YMC Process Technologies – Overview of TFF Systems

Tangential flow systems customized to your preferred membrane supplier
Custom TFF Specialists.

YMC designs custom UF and MF TFF systems based on flat sheet cassette or hollow fiber modules.
TFF systems using cassette or hollow fiber formats

• Major biopharma’s and OEM both come to YMC Process Technologies for TFF system design.

• YMC remains neutral to a specific membrane style – giving customers what is optimum for their TFF process.
YMC TFF cassette holder

Accommodates most major OEM TFF cassettes
YMC cassette holder

Designed with GMP and ease of operation in mind

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Combined with auto-torque control the YMC cassette holder provides an easy-to-manage unit.

Pneumatic controls automatically set proper torque.
YMC TFF cassette holder

Precision engineered by crossflow experts
Application Example: Cassette Membrane Purification System

Location
USA (Biopharm Facility).
Delivered 2009

Application
Flatt Sheet Cassette Membrane production skid for GMP production.

YMC solution
YPT original design for major biopharmaceutical company.
System design and manufacture by YPT.
Complex UF TFF Skids – No Problem.
Application Example: Membrane Purification System

Location
USA (Biopharma Facility).
Delivered 2011

Application
Hollow Fiber Membrane production skid for GMP production.

YMC solution
YPT original design for major biopharmaceutical company. Manufacture by YPT.
Application Example: TFF Ultrafiltration Processing System

Location
EU, USA, Asia (Multiple Biopharma Facilities).
Delivered series of units starting 2008

Application
Hollow Fiber Membrane production skid for GMP production.

YMC solution
YMC OEM design for major life sciences technology supply company. YMC Process Technologies design and manufacture based on OEM supplied concept.
Application Example: MF (dead end) Purification Systems by YMC

Location
USA (Biopharma Facilities).

Multiple Skids

Applications
Clarification and sterile filtration using MF cartridges from major suppliers skid for GMP production.

YMC solution
YPT original design for major biopharmaceutical companies.
Other industrial-scale standard systems by YPT

Batch chromatographic systems

YMC EcoPrime® LPLC and HPLC using digital pump drive technology

YMC EcoPrime® Twin
based on ChromaCon’s CaptureSMB and MCSGP

Multi-column continuous chromatographic systems

Buffer dilution systems

YMC Buffer dilution
MilliporeSigma buffers, bags and services
The Characteristics of Tangential Flow Membranes.
Cross Flow Filtration = Tangential Flow Filtration

- Higher filtering capacity than dead end filters (MF cartridges)
- Most commonly used for cell harvest, protein concentration, desalt, buffer exchange, etc.
- Complex process control
Tangential Flow Filtration

Feed ($P_F$) → Tangential flow → Membrane → Retentate ($P_R$) → Permeate ($P_f$) → Flux
Crossflow/Shear Rate and Delta P

**Cross Flow/Shear Rate is:**
- The flow that crosses through membrane surface. It typically refers to the retentate flow, not the feed flow.
- Tangential Flow (or “Cross flow) cleans the membrane surface in order to prevent membrane fouling.
- Higher crossflow is needed for dirty sample solutions, and zero cross flow represent the condition of dead end filtration.

**Delta P is:**
- The pressure difference between feed and retentate.
- Delta P determines cross flow.
- Crossflow and flow channel height determine shear rate.
Crossflow and Delta P

![Graph showing Crossflow (ml/min) vs. Delta P (psi) for Water and Sample Solution.](image-url)
**Crossflow and Delta P**

*Permeate Flow (Flux) is:*  
The flow that passes through membrane.  
It is typically presented in LMH (Liter/M2/Hour).  
Flux is usually higher for clean sample solutions than dirty sample solution.  
In practice, flux is usually declined with processing time, but sharp flux decline usually indicates insufficient cross flow (membrane fouling or gel layer formation).

*TMP is:*  
The trans-membrane pressure.  
The permeate pressure should be zero unless a half of the minimum delta P is higher than the required TMP.
Flux and TMP and Cross Flow

The graph shows the relationship between TMP (psi) and Flux (LMH) for different solutions. The x-axis represents the TMP in psi, ranging from 0 to 75. The y-axis represents the Flux in LMH, ranging from 0 to 600. The graph includes the following:

- **Water**: This line shows a steep increase in flux with increasing TMP.
- **CF₂(CF₁)**: This line shows a moderate increase in flux with increasing TMP, but less than Water.
- **Sample Solution**: This line shows a slower increase in flux with increasing TMP compared to the other two.

The graph demonstrates how different solutions behave under varying TMP conditions.
Cross Flow Filtration

**FLUX Vs. PROCESSING TIME**

![Graph showing FLUX Vs. PROCESSING TIME](image-url)
Application Example: Membrane Purification System

Location

USA (Biopharma Facility).
Delivered 2010

Application

Hollow Fiber Membrane production skid for GMP production.

YMC solution

YPT original design for major biopharmaceutical company.
Employed Fristam pumps with system design and manufacture by YPT.
More solutions for our customers

The innovation and growth of this and other EcoPrime product lines has attracted the attention of leading technology suppliers and users. YMC Co., Ltd. assumed all rights and production for the EcoPrime suite of systems in late 2018 from LEWA-Nikkiso America, Inc. This acquisition brings a broad spectrum of chromatographic resins, and columns ideal for large and small molecule purification. More about this new chapter for EcoPrime at www.ymcpt.com.

Ordering information To order the EcoPrime Twin LPLC system, please contact your regional sales representative.

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