical TFF perfusion systems is shown to be the single major contributor to shear stress and cell lysis.”

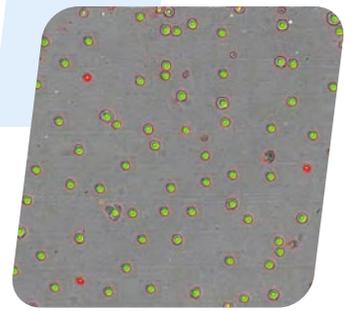
“Replacing the peristaltic pump with a [Levitronix] pump brought cell growth [...] in a TFF perfusion...”

“...performance of a TFF system operated with a [Levitronix] pump was identical to that of an ATF system in terms of cell growth and product sieving.”

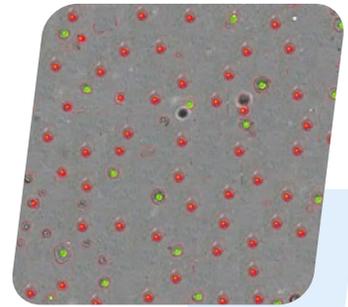
“[Compared to TFF], ATF requires more utilities, its controller is less well understood and is thus arguably less reliable than [...] TFF...”

Highest Cell Viability // Comparison to Peristaltic Pump Systems

Cell viability with Levitronix®



Cell viability with peristaltic pump



Facts

Shear stress due to the pump has a negative effect on cell viability and causes cell death.

Test conditions

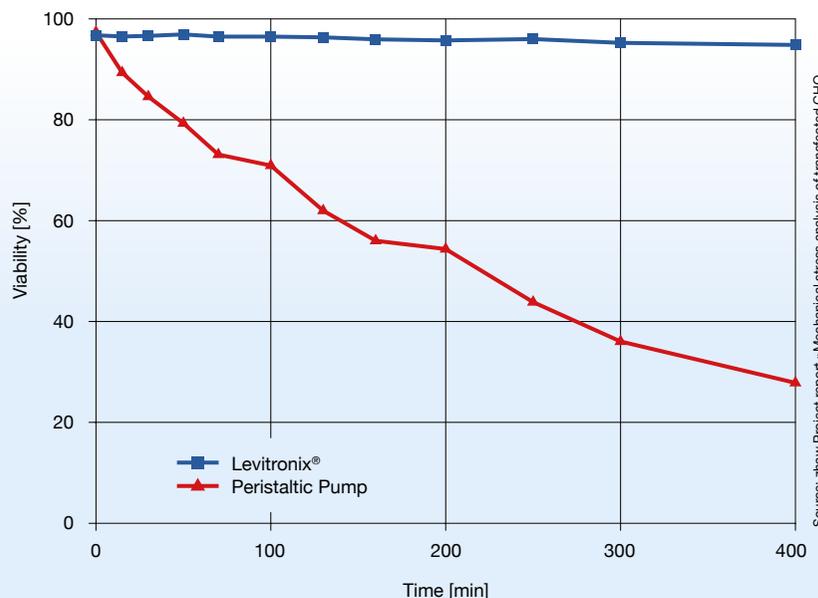
The goal of this study was to compare the mechanical stress on CHO cells created by a Levitronix® pump system vs. a peristaltic pump system. From beakers, CHO cells were pumped into two identical closed loop configurations. Flow rate was set at 3.4 lpm with a limited low backpressure for a period of over 400 minutes. Cell viability was consistently measured and compared.

Results

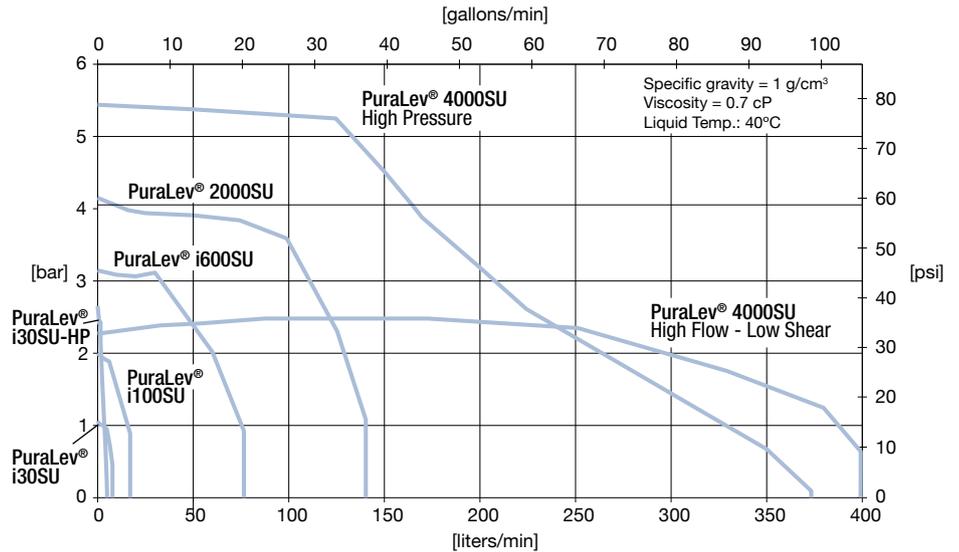
The cell viability of the Levitronix® pump system was consistently above 95%. The peristaltic pump system reached 28%. Similar results have been achieved at four different pressure levels up to 0.5 bar.

CELL STUDY RESULTS

Low shear forces - high cell viability



Time-dependent cell viability in suspension cells pumped at 3.4 lpm under a backpressure of 31 ± 2 mbar



Overview // SU Pump Systems

PuraLev® i30SU

1.0 bar (14.5 psi)
7.7 l/min (2.0 gpm)

PuraLev® i30SU-HP

2.6 bar (38 psi)
4.9 l/min (1.3 gpm)



PuraLev® i100SU

2.0 bar (29 psi)
17 l/min (4.5 gpm)



PuraLev® i600SU

3.1 bar (45 psi)
75 l/min (20 gpm)



PuraLev® 2000SU

4.3 bar (62.4 psi)
140 l/min (37 gpm)



PuraLev® 4000SU High Flow - Low Shear

2.5 bar (36 psi)
400 l/min (106 gpm)

PuraLev® 4000SU High Pressure

5.4 bar (78 psi)
374 l/min (99 gpm)



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