

FOR SALE, RENT AND/OR LEASE



Separate deeper, finer, cheaper

2-in-1 multi-process
membrane systems
for lab and
industrial tests

RVF-filtration.com
Paris, France

21-MPMS series

The same system combines both series of our previously developed systems:

- pressure driven (PMS) and
- non-pressure driven (NPMS)

May, 2016

These revolutionary turnkey systems are designed for the lab and on-site industrial tests regarding the following membrane **primary processes**:

- Pressure-driven (**MF, UF, NF, RO**)
- Osmotically-driven:
 - **FO** as forward osmosis,
 - **PRO** as pressure retarded osmosis,
- Thermally-driven (**MD** as membrane distillation)
- Chemical potential driven (**PerVap** as pervaporation)

The operator can combine these primary processes with the **secondary** ones:

- **DiaF** as diafiltration
- **MBR** as membrane bioreactor (with external or submerged modules)
- **DM** as Dynamic Module
- **CVM** as Concentrate's Volume Minimization

Finally, you may choose one of the following **hybrid processes**:

- **FO + MD or FO + RO/NF**
- **RO/NF + MD**
- **MF/UF + RO/NF**

(each system for hybrid process is composed of two sub-systems)

These systems are equipped with all necessary equipments (pumps, valves, sensors, tank(s), heat exchanger(s), heater and/or cooler, electric cabinet, PLC & DAQ system) in order to work under heavy laboratory or industrial conditions during short, long and very long cycle periods. The client has only to provide feed liquid, membrane module(s), electric power, compressed air, gas source, connection to ethernet, water and chemicals for CIP and rinsing, to dispose permeate (distillate) and concentrate.

If you plan to apply your system for the treatment of dangerous liquids (radioactively, biologically, chemically or off-shore use) we propose highly reliable Ethernet as well as Wireless connectivity devices (IoT devices) in order to organize the remote monitoring and control via the WEB server.

All our systems include: design, manufacturing, integration, installation supervision, commissioning, training, maintenance contract, IOM manual.

Design of the system

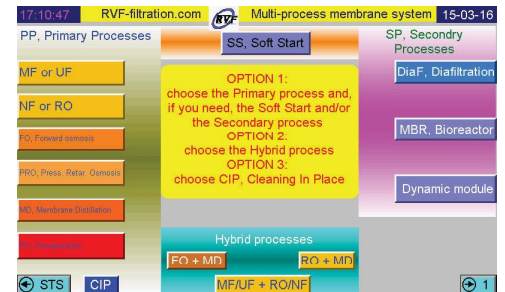
• Membrane modules which may be used with the system

- Hollow fiber external (in-to-out or out-to-in): organic, ceramic membranes
- Hollow fiber submerged (out-to-in)
- Tubular: organic, ceramic, stainless steel membranes
- Dynamic filtration: organic, ceramic, stainless steel membranes
- Spiral wound
- Plate & Frame (or stacked) external
- Plate & Frame (or stacked) submerged

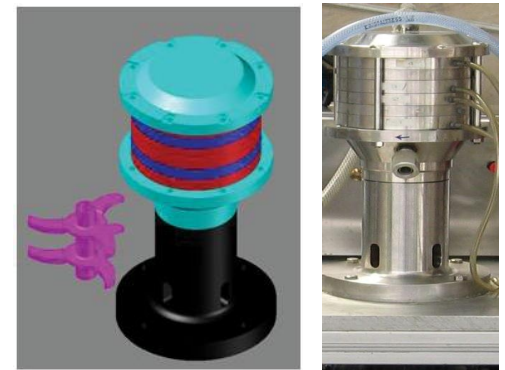
All above mentioned modules may be used on the same multi-process system.



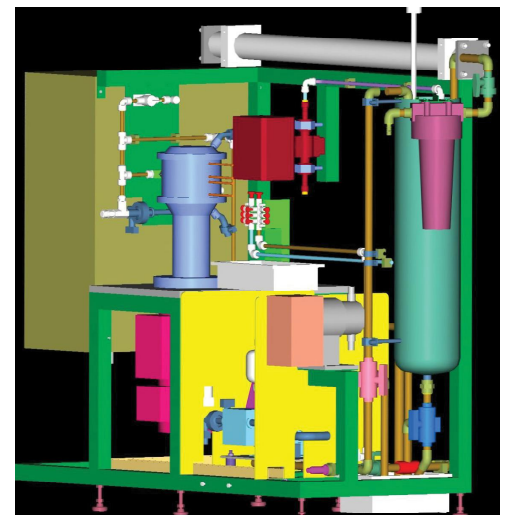
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• Procedures

- Primary process (may be coupled with secondary one) or hybrid process
- Cleaning-In-Place (CIP) procedure: heating, temp. control, automatic stop
- Rinsing procedure: automatic stop after emptying the tank
- Integrity testing of the membrane and/or module
- Screening of the feed liquid (using manual or automatic cleaning)

• Modes of functioning during primary process

- **manual:** operator sets pumps' speed and control valves' position
- **automatic:** operator presets flow rate, temperature and pressure
- **automatic stepper:** time-saving study of the membrane/liquid pairs:
 - at a constant cross-flow rate Q and variable pressure P (at one or both sides)
 - at $P = \text{const}$, $Q = \text{variable}$ (at one or both sides)
 - at $P, Q = \text{variables}$ (at one or both sides)
 - at $Q = \text{const}$, $P = \text{const}$, $T = \text{variable}$ (at one or both sides)
- **soft start:** prevents the membrane from initial clogging/fouling (very important for MF & UF)
- **cross-flow:** at one or both sides of the membrane in co- / counter-flow
- **dead-end:** at the concentrate side of the membrane
- **free flow:** at the permeate side of the membrane
- **under positive pressure:** the membrane module is positioned at the discharge pipe of the pump (gauge pressures inside the module: $P_{\text{conc}} > 0$ and $P_{\text{perm}} > \text{or} = 0$)
- **under combined pressure:** when the membrane module is positioned at the discharge and suction pipes of the pump (gauge pressures inside the module: $P_{\text{conc}} = \sim / > 0$ and $P_{\text{perm}} < 0$)
- **automatic filling** both tanks before starting the two-side cross-flow
- **automatic partial emptying** the permeate tank
- **free flow** of the permeate from the tank
- **automatic control of VRR** (Volume Reduction Ratio)
- **automatic shut down** (if one of the limits is over-passed) + reason's description

• Sensors, transmitters

(having analog or digital outputs: the accuracy may be up to 0.02% FS), non exhaustive list:

- pressure at the feed/concentrate side before the module
- pressure at the feed/concentrate side after the module
- pressure at the perm. /distil./DS side or average trans-membrane pressure
- cross-flow rate at the feed side
- cross-flow rate at the permeate/distillate/ draw solution side
- flow rate /volume for the permeate/distillate passed through membrane
- flow rate / volume for the bled concentrate
- temperature in the concentrate's loop
- temperature in the permeate/distillate/draw solution loop
- level in the feed and the permeate/distillate/draw solution tanks
- special sensors (conductivity, pH, ORP, ion-specific, optical)
- recently developed automatic devices:
 - for the measurement of the flow rate values in the range: from several ml/h to several L/h (instead of balance with digital output)
 - limiters for the flow rate in the circulating loops

• Automatic intermittent cleaning tools

- back-flush (BF) of the permeate (using pump or compressed air)
- chemically enhanced back-flush of the permeate
- combination of the BF using permeate & filtrated air (air scouring to sweep the fouling components away)



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- back-pulse of the permeate giving the square pulses instead of sine ones
- raise of the speed of the rotating bodies during dynamic filtration
- raise of the cross-flow rate onto feed/concentrate side
- membranes' relaxation before and after above mentioned cleanings

• **Automatic permanent cleaning tools**

- air scouring (for continuous sweeping the clogging components)

• **PLC and DAQ**

- Screen size (color or black/white touch screen): 3.5" or higher
- Whole remote monitoring and control via the WEB server
- Data log function, data storage
- Memorization of the system's activity
- Online modification of the set points
- Ethernet and Wireless connectivity devices for remote control
- Update of the program thru Internet (easy adaptation to new challenges)
- Presentation of the real-time data and curves

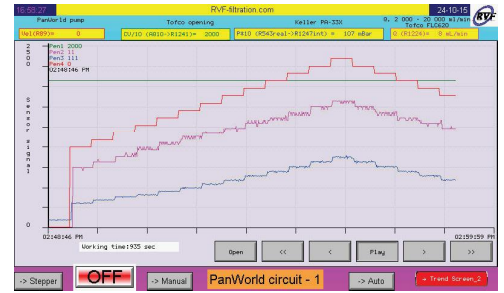
• **Specifications**

(Can be modified to fit your special application. You'll be asked to define your own range.)

- Temperature of fluids (controlled range) 7 to 60 °C 45 to 140 F
- Gauge pressure (concentr. side) 0.5 to 80 bar 7 to 1160 psi
- Gauge pressure (perm./distil./DS side) -0.7 to 25 bar -10 to 362 psi
- Cross-flow rate at the concentrate side 0 to 3000 L/h 0 to 13 GPM
- Cross-flow rate at perm./distillate/DS side 0 to 3000 L/h 0 to 13 GPM
- pH range (depends on used membrane) 1.5 to 12.5
- Tank's volume (feed and perm/DS) 1 to 3 L 0.3 to 0.8 gal
- Can be designed in compliance with approvals: ATEX, FDA, 3-A, EHEDG



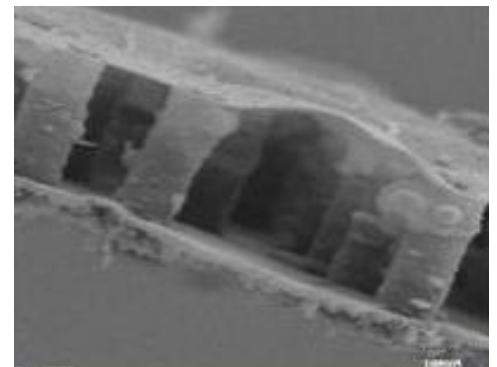
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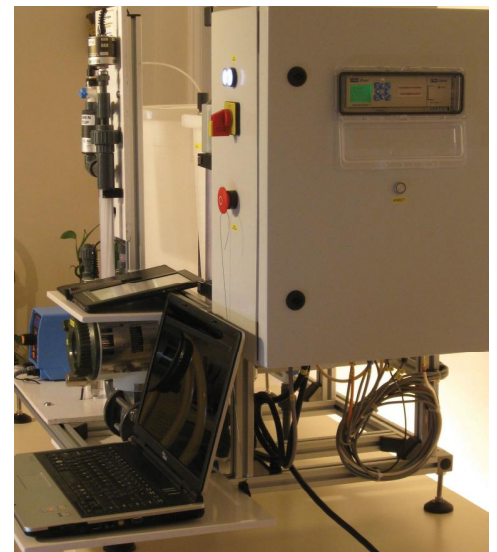
Our approaches to win-win deals

- Development & design of the automation control for your existing test system (retrofitting, upgrade)
- Extensive testing at our PLC controlled test benches is carried out for the optimum design of your future system
- Procurement, installation of all necessary additional equipments: adaptation of the system fabricated and installed by RVF-filtration at the client's site to the new challenges.
- Posterior update of the PLC's program to adapt it to the new challenges of your test system (can be downloaded remotely)
- Rent and lease of the membrane system (configured by the customer) and fabricated by RVF-filtration followed by a gradual transfer of the ownership.



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We created the widest array of solutions to facilitate the study of membrane separation processes.
Now, it's your turn...



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21-MPMS = PMS series + NPMS series