



# Advanced Degrees of Separation

Separation performance expectations within the biopharmaceutical processing community have yielded exciting new breakthrough technologies that allow today's bioprocessing professionals to maximize yield and press for greater standards of purity and efficiency.

Following years of extensive research and product development, NCSRT raises filtration, separation, and purification standards to unprecedented levels. Emerging from its portfolio of more than 40 revolutionary patents, NCSRT has produced a complete line of end-to-end filtration and chromatography solutions that significantly outperform all other separation and purification products available today.

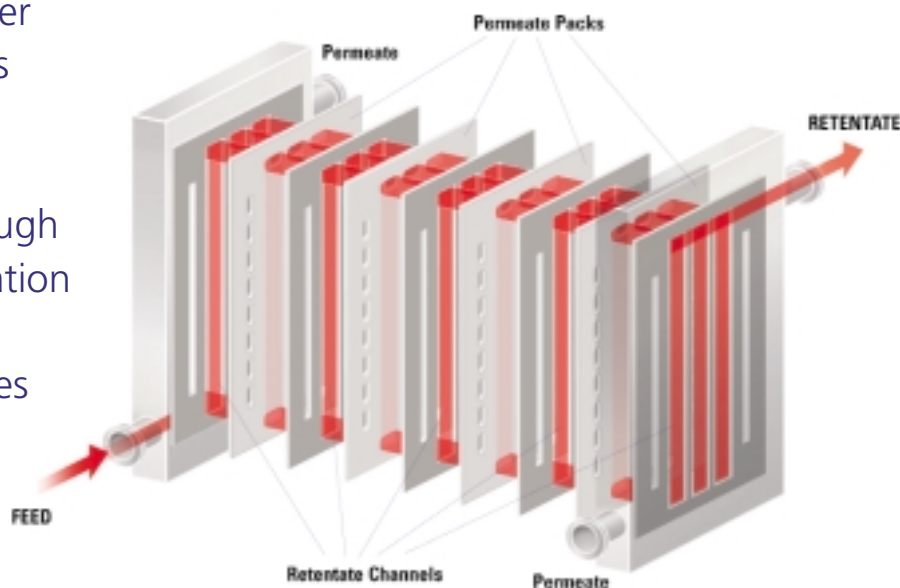
Discover how the NCSRT breakthrough in filtration, separation, and purification solutions are rapidly reshaping performance optimization techniques in bioprocessing.

## Discover OPTISEP® *SmartFlow*™ ...the pure advantage in filtration technology that's reshaping performance optimization techniques in bioprocessing

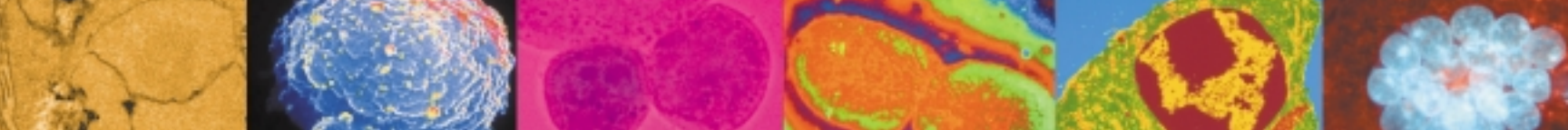
The NCSRT performance advantage comes from the patented OPTISEP *SmartFlow* Tangential Flow Filtration (SF-TFF) line. The *SmartFlow* technology in OPTISEP modules creates unique flow channels that reduce gel layer buildup and prevent fouling. This improvement in fluid dynamics optimizes membrane use and expands the performance limits of traditional Tangential Flow Filtration (TFF).

The novel *SmartFlow* ribbed design creates uniform retentate channels, equalizing flow rates across the entire membrane surface. This precise, uniform flow translates into 100% membrane utilization under uniform conditions, resulting in:

- higher permeate rate
- improved cleaning
- increased process yield
- higher cell densities
- finer separations
- higher protein concentrations
- higher viscosities
- and consistent, repeatable results



**NCSRT *SmartFlow* Solutions Can Improve Your  
TFF Processing By 50% To 500%**



# OPTISEP® Filter Modules

## Clearly the new standard in filtration and separation technology

### Discover the OPTISEP *SmartFlow*™ Advantage That's Revolutionizing Biopharma Processing

- Patented NCSRT *SmartFlow* tangential flow filtration (SF-TFF) technology assures unprecedented product purity and maximum permeate rates.
- Superior fluid dynamics of *SmartFlow* channels create uniform process conditions reducing gel layer buildup and preventing fouling.
- Uniform flow equals validatable cleaning.
- Design enables cost-efficient, reliable scale-up performance and decreased processing times.
- Exclusive OXIPURE™ biocleaner ensures complete decontamination of OPTISEP modules.

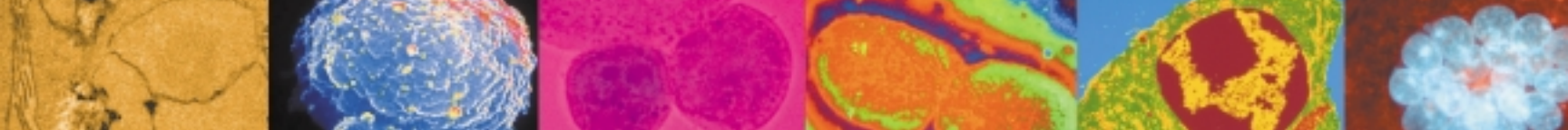
### OPTISEP Filter Modules Improve Processing Performance Up To 500%

All products in the OPTISEP line of filter modules feature the patented *SmartFlow* enhanced fluid dynamics technology. Modules are available in a broad array of membrane materials with precision pore sizes for ultrafiltration, microfiltration, nanofiltration and reverse osmosis. Select the OPTISEP filtration solution below that meets your specific needs.

### OPTISEP Modules Exponentially Advance TFF Performance

OPTISEP has proven to be a major breakthrough in TFF processing and cleaning. The benefits of OPTISEP's superior technology are the subject of several professional journals and other publications. With its patented *SmartFlow* technology, OPTISEP modules consistently provide protein recoveries >99%, cells mass concentrates to >80% solids (wet weight) and protein concentration to >40% solids. Scientists throughout the world continue to document advantages of NCSRT's *SmartFlow* process development technology and how it has revolutionized TFF processing.

Model	Application	Feature	Benefit	Membrane Area
<b>200 &amp; 400</b>	Versatile plate and frame devices to handle membrane evaluations, low volume separations and sterile processing. Ideal for smaller processes of 200 mL to 10L.	2 Sided "Dual" Holder, 2 Inlets, 2 Outlets, 2 Permeates.	Able to operate two membranes independently allowing for: 1) Simultaneous testing of 2 membranes and 2) Two-step process in one unit such as cell clarification and concentration.	OPTISEP 200: 0.1 ft <sup>2</sup> (0.009 M <sup>2</sup> ) per side 0.2 ft <sup>2</sup> (0.018 M <sup>2</sup> ) Total  OPTISEP 400: 0.2 ft <sup>2</sup> (0.018 M <sup>2</sup> ) per side 0.4 ft <sup>2</sup> (0.036 M <sup>2</sup> ) Total
<b>800</b>	Versatile plate and frame filtration device for lab and pilot scale applications. Membrane and process evaluation from 500mL to 20L.	Construction materials are pure virgin polyetherimide and stainless steel.	400 SIP cycles and excellent solvent resistance.	0.34 ft <sup>2</sup> (0.031 M <sup>2</sup> ) Stackable
<b>3000</b>	Ideal for biopharmaceutical processing in the laboratory and pilot plant. Designed to match the downstream processing needs of 2 to 50L bioreactors/fermentors. Typical Process Volumes of 2 to 100L.	Low hold-up volume. All the design functionality of the production scale OPTISEP 11000.	Optimizes yield with minimal hold-up volume. Provides optimum performance for solutions ranging from dilute proteins to viscous cell broths.	Standard sizes 1 and 2 ft <sup>2</sup> (0.09 and 0.19 M <sup>2</sup> ) Stackable
<b>7000</b>	Designed for processing solutions in your pilot plant and manufacturing suite. Typical Process Volumes of 5 to 4,000L.	Available with either: 1" TC Low Hold-Up Volume Header <b>OR</b> 2" TC Low Pressure Drop Header.	The low Δ P header provides the perfect cell harvesting format. The 1" TC header is the optimum design for dilute proteins requiring high concentration factors.	Standard sizes 5, 10 and 20 ft <sup>2</sup> (0.46, 0.93 and 1.86 M <sup>2</sup> ) Stackable
<b>11000</b>	Created for processing solutions at production scale. Production systems processing 50 to 2 million L per day in operation.	40 M <sup>2</sup> Microfiltration <b>OR</b> 60 M <sup>2</sup> Ultrafiltration Per Stainless Holder. Feed and Bleed Loops to 1300 M <sup>2</sup> .	True production module for protein separations, protein concentration, viscous cell harvesting and diafiltration.	Standard sizes 10, 50 and 100 ft <sup>2</sup> (0.93, 4.64 and 9.3 M <sup>2</sup> ) Stackable



# PUROSEP™ Filtration Systems

Pure process solutions that significantly outperform conventional separation systems

## PUROSEP standard and custom TFF systems surpass performance expectations regardless of your specified filter format.

Seamless integration upstream or downstream with any of the following filter arrays:

- OPTISEP® Filter Modules
- Hollow Fiber
- Ceramic
- Plate & Frame
- Flat Sheet
- Spiral Format

Whether you require a tabletop unit, pilot skid or production model, NCSRT applications-based design approach will provide you with a system to meet or exceed your specific process needs.

PUROSEP is a universal design concept proven to integrate with all standard TFF module formats. The advanced engineering and 3-D modeling utilized in all PUROSEP models allows for rapid and cost effective customization when required.

PUROSEP systems can be operated independently or integrated with upstream and/or downstream processing equipment as a single unit operation.

The NCSRT advantage continues with its ongoing commitment to ensure achievement of your individual research and production requirements.

NCSRT support services provide you with industry-leading validation assistance, preventive maintenance contracts and responsive technical service representatives who keep PUROSEP systems performing at optimal levels.

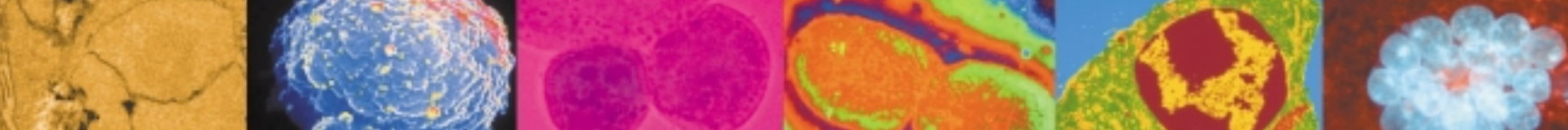
## NCSRT options available to meet your specific Bioprocessing needs

- Hazardous Environment Ratings
- Multiple Levels of Automation
- Conductivity Sensors, UV Sensors
- Data Acquisition
- PLC
- Flow Meters
- pH Probes
- 21 CFR Part 11

## NCSRT filtration systems and patented performance features are designed to meet your specific application needs:

Model	Description	Compatible Filter Modules	Control Systems	Typical Options	Recirculation Flow Rates	Operating Pressure Range
<b>LT-1</b>	Benchtop system ideal for small process volumes.	OPTISEP 200, 400, 800 and 3000. Laboratory scale hollow fibers, ceramic test cells.	Manual control.	Sample Vessels, Flow Meters.	Up to 12 LPM.	0-75 psi (0-5 Bar).
<b>LT-2</b>	True low volume cGMP system.	OPTISEP 400, 800, 3000 and 7000. Laboratory and pilot scale hollow fibers, ceramic modules and spiral elements.	Manual control systems with alarms with 21 CFR Part 11 compliant data acquisition.	Mobile Cart, Rotary Lobe or Quattroflow Pump, UV, Conductivity, pH, PLC, PLC Integrated with PC, Hazardous Environment Operation.	Up to 75 LPM.	Base System up to 90 psi (6 Bar), High Pressure Option up to 300 psi (20 Bar).
<b>PT</b>	Ideal cGMP system for the pilot plant, process development or small scale manufacturing.	OPTISEP 3000, 7000 and 11000. Pilot and production scale hollow fibers, ceramic modules and spiral elements.	Multiple controls packages and HMIs. Range from manual control with alarms to PLC to PLC integrated with PC and plant wide systems.	UV, Conductivity, pH, PLC, PLC Integrated with PC, Hazardous Environment Operation, Process Vessel and Steam In Place.	Up to 340 LPM.	Base System up to 150 psi (10 Bar), High Pressure Option up to 300 psi (20 Bar).
<b>PRO</b>	Full production system designed for robust manufacturing under cGMP. Customization available per process specifications.	OPTISEP 7000 and 11000. Production scale hollow fibers, ceramic modules and spiral elements.	Multiple controls packages and HMIs. Range from manual control with alarms to PLC to PLC integrated with PC and plant wide systems.	UV, Conductivity, pH, PLC, PLC Integrated with PC, Hazardous Environment Operation, Process Vessel and Steam In Place.	Up to 7,500 LPM Per Loop.	Base System up to 150 psi (10 Bar), High Pressure Option up to 300 psi (20 Bar).

All systems are certified to: UL 508A and 61010; CE 61010



## **OXIPURE™ Organic Cleaner** Assures clear results and complete decontamination of OPTISEP modules

### **OXIPURE**

Your company's ability to successfully compete in the bioprocessing arena is directly related to its ability to meet validation requirements and compliance imperatives.

NCSRT has developed a safe and effective biocleansing system that extends the life of bioprocessing filtration modules and equipment. Count on OXIPURE, the revolutionary organic cleaner for powerful, cost-efficient decontamination of both stainless steel and polymeric filtration system materials.

### **When you validate with OXIPURE the results are clear:**

- OXIPURE helps you extend the life of your filtration equipment and modules by avoiding the need to use chlorine, peracetic acid, or steam sterilization processes
- OXIPURE has oxidative properties to effectively depyrogenate equipment and solutions
- Following treatment with 50 ppm of OXIPURE for one hour, analysis of PUROSEP™ systems with OPTISEP™ filter modules used to concentrate *Pichia pastoris* and *E. coli* demonstrated no growth.

### **Rely on OXIPURE for validatable cleaning solutions and absolute contamination control**



#### **NCSRT, Inc.**

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## **Industry Leading Filtration Solutions with Customer-focused Technical Support**

The NCSRT design-engineering team is committed to providing innovative filtration, separation, and purification solutions for both new and existing bioprocesses.

In addition, NCSRT assures optimal performance of its patented filtration technologies by providing highly responsive end-to-end support services including:

- Superior validation services
- Responsive technical support
- Outstanding preventive maintenance programs
- Process optimization services
- Training Seminars

**Learn how an NCSRT filtration,  
separation and purification solutions  
can provide your organization with  
Advanced Degrees of Separation.**

**Call 919-387-8460 or email [info@ncsrt.com](mailto:info@ncsrt.com).**