

Functionality of CellTank Single-Use-Bioreactor

How does the CellTank cultivate suspension cell lines in perfusion?

It's easy to understand

1. Typically billions of cells are hosted in one large cavity - the glass/steel Stirred-Tank-Reactor
2. Think opposite - mobilized cells hosted in millions of small cavities in a matrix
3. Then think 500 cells in each cavity
4. It's that simple





Perfusion is a method for continuous cultivation, where cells are harboured inside a 3D matrix / scaffolding and a steady flow of nutrients are fed to the cells, giving a continuous harvest for an extended period.

The CerCore perfusion platform is engineered:

- to increase volumetric productivity by 10-50 times
- to allow perfusion cultivation for months
- to use conventional Process-Control-Systems (PCS)
- to eliminate gradients
- to retain cells in the matrix and hereby avoid external arranged cell retention membranes
- to accept a variety of scaffoldings / porous matrix materials hosted inside each envelope supporting adherent as well as suspension cell lines
- to integrate classical signal SUS pH sensors, DO / non-invasive well and future bio mass sensors
- to be precision E-beam sterilized and ready to use right out of the bag
- to operate with a variety of turntables or servo motors
- to avoid contact between aeration bubbles and cells
- to offer selectable cell bleeding depending on model

CerCore perfusion platform scalable 1:1000

Four different SUB sizes take advantage of the CerCore platform:

- CellCompact 15 ml (33 series - 1 discs)
- CellTank 150 ml (34 and 35 series - 2 discs)
- CellReactor 1,500 ml (36 series - 4 discs)
- CellDream 15,000 ml (38 series - 8 discs)

Photo of CellTank (34 series) shows:

- non-invasive well with inserted Hamilton DO sensor
- non-invasive well for temperature, (empty)
- single-use Hamilton pH sensor installed (blue tip)
- bio mass sensor installed (future white SUS shown)
- single-use mass flow rotameter (G) installed

How does CellTank work?

1. The CerCore platform is a reactor core A designed as a cylinder with stacked two slightly angled and circular envelopes B. The envelopes are arranged parallel with radial / axial inlet / outlet. As the envelope diameter and pair number are variable the incredible scalability is created. The volume span is from a 15 ml to >15,000 ml.
2. The shown CellTank 34 series use non-woven polyester fiber scaffolding / porous matrix F materials to create the millions of cavities to harbour both suspension and adherent cells. Other scaffolding materials may be introduced into the envelopes for specific needs.
3. Internal re-circulation of media inside the SUB insures constant, gradient free access to nutrient and gasses for constant expression of product.
4. Media pump inlet C is at the very bottom. The media passes the impeller D driven by external magnetic forces (not shown) and exits the pump into the reactor core centre E into the triangular volumes and flows further perpendicularly through each of the envelopes / matrix discs F. Having passed the matrix, media is collected in the hollow circumference collection volume in direct correspondence with the built-in media mass flow instrument G capable of 0.4 - 2.4 liter/min.
5. The centrifugal pump D flows 0-3 liter/min at 250-600 rpm depending on cell density ranging up to max practical 1.5×10^8 /ml matrix. Up to 25 Watt of power is required to overcome the 0-50 mBar pressure difference accros the cell packed matrix.
6. Each of the two envelopes B has 50 cm² inlet surface area and close to 80 ml volume. This is also how CerCore creates the 4 - 24 cm/min flux / media velocity accros the 18 mm thick envelopes B in order to avoid gradients.

A simplified CellTank cut open through the center

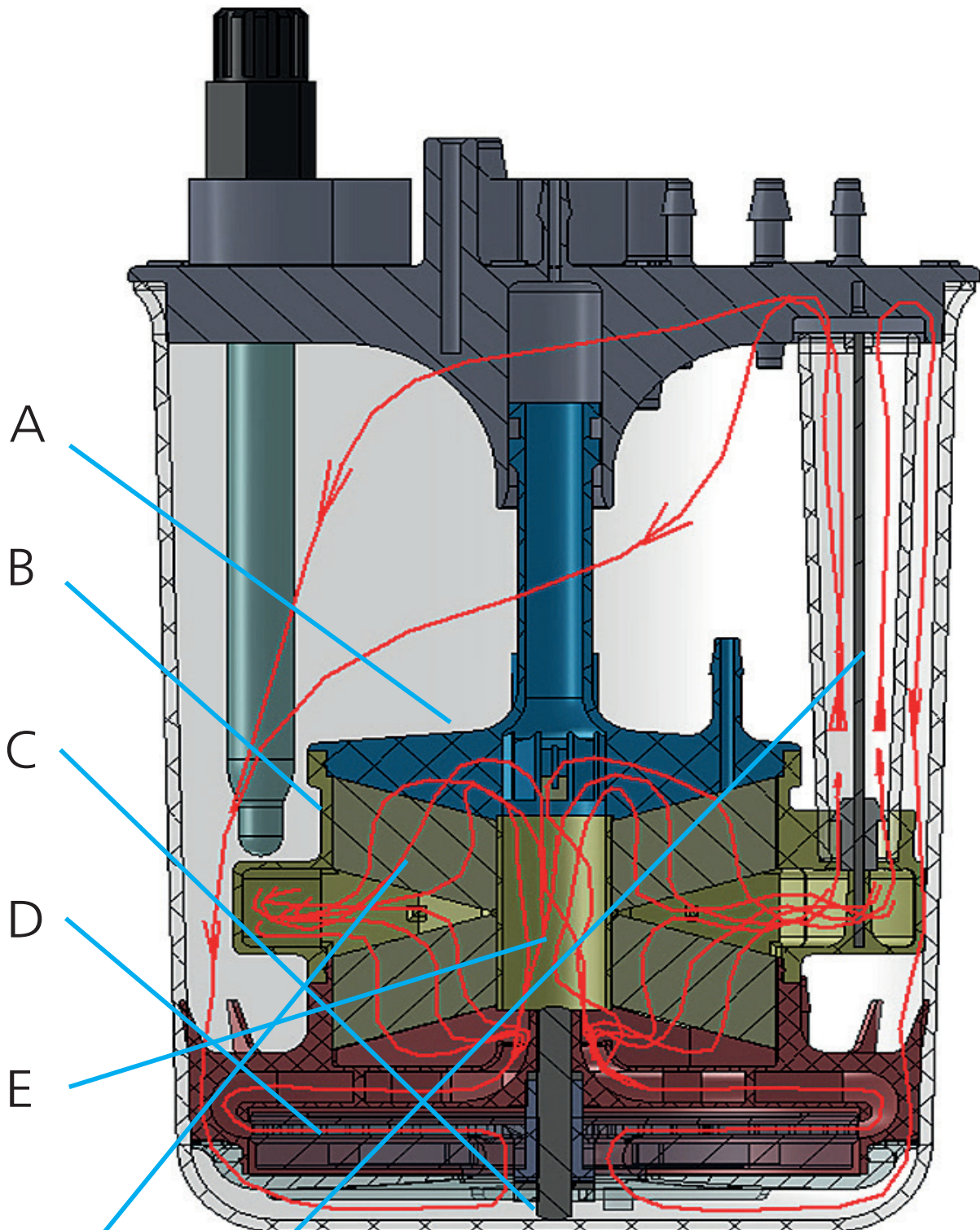
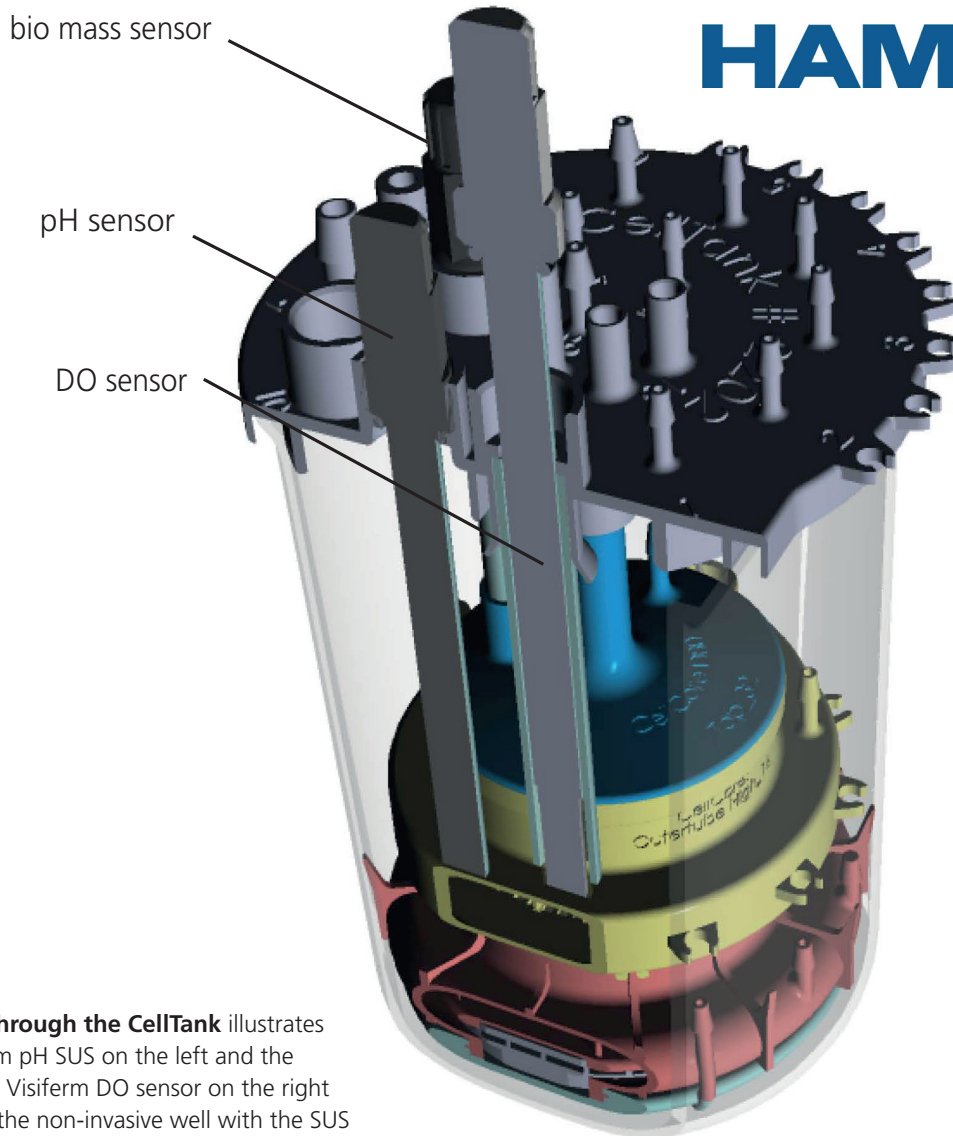


Illustration of constant media re-circulation and flow pattern in CellTank insuring cells obtain gradient free access to nutrient.

- A - Reactor core body
- B - Envelope body, one of two opposite arranged envelopes
- C - Centrifugal pump inlet
- D - Centrifugal pump impeller
- E - Reactor core media distribution center
- F - Porous matrix / scaffold inside envelopes
- G - Mass flow rotameter 0.4 to 2.4 liter/min

Integrated Single-Use-Sensors

HAMILTON 



3D cut through the CellTank illustrates a 120 mm pH SUS on the left and the re-usable VisiFerm DO sensor on the right fitted to the non-invasive well with the SUS optical membrane in the front. The 120 mm bio mass sensor is seen behind the pH sensor.



More information at www.hamilton.ch

More information at www.prolifecell.com

Single-Use-Sensors (SUS) for DO and pH offer the following advantages:

- Integrated SUS eliminates contamination risk
- Saves hours of prep time and labor, as no autoclaving or cleaning is needed
- Enables SUS integrated SUB setup right on the bench – no biosafety cabinet / hood needed for operation
- Optical sensing principle integrated in non-invasive well for the re-usable VisiFerm DO classical sensor
- Extends DO sensor life, as it is never autoclaved
- Classical pH sensor for extended lifetime needed for months of perfusion cultivation
- Classical pH and DO sensor signal fits any PCS