ESCO VACCIXCELL
ADHERENT BIOPROCESSING SPECIALIST

Bioprocess in Motion for Your Upstream and Downstream Needs

A Complete Product Guide from Research to Production

Bioprocess in Motion

Bioprocess involves the utilization of live sources, such as microorganisms, to generate the desired product material. Essentially, the organisms should be kept active and responsive in their niche, under controlled conditions. Upstream bioprocessing dictates the initial stages of the bioprocess, from cell line development, culture expansion to cell harvest. Bioreactors are used to provide the optimal environment to grow organisms that are utilized in different industries such as vaccine production, pharmaceuticals, cosmeceuticals, among others.

Esco VacciXcell offers a wide range of bioprocess solutions from adherent bioreactors to stirred tank bioreactors for your chosen cell lines. As part of the bioprocess equipment manufacturers worldwide, our systems are perfect for research and development up to commercial or manufacturing scale.

Choose The Right Bioreactor for You:

Cells				Proof-of-Concept	Research & Development	Process Development Optimization	PRODUCT
Adherent	Suspension	Fermentation					
		MC	Others				
✔				✔	✔		CelXrocker™
✔				✔	✔	✔	MiniTide™
✔				✔	✔		BelloCell™
✔							CelCradle™
✔							CelCradle X®
✔						✔	TideXcell®
✔	✔	✔	✔			✔	VXL™ Hybrid Bioreactor
	✔					✔	BioXcell®
	✔	✔	✔			✔	StirCradle™
		✔	✔			✔	StirCradle™ -PRO
✔						✔	CelShaker™
✔						✔	CelCradle X® Harvesting System (CCXHS)
✔						✔	TideXcell® Harvesting System


CelXrocker™


MiniTide™


BelloCell™


CelCradle™


CelCradle X®


TideXcell®


VXL™ Hybrid Bioreactor


BioXcell®

Applicable - ✔ **MC** – Microbial Cells

Seed Expansion	Production	Cultivation Vessel Type			Secreted Product Harvest	Non-secreted Product Harvest
		Single-use	Glass	Stainless Steel		
				✔		
		✔				
		✔				
✔	✔	✔			✔	
✔	✔	✔			✔	
✔	✔	✔	✔	✔	✔	
✔	✔		✔	✔		
✔	✔	✔	✔	✔		
✔	✔		✔	✔		
✔	✔		✔	✔		
				✔		✔
				✔	✔	✔
				✔	✔	✔

StirCradle™

StirCradle™ -PRO

CelShaker™

CelCradle X® Harvesting System

TideXcell® Harvesting System

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Table of Contents

Cell Processing Center

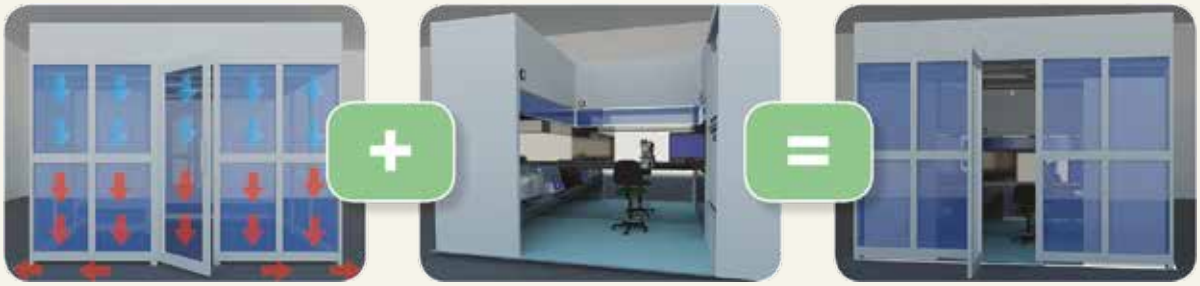
Esco's bio-work station is designed to help you produce biologics as well as cell therapy products efficiently. This workstation is a self-contained system that delivers an efficient and cost-effective GMP-compliant processing and manufacturing solution for applications including regenerative medicine and stem cell therapy. It is designed to be easily customizable depending on the client's requirements.

Cell Processing Center

Features

- Bio-work station with HEPA-filtered airflow and UV sterilization
- Air circulation can be single-pass or recirculating
- Integrated with Esco VacciXcell's bioreactor systems and Esco Scientific laboratory equipment
- Footswitch designed to start and stop centrifuge and incubator shaker
- Pressure gauge to monitor differential pressure across filters and alert the user if filter replacement is necessary
- Positive pressure regime to prevent ingress of airborne contaminants from the external environment.

The Concept



Esco's Grade C (ISO Class 7) modular room

Multi-functional Bio-work station

Self-contained system

Equipment Integration:

- Bioreactor
- Centrifuge
- Incubator
- Shaker
- Others (as not specified)

Applications

- Biologics
- Quality Control
- Cell Handling and Manufacturing
- Stem Cell Isolation
- cGMP Production of Autologous and Allogeneic Therapy

Cradle-Pro Isolator

The Cradle-Pro Isolator fully encloses the entire cell processing procedure in a cGMP compliant isolator. The system combines the CelCradle benchtop Tide Motion bioreactor series and a variety of Esco manufactured laboratory equipment such as CO_2 incubator, Orbicult™ Shaker, and Versati™ Centrifuge, among others.

Features

- Specially designed incubator for isolator integration enables even heating inside the incubator
- Simple pressure test protocol
- Provides an ISO Class 5 environment in work zone
- Integrated 0.22 µm hydrophobic PTFE filter in the CelCradle™ bottle cap
- Individual control of CelCradle™ compression and Orbicult™ shaking function enables independent use of the CelCradle™ bottles

Equipment Integration:

- Biobank
- Peltier Dry Well
- Refrigerators/ULTF
- Dry Shaking Bath
- Autoclave
- Vacuum
- Incubators
- Tide Motion Bioreactors
- Shaking Incubator
- Centrifuge
- Microscope
- Filling System with Optional Single-shelved Freeze Drier
- Glove Leak Tester

Applications

- Cell Banking
- cGMP Stem Cell Manufacturing
- Vaccine Research
- BSL-3/4 Virus Production
- Protein Research

Cell Processing Isolator

An isolator facilitates the isolation of a product or process while providing the required conditions for a sterile/aseptic environment. The Cell Processing Isolator (CPI) provides a comprehensive range of protection, including personnel, product, and environment.

Features

- Easily customizable, depending on client's requirements
- Modular and adaptable solutions for cell and gene therapy, tissue engineering, seed banking, and cell processing
- Integrates Esco VacciXcell bioreactor systems

Base Units

Temperature and CO_2 Controlled Isolator

TFAI | ACTI

Isolator Ready with Esco Cell Therapy Equipment

GPPI | CPI | APPI

Stand-alone Isolator with Third-party Equipment

SCI | HPI

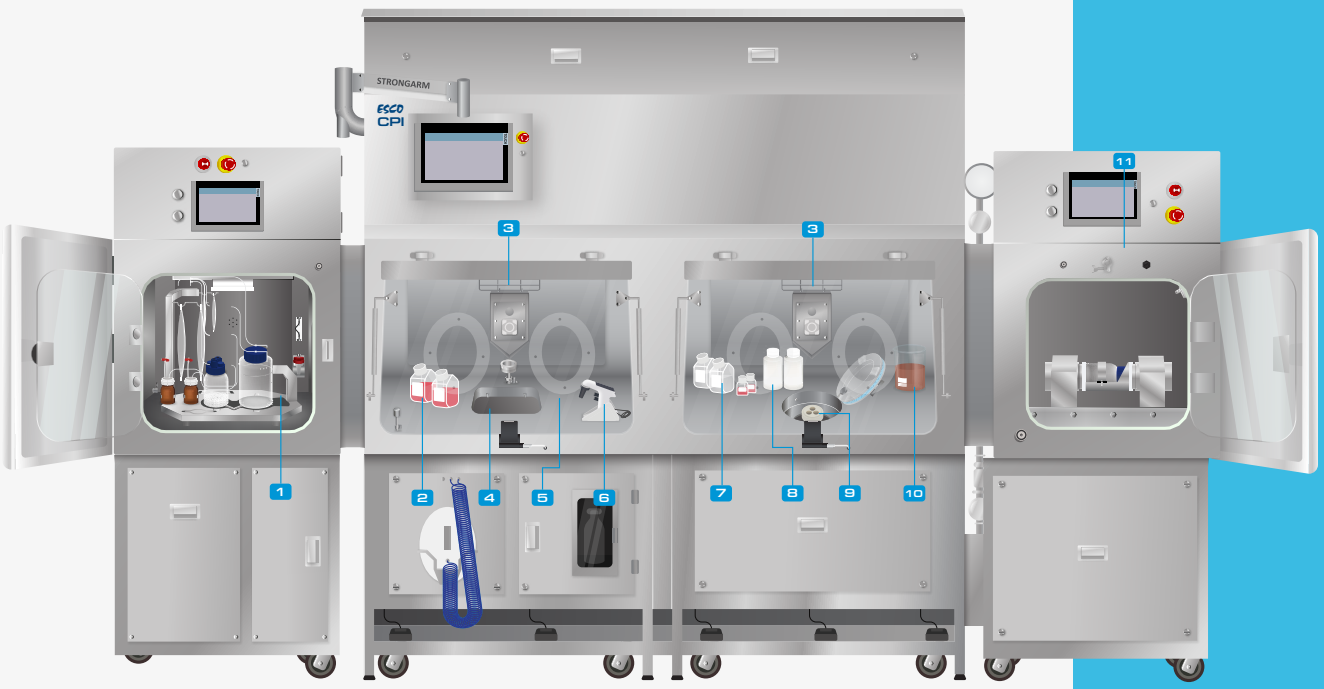
Equipment Integration:

- Biobank
- Peltier Dry Well
- Refrigerators/ULTF
- Dry Shaking Bath
- Autoclave
- Vacuum
- Bioreactors
- Shaking Incubator
- Centrifuge
- Microscope
- Filling System with Optional Single-shelved Freeze Drier
- Glove Leak Tester
- Incubators

Applications

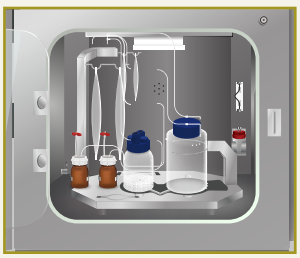
• Cell Processing	• Biosafety/Animal Biosafety Level 3/4 Containment
• cGMP Manufacturing	• Cell Banking
• Aseptic Processing	• Monoclonal Antibody Production
• Small-Scale Potent Material Handling	• Phase III Clinical Trial
• Pharmacy Compounding (Chemotherapy/TPN)	• Protein Production
• Quality Control	• Vaccine Research
• Allogenic Cell Therapy	• Virus Production
• Autologous Cell Therapy	

Our technical and application support will be with you from designing your preferred cell processing containment technologies up to equipment production, to help you achieve and deliver high-quality biologics. Our comprehensive range of bioprocess technologies can facilitate the manufacturing of biopharmaceuticals in a cost-effective, high-quality manner.



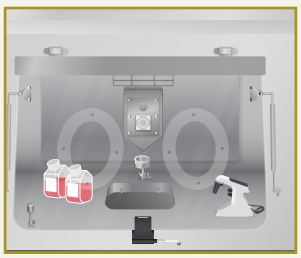
1. CelCradle X® Unit
2. Reagents and media
3. SS Rod (for hanging of bags/pipette and others)
4. Peltier well
5. CCX Bottle
6. Pipettor
7. Enzyme Media
8. Centrifuge Bottles
9. Centrifuge
10. Waste
11. Exit Pass Through Chamber/ CCXHS (Harvester)

Unidirectional Process Workflow



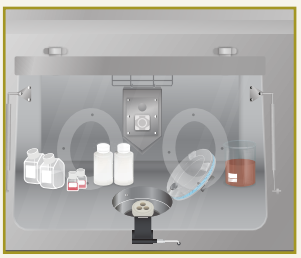
Incubation System

Integration of Tide Motion Bioreactors (may vary based on customer requirements)



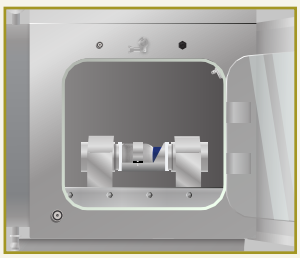
Cell Processing Area

Integration of cell processing laboratory equipment



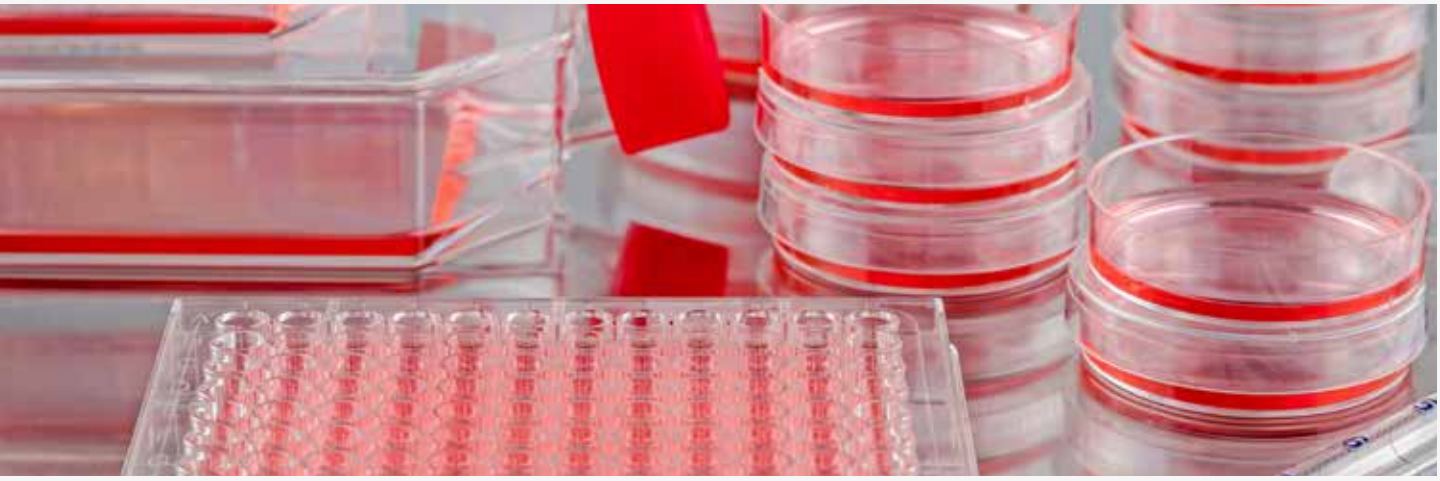
Monitoring and Harvest

Monitoring devices such as microscope and harvest systems are placed in this area



Final Product

Pass-through chamber for final product removal from containment system



Cell Nutrition

The optimum culture media is required to maintain adherent cell culture success. The properties of the culture media allow cells to maintain their viability and grow at higher yields for targeted applications. Whether for expansion, viral propagation, or others, the components of the culture medium should provide energy and compounds to support cell growth.

Plus™ VERO

A powdered-format culture medium for VERO adherent cell growth to achieve higher cell yields as compared to usual basal media.

Plus™ MDCK

A powdered-format culture medium for MDCK adherent cell growth to achieve higher cell yields as compared to usual basal media.

Super Plus™

A cell culture supplement compatible with a commercial basal medium that saves up to 90% serum or serum-free culture medium, is completely defined with low protein content and is free of complex components.

Super Plus™

Plus™ VERO

Plus™ MDCK

GlucCell® Glucose Monitoring System

Glucose Monitoring at Your Fingertips

Maintaining the glucose concentration in the culture medium is essential when growing adherent cells. Some cell lines have high metabolic activity that requires immediate replenishment of nutrients once used up. Knowing when to optimize the media with the right glucose level is important to ensure cells are maintained and grown in a healthy culture environment.

Features

- Portable Meter and Disposable Test Strips
- Sample only 1.5 µL of culture medium
- Obtain results within 15 seconds
- Safe and Secure Handling
- Accurate and Reliable Results
- Powerful memory that can store up to 180 test results

Crystal Violet Dye Nuclear Count Kit

Crystal Violet Dye Nuclear Count Kit is a simple tool used for quantitative analysis of cells. Throughout the cell culture process, cells require regular monitoring in order to understand their growth in the culture medium. The CVD kit consists of reagents that disrupt the cells, enabling the release of cells that are subsequently dyed.

Features

- Consists of crystal violet, citric acid, and detergent
- Easy quantification of cells
- Cell Culture
- Cell Staining

Note: Not recommended for accurate quantification of some cell lines. Staining dyes are recommended based on application.

BioNOC™ II Cell Culture Macrocarriers

The Heart of Tide Motion Bioreactors

Macroporous carriers are matrices that support the attachment, growth, and proliferation of adherent cell lines, including that of animals, mammalian, and insect cells.

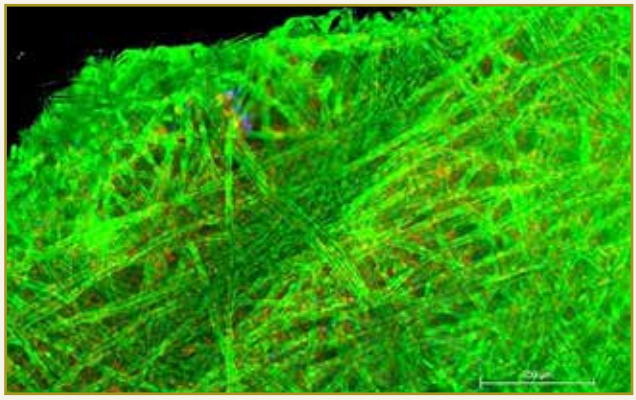
BioNoc™ II macrocarriers promote the growth of adherent cells in combination with Tide Motion Bioreactor systems such as CelXrocker™, MiniTide®, CelCradle™, CelCradle X®, and TideXcell®, and other commercially available packed-bed culture equipment.

Features

- Material: made of 100% PET
- Safe to use: complies to USP <85>, <87>, <881>
- Biocompatibility: high porosity and biocompatible to coating reagents for better attachment
- Larger surface area: up to 24,000 cm^2 per 0.1 L packed-bed volume
- High productivity yield: 2-3 billion VERO cells harvested in just 0.1 L packed-bed volume

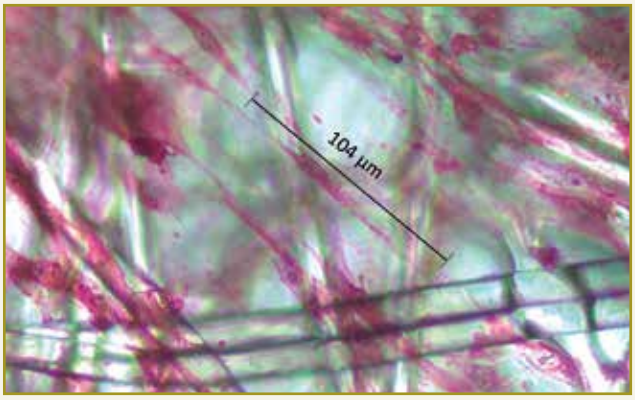
Note: Surface area varies on the cell line used.

VERO Cells



Live cells (fluoresecent) staining of VERO cells on BioNOC™ II under 4x magnification. FDA green stain for live cells and PI red stain for dead cells.

Mesenchymal Stromal Cells



Black arrow points show ECM CL-MSCs cultured 4 days in BioNOC™ II – staining of collagen fibers with picro sirus red.

BioMESH®
3D Macrocarriers

The Next Generation Macroporous Carrier

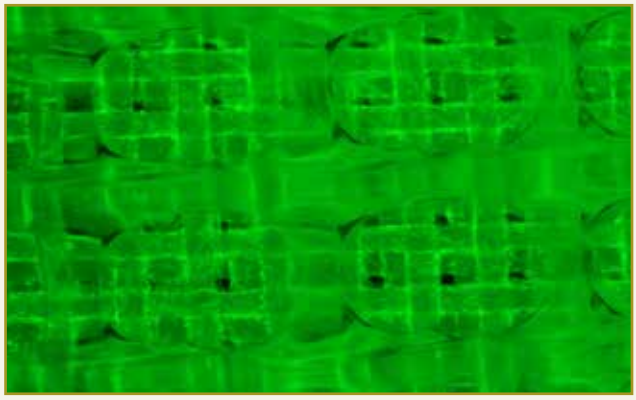
BioMESH® macrocarriers are well-defined surface environment for the growth of adherent cells (MSCs, VERO, HEK293 etc.). Cells can grow undisturbed in 3D while maintaining a stable environment with minimal shear stress through the Tide Motion. These carriers are packed inside a Tide Motion bioreactor that enables adherent cells to grow at high density and produce larger volumes of secreted or non-secreted products.

Features

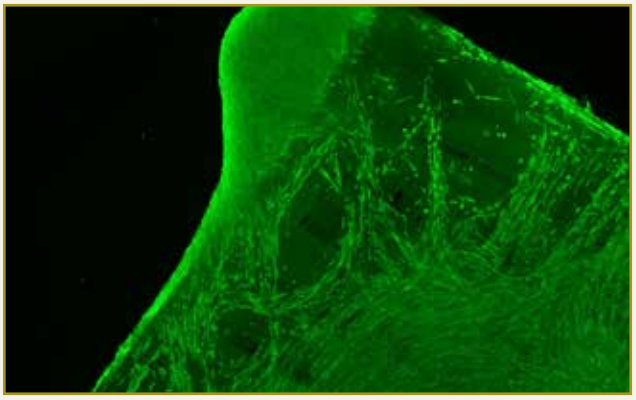
- Highly porous:
  - PET (200 µm)
  - PP (670 µm)
- High surface area for cell growth: up to 23,000 cm^2 per 0.1 L packed bed volume
- Enhanced biocompatibility: coating of attachment factors on carriers is possible
- Safe to use and complies to USP <788> Class VI
- Enables easy cell harvest from the macrocarriers in conjunction with automated harvester when used with Tide Motion bioreactor

Note: Surface area can be larger based on cell line used

Umbilical Cord-derived Human Mesenchymal Stromal Cells



Live cells (fluorescent) staining of umbilical cord-derived hMSCs on BioMESH® under 400 µm magnification.



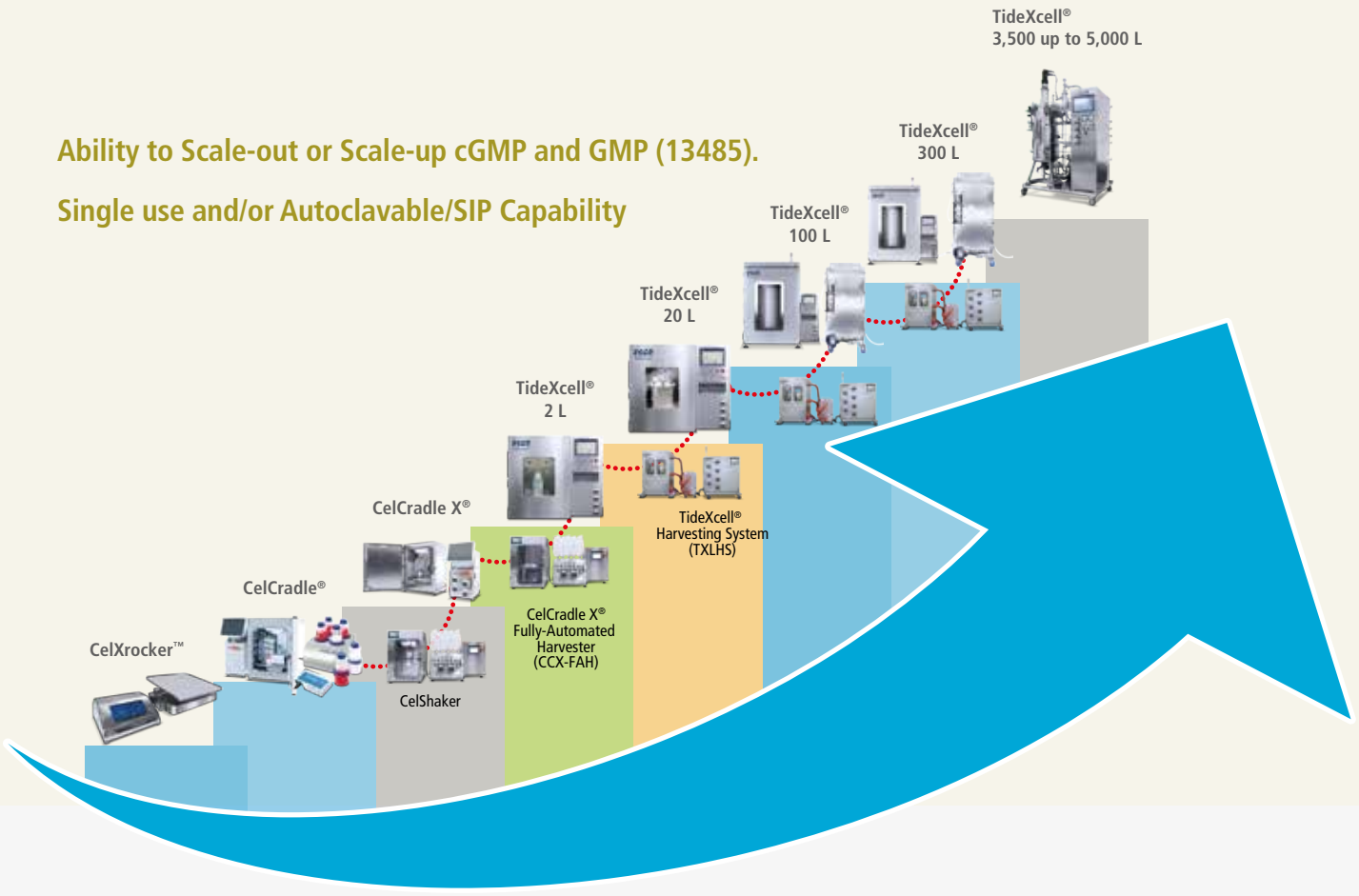
Day 10 (Deep into plateau phase) of umbilical cord-derived hMSCs in BioMESH®. More extreme cell migration occurs.

Bioprocess in Motion with Tide Motion Bioreactors

Upstream bioprocessing comprises the initial phases of a production process from cell line development, culture expansion to cell harvest. The upstream process dictates the integrity of the end-product; therefore, it is of critical importance to sustain the quality of the equipment involved. Bioreactors provide the most favorable environment to grow organisms that are widely utilized in industries such as vaccine production, pharmaceuticals, cosmeceuticals, and others.

Ability to Scale-out or Scale-up cGMP and GMP (13485).

Single use and/or Autoclavable/SIP Capability



Esco VacciXcell's Tide Motion bioreactors for upstream bioprocessing are designed to support the demands of different biomanufacturing industries, catering to single-use and multiple-use culture applications. We offer a wide range of selections from benchtop bioreactors, to closed-system pilot-scale bioreactors which are all linearly scalable.

Ascertain cell lines show a lack of growth when initially seeded in 2D systems and subsequently cultured in 3D systems, the gap between the transition can potentially disrupt the growth and conditions of the cells. Our Tide Motion systems allow cell cultivation in 3D systems from seed preparation to production through CelCradle™ system and successive TideXcell® systems through the proprietary Tide Motion principle. The Tide Motion systems can also be integrated with a GMP isolator at a Grade C-D environment, making it an ideal system to produce wild-type viruses. This feature reduces the cost of cleanrooms by cutting the requirements for personal protective equipment (PPE), utilities, viable/non-viable monitoring, and gowning airlocks, all of which are needed in larger Grade A and B cleanrooms.

VXL™ Hybrid Versatile Bioreactor

Your 4-in-1 Bioreactor

The VXL™ Hybrid bioreactor is a versatile system that is capable of culturing in:

1. Adherent mode using macrocarriers in Tide Motion principle
2. Adherent mode using microcarriers in Stirred principle
3. Microbial mode using the Stirred principle
4. Fermentation mode

This 4-in-1, multifunctional bioreactor system is designed for research and development prior to scaling up to larger bioreactor systems.

Features

- Automated control of pH, DO, aeration, foaming, temperature, agitation and level
- 7 L glass water-jacketed vessel heats to 37°C (±) 0.3 in just 30 minutes
- Inoculation and sampling in a closed system
- Touch screen HMI controller
- Interchangeable vessels for transiting from Tide Motion to stirred tank set-up

Applications

- Adherent cell line creation and development
- Scaled down experiments
- Offline spent media analysis
- Development of MOI for viruses and transient transfection
- Evaluation of coating factors and enzymes for adherent cell lines
- Analysis of optimal downstream, processing strategy

MiniTide™ Parallel Bioreactor

Different Cultures, Same Tide

The MiniTide™ system is a bioreactor best used for the design of experiments (DOE), culturing in parallel for process optimization, and more. The system can run up to 16 units of MiniTide reactors simultaneously.

MiniTide™ takes adherent Tide Motion culture to the next level with its increased microreactor capabilities and individual control on all process parameters. The enhanced environment coupled with the latest DOE, 21 CFR Part 11 compliant software, enables faster time to clinic by allowing an efficient and rapid high throughput scaled-down model that is linearly scalable to manufacturing.

Features

- Provides efficient, high throughput scale-down model for process development
- Full DOE performed at lower cost with higher throughput
- Linear scalability to larger Tide Motion Bioreactors
- Rapid evaluation of cell line/ strain performance and process conditions
- Reduced footprint
- Allows analysis of different media conditions and spent media

Applications

- Research and development/scale up studies
- Production of vaccines, mAbs, biologics, biosimilars/biobetters
- Cell and gene therapy
- Media development
- Secreted extracellular vesicles and secreted virus (e.g. Rotavirus or Hog Cholera)
- Virus-like particles and viral vector production

CelXrocker™ Laboratory Rocker

Your Benchtop Versatile Cell Culture Rocker

The CelXrocker™ provides gentle side-to-side rocking motion for culturing cells in flasks, tubes, and dishes. The laboratory rocker is designed to conveniently fit in most CO_2 incubators and refrigerators, enabling flexible set-ups and assays in a controlled environment.

For small scale culture, CelXrocker™ mimics the Tide Motion principle as a proof of concept of Top holding time and Bottom holding wherein cells are exposed to nutrition and aeration, respectively.

Features

- Tide Motion via adjustable tilt delay (0-60 sec.)
- External HMI control box
- Adjustable rocking speed as low as 1 rpm to 20 rpm

Applications

- Tide Motion testing of BioNOC™ II carriers (Proof-of-concept)
- Small-scale cell culture using macrocarriers
- Assays requiring side-to-side rocking mechanism
- Blotting, hybridization, staining, and destaining

BelloCell™ Benchtop Bioreactor

Cradle for Your Adherent Cells

CelCradle™ is a single-use, bench-scale, cost-effective packed-bed bioreactor system that supports high adherent cell density culture, and scale-up from laboratory scale to production scale. This disposable bioreactor fits inside a 6 ft^3 CO_2 incubator (for batch culture) or 8.5 ft^3 CO_2 incubator (for recirculation culture).

This single-use bioreactor is designed based on the concept of Tide Motion technology of bellow-induced intermittent flow of media and air through macrocarriers where cells adhere and reside. This provides extremely low shear stress, high aeration, and foam-free culture environment.

Features

- Pre-sterilized, ready-to-use, disposable bottles with 0.1 L packed-bed volume
- Extremely low shear stress, foam-free, no O_2 limitation
- High productivity: 1 CelCradle™ bottle has a productivity equivalent to 18-20 of 850 cm^2 roller bottles
- Compact design: fits in 6 ft^3 or 8.5 ft^3 CO_2 incubator
- Choice of batch, fed-batch, or recirculation culture modes
- Scale-up by multiplying the number of bottles or upgrade to TideXcell® system
- Specially treated carrier surface to grow most anchorage-dependent cells
- Allow easy harvest of cells and secreted components

Applications

- Human and animal vaccines
- Autologous and allogeneic therapy
- Culture of adherent cells
- Mammalian and insect cell research
- Recombinant protein research and production
- Switching from 2D to single-use closed system culture
- Replacement of microcarrier stirred tank technology

CelCradle™ Benchtop Bioreactor

Next Cradle Generation for Your Adherent Culture

CelCradle™ is the latest cradle generation with an option to use different macroporous carrier for culture. With CelCradle™, the number of carriers that can be used is subjected to the user's request.

The CelCradle™ bottle is pre-packed, pre-sterilized and placed on the stage. The whole CelCradle™ system is situated inside a 170 L (6ft^3) or 240 L (8ft^3) CO_2 incubator for batch and recirculation models, respectively. The system comes with CelFeeder as a standard for better pH monitoring and control. The control tower boasts of its advanced real-time display and software that is compliant with 21 CFR.

Features

- Tide Motion via adjustable tilt delay (0-60 sec.)
- Hydraulic lift of control tower
- Automated perfusion process with the integrated CelFeeder system
- Automated control of pH parameters

Applications

- Adherent cell expansion
- Vaccine production
- Cell and gene therapy
- Vital vector production
- Secreted product (mAbs and proteins)

CelCradle X®

Closed Automated Single-Use Bioreactor

Adherent culture bioreactor platforms have different advantages for different applications such as vaccine production and cell therapy. CelCradleX® is designed as a single-use, closed, and automated bioreactor that runs on the Tide Motion platform. It is manufactured with cGMP requirements of 21 CFR Part 11.

CCX adoption in the early phase of culture production simplifies manufacturing by helping streamline bioprocessing and reduce challenges faced when scaling up.

CelCradle X® standalone unit

Features

- Combination technology: multiple-use or single-use Components
- Flexible models: complete standalone bioreactor running on Siemens HMI/PLC or integrated with Esco Cell Processing Isolator
- <90% harvesting efficiency: equipped with a single-use automated harvesting system from rinsing to product harvest
- Macrocarrier choice: choose from Esco VXL's range of macroporous carriers or client's own for cell culture process
- Process modes: Batch, Fed-Batch, Perfusion

CelCradle X® model for isolator integration

Applications

- Vaccine, virus MVB, monoclonal antibodies, and recombinant protein production
- Drug discovery, proteome research
- Conditioned media production for cosmeceuticals
- Adherent cell master or working cell bank generation
- PK/PD testing

TideXcell® Pilot Scale Bioreactor

The Gentle Giant of Adherent Bioprocessing

The TideXcell® is a combination technology adherent bioreactor that can be linearly scaled from seed preparation to production scale of up to 5,000 L packed-bed volume. It is ideal for adherent cell expansion under single-use or multiple-use technologies. The manufacturing scale bioreactor can also be integrated with desirable and advanced features such as pH and DO (dissolved oxygen) measurement capability, Siemens HMI PLC-based monitoring and control system, compressed air path that comes with a double HEPA and VOC (volatile organic chemicals) filters as well as other accessories. It is a complete platform that supports laboratory research to process development and final production.

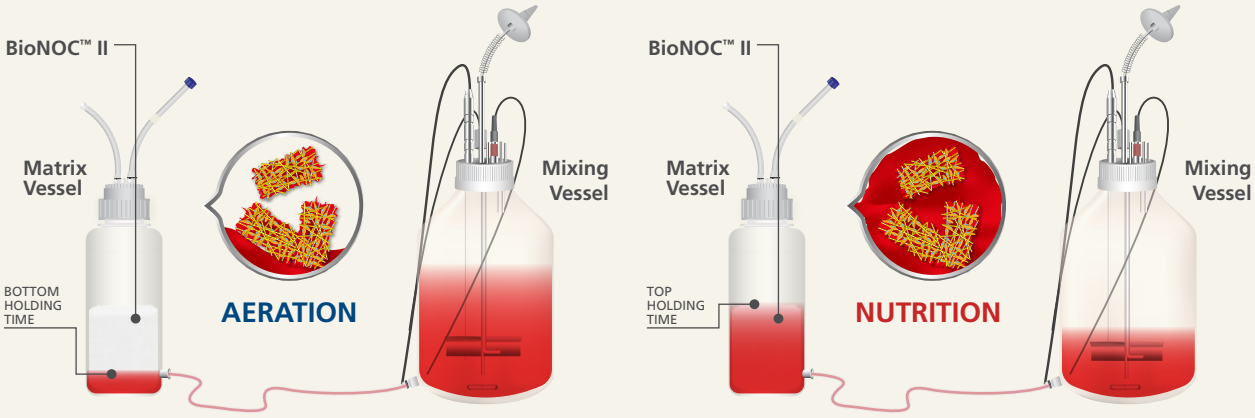
Features

- Linearly scalable up to 5,000 L
- Closed, automated, and controlled culture process
- Reduced equipment footprint
- Siemens HMI PLC-based monitoring system with simple, intuitive, touchscreen that runs on Wonderware SCADA with DeltaV or PCS7 controls
- Run in normal or hypoxic conditions
- Isolator equipment integration

Applications

- Human and animal vaccines
- Autologous and allogeneic therapy
- Culture of adherent cells
- Mammalian and insect cell research
- Recombinant protein research and production
- Large-scale virus production
- Cellular agriculture

TideXcell-002 with Mixer 10/20



Tide Motion in TideXcell®

When the matrix vessel is filled with the culture medium, the cells are exposed to nutrition. Conversely, when the culture medium is pumped back to the mixing vessel, the cells are exposed to aeration in which an exchange of O_2 and CO_2 occurs. The intermittent flow of media and air exposure are similar to the principle of the roller bottle system.

The separation of the culture medium and culture vessel dramatically decreases problems that are encountered during mixing. It allows dual control temperature essential for various cells and viral cultures to achieve higher viral titer. Normally, cells will be cultured to confluence at 37°C in 1 mixing vessel, while 100% of a fresh medium at a lower temperature in a separate mixing vessel can be used for viral culture after seeding.

TideXcell-020 with Mixer 200

TideXcell-100 with Mixer 1000

**The current models shown are the standard units. Please refer to the TideXcell brochures for full product specifications*

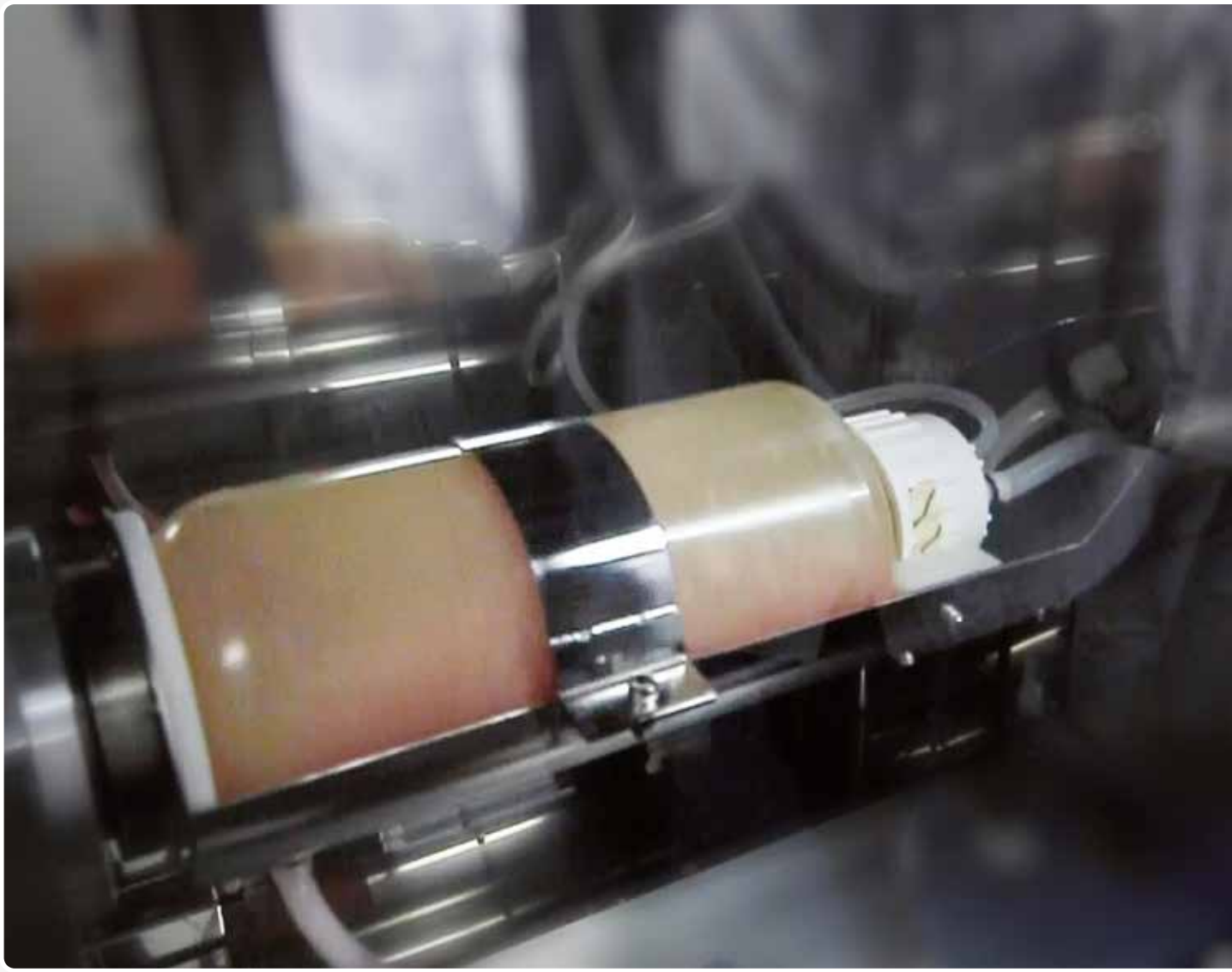
Tide Motion Harvesting Systems

The TideXcell® is a combination technology adherent bioreactor that can be linearly scaled from seed preparation to production scale of up to 5,000 L packed-bed volume. It is ideal for biomass expansion of adherent cells under single-use or multiple-use technologies. It is also integrated with desirable and advanced features such as pH and DO (Dissolved Oxygen) measurement capability, Siemens HMI or PLC-based monitoring and control system, compressed air path that comes with a double HEPA and VOC (volatile organic chemicals) filters as well as other accessories. It is a complete platform that supports laboratory research to process development and final production.

Automated Harvesting from Bench-scale to Production Scale

Harvesting Process in Tide Motion Bioreactors:

1. ***Harvest:*** Removal of the culture medium.
2. ***Rinse:*** Wash the cells by adding PBS/EDTA, distribute the PBS equally and slowly rinse the surface. Remove and discard the wash solution.
3. ***Enzyme:*** Add trypsin/EDTA (or other dissociating enzyme) and gently distribute the solution evenly.
4. ***Incubate and add inhibitor:*** After 15 mins. of incubation, an enzyme inhibitor is used. (This step is optional)
5. ***Mechanical Agitation:*** Tap or shake the vessel to detach the cells from the vessel
6. ***Add in Medium:*** Add culture medium contains serum or trypsin inhibitor to flush the cells.
7. ***Collect:*** Gather the solution with suspended cells.
8. ***Repeat:*** Repeat step 5-6 about 5 times. Obtain cell pellet through centrifugation.



CelShaker™

Your CelCradle Automated-harvester Partner

The CelShaker™ is used as a semi-automated harvesting companion of the BelloCell™ and CelCradle™ Benchtop Bioreactors. The system is capable of closed-system, live whole-cell harvest with one (1) CelCradle bottle at a time in an inverted position for efficient shaking process.

The CelShaker™ involves automated harvesting run from washing to harvesting of either secreted or non-secreted products.

Applications

- Automated mechanical dissociation from CelCradle
- Closed-system harvesting
- Semi-automated process from rinsing to harvesting
- Intracellular virus harvest

Features

- Capable of harvesting secreted and non-secreted products
- Automated and closed-system process from rinsing to harvesting step
- Allows harvest of one CelCradle bottle at a time

CelCradle X® Harvesting System

Your Benchtop Automated Harvester for Tide

The CelCradle X® Harvesting System (CCXHS) is used to automatically harvest live whole cells in a closed vertical manner, from the CelCradle™ X matrix vessel through setting up culture harvest parameters. It can also be used for small scale process development for TideXcell Harvesting System (TXLHS). It involves an automated harvesting run that can be set up from washing to harvesting either secreted or non-secreted products. All major harvesting processes are standardized for increased cell harvest and viability, enabling the production of GMP-compliant cell products.

Applications

- Closed, automated harvesting from rinsing to harvesting
- Mammalian cell harvest
- Biomass harvest for seed train, bioprinting, or cellular agriculture
- Intracellular virus harvest

Features

- Single-use CCXHS assembly kit for closed, automated harvesting
- Harvest viable cells within 1 to 3 hours
- Achieve >90-120% harvesting efficiency

TideXcell® Harvesting System

The Gentle Giant's Harvester Companion

The TideXcell Harvesting System (TXLHS) is a high-density closed system cell harvester that is available in 2 L, 20 L, and 100 L scale. It is a closed automated system utilized for large scale harvest from commercial scale TideXcell system.

Harvest within one (1) to three (hours) automatically from cell wash, enzyme incubation, rinsing, mechanical dissociation, to cell harvest. The system achieves more than 90 harvesting efficiency for mammalian cell harvest to intracellular harvest.

Features

- Closed, automated cell harvester
- Suitable for TideXcell® 2 L to 20 L Matrix Vessels
- Support cell seed source for TideXcell®-010 to TideXcell®-100 systems
- Short harvest time: 1-3 hrs (depending on harvest cycle)
- More than 90% harvesting efficiency
- Equipped with seven (7) high-speed peristaltic pumps for connections in tanks used for the harvesting process

Applications

- Automated cell harvester for adherent cell culture including but not limited to: Insect cells, Mammalian Cells, and Stem Cells
- Biomass expansion for seed train from 2D to 3D
- Autologous and allogeneic cell therapy
- Intracellular virus harvest

Parameters

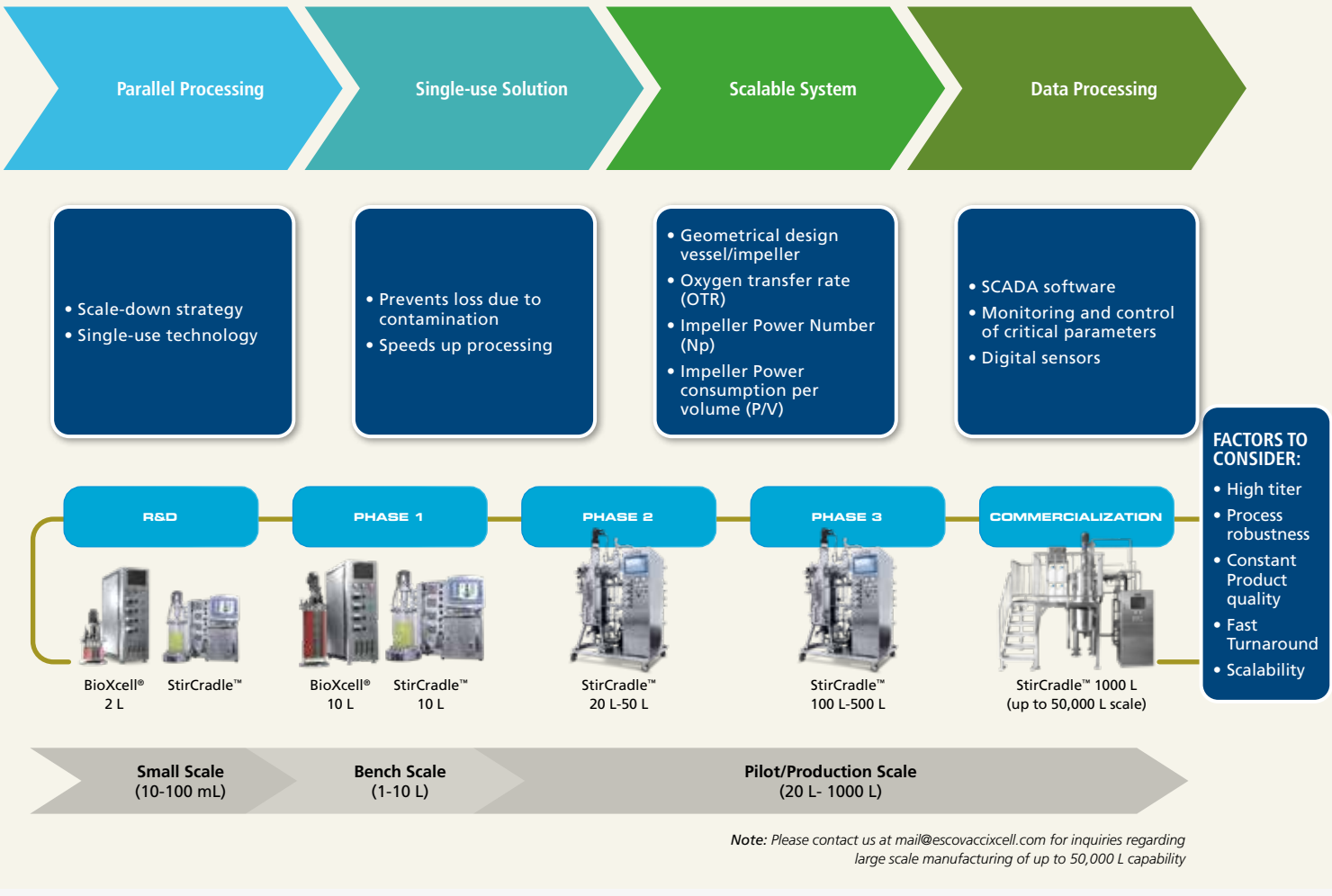
- Pump Speed
- Rotation Speed
- Duration of Shaking/ Rotating
- Harvesting Cycles

Fermentation or Suspension Culture with Stirred Tank Bioreactors

Stirred tank bioreactors are one of the most conventional bioreactor systems utilized in the production of different cells, enzymes, and antibodies. These bioreactors have been widely used in different suspension and microbial cultures in different industries such as biopharmaceuticals. The main component of this type of bioreactor is the impeller which is responsible for agitation in order to achieve homogeneity in the culture media and the sparger which provides oxygenation for the cells.

Presently, several challenges are still faced with stirred tank bioreactor despite being around for a long time. Among these challenges include mixing efficiency, media composition, homogeneity of culture, heat transfer, and scalability which are all significant in the overall culture run.

Esco VacciXcell's stirred tank bioreactors address the issues experienced with typical stirred tank systems. Esco VacciXcell provides fermenters/stirred tank bioreactors designed for culturing of microorganisms and suspension cells from bench scale to manufacturing scale, simplifying the scale-up process for suspension and microbial cultures.



Note: *Please contact us at mail@escovaccixcell.com for inquiries regarding large scale manufacturing of up to 50,000 L capability*

BioXcell® Small-Scale Stirred Tank Bioreactor

Excellent Versatility for Microbial Culture Success

Stirred tank bioreactor systems are among the conventional systems for culturing cells, producing enzymes or antibodies. BioXcell® is a stirred tank bioreactor suitable for small-scale research and development applications, available in single or multiple-use vessels.

The compact design of the bioreactor entails smaller footprint in laboratories. Its control tower is combined with either 2 L or 10 L vessel for culture applications such as microbial, fermentation, and suspension cell culture.

Features

- Perfectly suited for research and development
- Combination Technology: Multiple-use or single-use components
  - 1:2 for mammalian cells
  - 1:3 for microbial/fermentation
- Scalable from bench to research
- Intuitive Siemens HMI software controls
- Compact design for saving critical laboratory space
- Configurable peristaltic pumps
- Interchangeable impellers for addressing user's requirement
- Batch, fed-batch, perfusion process modes

Applications

- Microbial cells
- Suspension cells
- Fungi
- Mammalian cells in suspension
- Cellular agriculture
- mAbs, recombinant protein

StirCradle™ Stirred Tank Bioreactor

Stirring Up Your Microbial Culture

StirCradle™ is a benchtop stirred tank bioreactor system that can double up both as a fermenter and as a bioreactor, suitable for microbial fermentation and suspension cell culture. It is a versatile system, capable of supporting the growth of different types of bacteria, yeast, plant cells, insect cells, and mammalian cells. This system is available in three capacities with total volumes of 5 L, 7.5 L, and 10 L.

The StirCradle™ system features a control tower with four built-in peristaltic pumps, configurable for automated fluid addition. It also has a patented agitation system designed to effectively enhance the oxygen transfer rate. This stirred tank bioreactor is expandable and compatible with a variety of accessories such as oxygen enrichment devices, multiple gas devices, external pumps, and exhaust gas analyzer, making it suitable for the client's culture process requirements.

Features

- Different aeration strategies for DO control during high density culture
- Can be used with oxygen enrichment or multiple-gas devices to achieve ideal gas mixing for cell culture
- Vessels can be easily changed to suit different applications
- Small footprint
- Four (4) built-in peristaltic pumps (with option to add up to 3 more) with assignable functions
- Easy integration to downstream processing equipment

Applications

- Research and development
- Proteomics
- Laboratory-scale of fermentation processes, cells, or manufacturing biopharmaceuticals
- Bacterial, fungal culture

StirCradle™ - Pro Stirred Tank Bioreactor

Stirred Tank Bioreactor Partner

StirCradle™-Pro features various advanced designs and assembly to facilitate the fermentation/culture process including reactor design that eliminates blind spots and increases oxygen retention rate, lifting system for easy cleaning of the reactor vessel, and LED light for easy viewing within the culture tank

Esco VacciXcell simplifies scale up from the laboratory to pilot and production scale through providing analysis data as reference for scale-up conditions. Apart from commercial sizes, Esco VacciXcell also offers parametric programming and special vessel development to help speed up the experiment.

Features

- Smart control system
- Enhanced design of reactor vessel and components
- Built-in configurable pumps
- Sterilization-in-place (SIP) and Clean-in-place (CIP)
- Validation and documentation
- Batch, fed-batch, continuously-batch, semi-continuous and high-density batch system.

Applications

- Pilot and production scale of fermentation processes of microorganisms such as yeast, bacteria, and fungi (large scale bioreactor for bacterial culture)
- Pilot and production scale of cells such as insect cells and suspended mammalian cells (large scale bioreactor for suspension culture)
- Pilot and production scale of the manufacturing of biopharmaceuticals such as recombinant proteins, vaccines, and monoclonal antibodies

Impeller Options:

Flat Disk Turbine

45° Flat Blade Disk Turbine

Curved Blade Disk Turbine

Pitched Blade Turbine

**several impeller designs are available for different applications that requires dynamic mixing.*

GENERAL LABORATORY CULTURE PRODUCTS

It is essential to utilize quality products from cell media preparation down to the harvesting step in order to maintain the integrity of the cells through the culture process, and the end-product. Your general laboratory products such as biosafety cabinets, refrigerators, centrifuge and more are commonly used to aid in the aseptic bioprocessing of your target application.

Biological Safety Cabinets

Biosafety Cabinets (BSCs) provide ISO Class 3 work zone for vaccine, cell therapy research and development procedures, including cell line establishment, cell passaging, cell transduction, and more.

These biosafety cabinets are normally used in bioprocessing laboratories where 2D systems such as culture disks and flasks are placed in the work zone. The culture media and seed optimization processes are done inside the hood to maintain aseptic conditions.

Features

- Energy-saving DC ECM blower for most models
- Isocide™ Antimicrobial Powder Coating
- ULPA/H14 Filter with >99.999% efficiency at 0.1-0.3 µm

  **ULPA as per IEST RP CC001.3*
  **H14 as per EN1822 EU*
- Low noise
- Easy-to-clean design
- Ergonomic design

Airstream® Class II Type A2 Biological Safety Cabinet - NSF Certified (AC2-NS)

Labculture® Class II Type B2 Biological Safety Cabinet (LB2)

Streamline® Containment Isolator - Biosafety Cabinet Class III (SCI-III)

Protection for You

Biosafety Cabinets (BSCs) are divided into three classes: I, II, and III.

Class I biosafety cabinet: This type of biosafety cabinet provides protection for the personnel and surrounding environment but not the sample being manipulated. This is usually used for housing equipment wherein release of infectious aerosols is possible.

Class II biosafety cabinet: This type of biosafety cabinet provides protection for the personnel, surrounding environment, and the sample being manipulated. When culturing with Tide Motion bioreactors, this type of cabinet is typically used especially during culture media exchange, cell sampling and monitoring, seeding, and harvest. Other applications can also be done such as microbiological studies, pharmaceutical compounding/preparation, and toxicology.

Class III biosafety cabinet: This type of biosafety cabinet provides the highest level of personnel protection and is used for Risk Group 4 agents. It is typically installed in a biosafety level (BSL) 3 and 4 laboratories. This gas-tight containment system is best-suited for viral production during vaccine manufacturing and cell processing, both of which require a safe and secure work zone for tissue culture.

Working Safely with the Biosafety Cabinet

When working with Tide Motion bioreactors or performing general cell culture procedures, the placement of the materials shall be from **clean area → working area → waste area**. This workflow is typically utilized to avoid cross-contamination during cell processing.

Culture media reagents, prepared seed cells, enzymes, and materials that are important at the beginning of cell culture should be placed in the left-most part of the cabinet, or as usually called a **clean area**. The **working area** is where the cell culture manipulation, media exchange, sampling, and monitoring are done. Disposable pipettes and other cell culture-related items such as sieves for harvesting waste media are discarded in the **waste area** and thrown outside the cabinet after the process.

Laboratory Shakers

Orbital laboratory shakers are ideally used for a variety of general-purpose shaking and mixing applications in cell culture, bacterial and growth suspension, staining, and washing. The circular shaking motion of the system has a low to high speed with minimal vibrations, ideal for culturing microbes.

As shakers are used in the laboratory for a variety of applications from chemical extractions, over washing and staining procedures up to cell expansion, different shaker types developed over time. Choose from orbital to side-to-side rocking mechanisms to optimize your target cell culture process.

Esco OrbiCult™ Incubator Benchtop Shaker
IBS-R-25-_

Esco OrbiCult™ Ambient Shaker
AS1-NC-25

Features

- SmarTouch™ Large 5.7" Intuitive Touchscreen
  - Easy-to-use design enables to set parameter precisely
  - Historical setting can easily track and review from the touchscreen
- Connecting Alarm Contact
  - Located at the back of the unit to monitor speed, shaker imbalance and power recovery alarms
- Isocide™ Antimicrobial Powder Coating
  - Eliminates 99.9% of surface bacteria within 24 hours of exposure
- Transparent Acryclic Hood (IBS-R-_-_ Model)
  - Clear cover allows easy viewing of samples
  - Door sensor pauses the driver rotation when the chamber door is open
- Gas Manifold Port (IBS-R-_-_ Model)
  - Adds versatility for aerobic and anaearobic cultivation with its 12-port gas manifold option
  - Allows the operator to supply gas directly to the culture medium of 12 individual flask

CO_2 and CO_2/O_2 Incubators

CO_2 incubators are mainly used to maintain important parameters in cell culture such as sterility, temperature, humidity, and pH. These parameters are kept at an optimum level to maintain the viability of the adherent cells during culture.

Esco offers top-grade quality incubators with a variety of features, making them the best choice to cradle precious cells.

Every cell culture has different requirements, therefore, Esco provides various options from filter installation, decontamination/sterilization cycle, UV lamp installation, chamber material, external construction material, to O_2 control that can suit your needs.

What you can store:

- Biological samples
- Culture media
- Non-flammables
- Pharmaceuticals
- Pure cultures
- Reagents
- Vaccines
- Staining dyes

Features

- VivoCell™ Precise Parameter Control
- Isocide™ Antimicrobial Powder Coating: eliminates 99.9% of surface bacteria within 24 hours of exposure
- Seamless Protection: complete with contamination control methods
- User-friendly software interface
- Easy-to-clean, Easy-to-service
- Wider Temperature Range: especially for cell culture conditions that are sensitive to temperature
- Highly Efficient, Environmentally Friendly Peltier Cooling System: Best used for low-temperature culture conditions
- FDA-Listed, Class II, 510k exempt medical device

CelCulture®, Standard Model
CCL-170B-_

With High Heat Sterilization
CCL-240_-_-HHS

With Copper Exterior
CCL-240_-_-Cu

With Stainless Steel Exterior
CCL-170-_-SS

Versati™ Centrifuge

Centrifugation is a final step in the harvesting procedure of adherent cell culture. Usually, when the end-product of a culture are the cells, the supernatant is centrifugated to obtain the cell pellet, bank them down, and later be used according to the application.

Esco Versati™ centrifuge is equipped with maintenance-free motors, a durable mechanism, and an intelligent Versati™ microprocessor control system that offers extreme reliability and safety. Versati™ centrifuges have a robust versatility covering microcentrifuge and low-to-high speed general-purpose centrifuge with a variety of rotors, adapters, and accessories to fit all your application needs.

Features

- Maintenance-free, brushless motor
- Diverse choices of rotor
- Emergency switch
- Distinct control panel and intelligent Versati™
- Microprocessor control system
- Superior safety features (lid lock, imbalance weight protection, over speed and over temperature protection)
- CFC-free refrigeration system (for refrigerated models)

Esco Versati™ Tabletop Refrigerated Centrifuge
TCR-1500-_

Esco Versati™ Tabletop Ventilated Centrifuge
TCV-1500-_

Cell Pellet Recovery – Centrifugation with Versati™

Laboratory Refrigerator and Freezers

Laboratory refrigerators and freezers are vital in keeping the storage at lower temperatures optimal for conditions of certain products. In cell culture, it is important to ensure that cells maintain their structure and composition after harvest. This is carried out through cryopreservation which allows long-term storage of cells and other viable biological samples with very low temperatures to preserve the integrity of their structures.

Esco Scientific offers cold storage solutions that are designed for laboratory purposes, allowing superior product protection with long-term reliability and exceptional product quality. Esco HP Series models cater to a wide range of temperature storage starting from +2°C to +15°C for the lab refrigerators (HR1) up to -10°C to -40°C for the lab freezers (HF2 and HF3). Esco Lexicon® II series offers long-term sample storage and preservation as well as freezing samples in freeze-thaw processes, commonly used in cell lysis, at ultra-low temperatures of -50°C to -86°C.

Features

- Forced-air design
- Intelligent automatic defrost
- Energy saving
- Environment-friendly refrigerants
- High quality construction
- Isocide™ Antimicrobial Powder Coating

What you can store:

- Biological samples
- Culture media
- Non-flammables
- Pharmaceuticals
- Pure cultures
- Reagents
- Vaccines
- Staining dyes

HR1-140S-_ HF2-400S-_ HC6-700S-_ HR1-1500S-_ UUS-480B-_

Automatic Loading / Unloading System

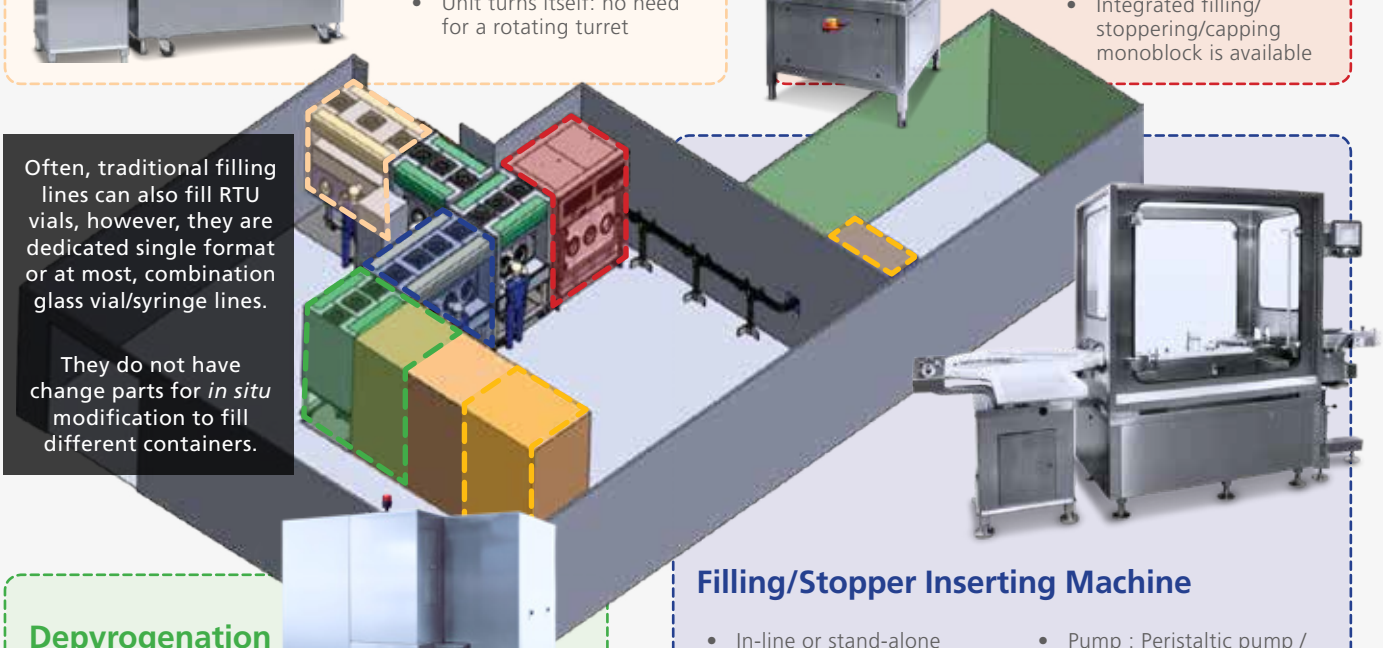
- Semi / fully automatic loading system
- Laser-Guided loading and unloading systems
- Self-empowered via battery: no need for the x-rail
- Unit turns itself: no need for a rotating turret

Capping Station

- Stand-alone capping machine
- Spinning vials
- Output: Up to 200 vials/ min (depends upon client requirement)
- Vial range: 2-100 ml
- Center stationary disk
- Maintenance-free design
- Integrated filling/ stoppering/capping monoblock is available

Often, traditional filling lines can also fill RTU vials, however, they are dedicated single format or at most, combination glass vial/syringe lines.

They do not have change parts for *in situ* modification to fill different containers.



Depyrogenation Tunnel

- cGMP-compliant design and construction
- Full range of tunnels to choose from, depending on requirements
- Detect the air speed and keep it constant with a precision of 0.01 m/s
- HEPA-filtered air supply across tunnel chambers
- Capable of up to 6-log bacterial endotoxin level reduction
- Recycled in the Cooling Chamber
- Features a "Night Mode" to save energy while avoiding contamination

Filling/Stopper Inserting Machine

- In-line or stand-alone
- Filling station with optional pre/post nitrogen flush
- Dual stopper inserting station
- Vial range : 2-100 ml
- Output : up to 100 vials/min
- Pump : Peristaltic pump / rotary piston pump
- Option : statistical check weighing / reject station
- Quick changeover
- Isolator / RABS (Restricted Access Barrier System) Ready

Vial Washer

- Hanging vials for complete underside exposure for cleaning and drying
- Servomotor main and height adjustment drives
- Universal change part (belts): 13 mm caps/ 20 mm caps
- Quick tool-free changeover
- Built-in low pressure, high volume centrifugal blower for drying
- Lower noise volume
- c/RABS or isolator enclosure ready

Disclaimer

Esco does not manufacture stand-alone filling lines, rather, it is always in combination with Esco's isolators or with open/close restricted access barrier systems (o/cRABS).

When necessary, Esco can: do the front end engineering design, ergonomic trials, URS write-up, and coordinate with its various partners for the provision of a fully integrated system (Isolator + Filling lines + Freeze Drier + Auto-loading/unloading system) or provide a fully integrated system according to the client's URS.

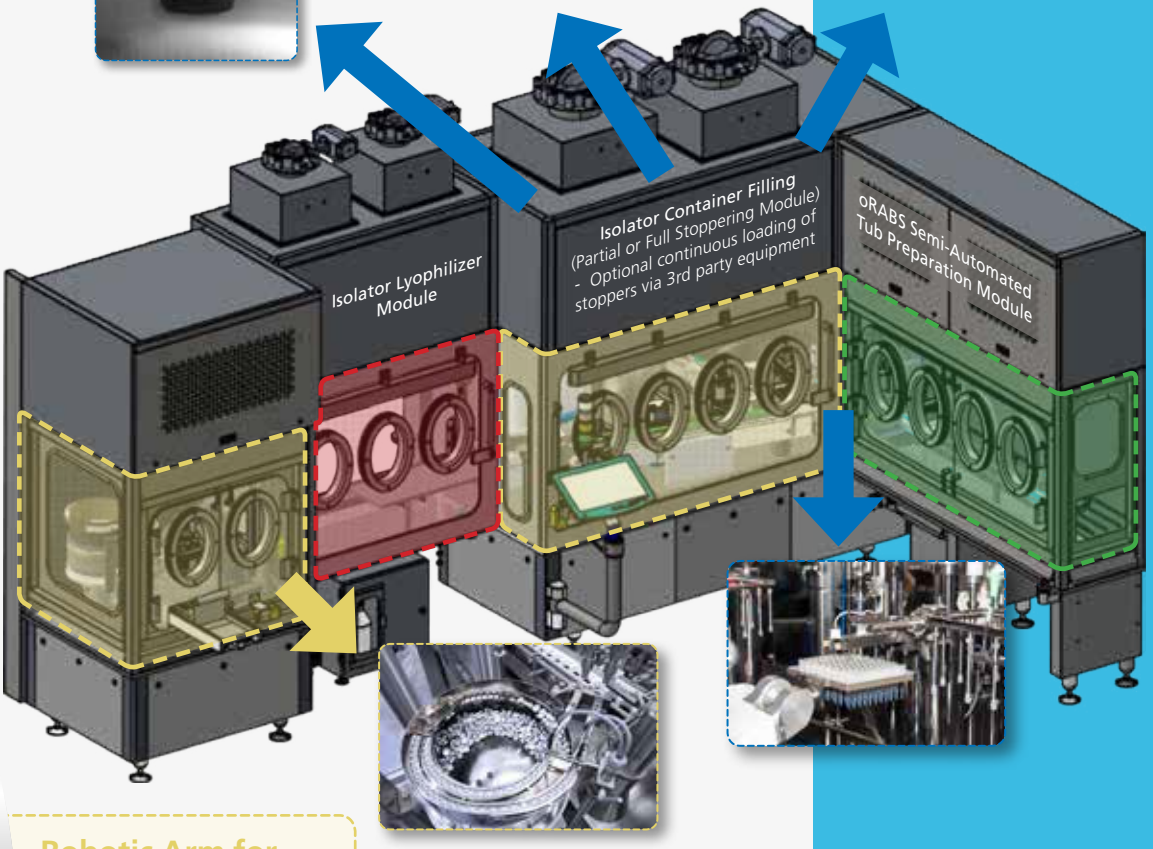
Esco also has an option to link the complete system to the client's SCADA/DCS system (PCS7, DeltaV, Wonderware or others) for eBatch records and eSignatures in compliance to GAMP 5, 21 CFR Part 11 compliance with computer systems validation.

Lyophilizer

- With options for denesting, automatic loading / unloading into freeze driers, and renesting before capping.

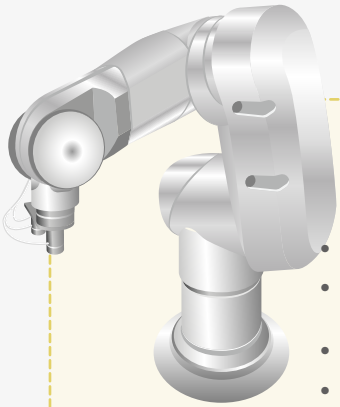
Automated Tub Conveyor & Automated Nest Transporter

- An RTU system can process 200 containers per minute
- Additional Features
  - Stopper gap detection system
  - Quarantine location
  - Inspection and labelling system
  - Viable monitoring (active and passive)
  - Modular *in-situ* configuration to have changeable parts to fill multiple container formats (e.g. RTU vials/syringes/ cartridges/IV bags)



Isolator Capping Module

(oRABS can be used for non-potent freeze-dried products and non-BSL 3 products)



Robotic Arm for Filling, Stoppering, and Capping

- Increases product output
- Capable of handling multi-container formats
- Accurate dosing of products
- 'Zero loss' philosophy

External Vial Washer

Optional Equipment

- Optional external washer for post-freeze dried products
  - Required for potent liquid filling as some liquids on external surface of vials/ syringe will form potent powders harmful to operators.

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ESCO® Healthcare

"Discovery to Delivery"

9010289 Esco Vacixcell Product Guide A4 Bioprocess vA_03082022

ESCO VACCIXCELL
ADHERENT BIOPROCESSING SPECIALIST

For queries and comments, please contact Esco VacciXcell Technical Support team.

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Esco AsterMavors Cellular Agriculture and Alternative Proteins (Food)
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