Membranes and Modules

PCI Membranes is the membrane filtration solutions provider within the ITT group. PCI Membranes continues to offer the range of cross-flow tubular membranes and modules, the origins of which date back over 40 years. Tubular membranes are particularly suited to fluids with high viscosity and/or suspended solids as their wide flow paths make them highly resistant to blocking. Pre-treatment requirements are minimal, and often completely avoided - a benefit that renders them the most cost effective choice for many small systems.

Proprietary Tubular Membranes

The table opposite provides a technical summary of our range of proprietary tubular membranes. These membranes are all produced "in-house" in a brand new, purpose-built facility, operating under the international Quality Assurance standard ISO 9000:2000.

The table below provides a technical summary of our range of modules which are fully compatible with our tubular membranes.

Type	Application	Length	Diameter	Membranes Area	Standard Options/Comments
A5	UF	3.1m 3.7m	83mm 83mm	$4.0m^2$ $4.75m^2$	Shroud AISI 316 stainless steel Permeate sampling device available
A19	UF	3.1m 3.7m	83mm 83mm	$2.1m^2$ $2.5m^2$	Shroud AISI 316 stainless steel Permeate sampling device available
A37	UF	3.1m 3.7m	119mm 119mm	$4.2m^2$ $5.2m^2$	Shroud AISI 316 stainless steel
B1 parallel flow	NF, UF	1.2m 2.4m 3.7m	100mm 100mm 100mm	$0.9m^2$ $1.7m^2$ $2.6m^2$	For highly viscous materials, and low pressure drop. Permeate sampling device available.
B1 twin-entry	RO, NF, UF	1.2m 2.4m 3.7m	100mm 100mm 100mm	$0.9m^2$ $1.7m^2$ $2.6m^2$	End-caps in epoxy, AISI 316 stainless steel. Shroud AISI 316 stainless steel or plastic. Permeate sampling device available.
B1 series flow	RO, NF, UF	1.2m 2.4m 3.7m	100mm 100mm 100mm	$0.9m^2$ $1.7m^2$ $2.6m^2$	End-caps in epoxy, AISI 316 stainless steel. Shroud AISI 316 stainless steel or plastic. Permeate sampling device available.
C10	NF, UF	0.9m 1.8m 3.7m	210mm 210mm 210mm	$2.5m^2$ $5.0m^2$ $10.5m^2$	DWI approved ABS wetted parts
Micro 240	RO, NF, UF	30cm	63.5mm	$0.024m^2$	AISI 316 stainless steel module (2 membrane tubes). Membrane micropacks available.
Single tube	RO, NF, UF	30cm	12.5mm	$0.072m^2$	For comparing up to 6 membrane types.

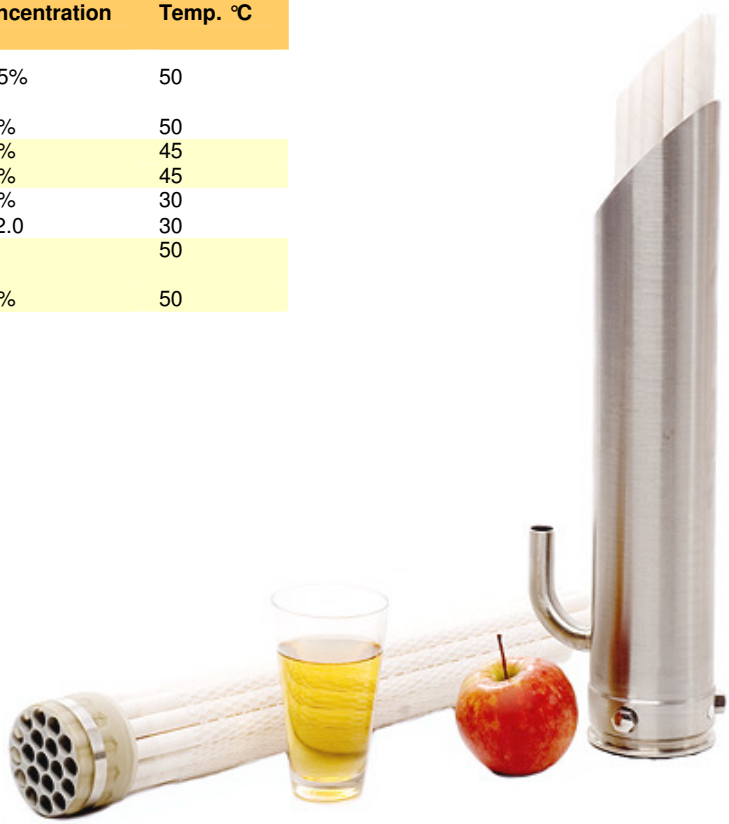
Membrane Development

Our development chemists continuously refine product performance and expand our membrane range, extending the benefits the technology is able to offer users. This can prove highly beneficial where short process development times are the key to commercial success. New developments include hydrophilic membranes for lower fouling, improved selectivity, increased solvent, acid and base resistance, improved flux and strengthened membrane supports.

Cleaning

Choice of cleaning chemicals and cleaning frequency depend upon the nature of the process and the membrane type. Acids, alkalis and detergents are used as required. Typical cleaning procedures are indicated on the adjacent table. PCI membranes offers advice on cleaning for specific applications. PCI's tubular membranes can also be cleaned mechanically using an automated "pigging" process that employs foam balls and can significantly reduce the need for cleaning chemicals.

Membrane Type	Chemical	Concentration	Temp. ℃
AFC99	Alkaline detergent	0.25%	50
	Nitric acid	0.3%	50
AFC80,40,30	Enzyme	0.5%	45
	Nitric acid	0.3%	45
CA/AN	Enzyme	0.5%	30
	Nitric acid	pH2.0	30
ES/PU/FP (Excluding FPA / FPT)	Chlorinated alkaline detergent	1%	50
	Nitric acid	0.3%	50



Membrane Information

PCI Membranes manufactures an extensive range of tubular reverse osmosis, nanofiltration, ultrafiltration and open ultrafiltration membranes, which are widely used in the chemical and pharmaceutical process industries, for food and beverage processing and for waste water treatment. These membranes are ideally suited to processing liquids containing suspended solids, or where precipitation may occur during processing. Note that retention character is highly-dependent upon the nature of the fluid being processed.

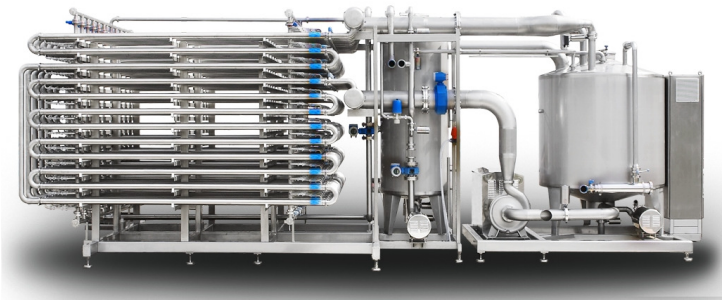
Membrane Type	Material	Max. pH Range	Maximum Pressure (bar)	Max temp (°C)	Apparent Retention Character[1]	Hydro-philicity[2]	Solvent Resistance[3]	Applicable Module(s)
AFC99	Polyamide Film	1.5-12	64[5]	80	99% NaCl	3	++	B1
AFC80	Polyamide film	1.5-10.5	60	70	80% NaCl	4	++	B1
AFC40	Polyamide film	1.5-9.5	60	60	60% $CaCl_2$	4	++	B1
AFC30	Polyamide film	1.5-9.5	60	60	75% $CaCl_2$	4	++	B1 / C10
CA202[4]	Cellulose acetate	2-7.25	25	30	2,000 MW	5	+	B1 / C10
EM006	Modified PES	1.5-12	30	80	6,000 MW	4	++	B1
ESP04	Modified PES	1-14	30	65	4000 MW	2	++	B1
ES404	Polyethersulphone	1.5-12	30	80	4,000 MW	2	++	B1 / C10
PU608	Polysulphone	1.5-12	30	80	8,000 MW	2	++	B1
ES209	Polyethersulphone	1.5-12	30	80	9,000 MW	2	++	B1
PU120	Polysulphone	1.5-12	15	80	20,000 MW	2	++	B1
FPT03	PVDF	1.5-10.5	10	60	20,000 MW	1	+++	A5
FPA03	PVDF	1.5-10.5	7	60	20,000 MW	1	+++	A19
FPS03	PVDF	1.5-10.5	7	60	20,000 MW	1	+++	A37
AN620	Polyacrylonitrile	2-10	10	60	20,000 MW	5	+++	B1
ES625	Polyethersulphone	1.5-12	15	80	25,000 MW	2	++	B1
FPT10	PVDF	1.5-10.5	10	60	100,000 MW	1	+++	A5
FPA10	PVDF	1.5-10.5	7	60	100,000 MW	1	+++	A19
FPS10	PVDF	1.5-10.5	7	60	100,000 MW	1	+++	A37
FP100	PVDF	1.5-12	10	80	100,000 MW	1	+++	B1
FPT20	PVDF	1.5-10.5	10	60	200,000 MW	1	+++	A5
FPA20	PVDF	1.5-10.5	7	60	200,000 MW	1	+++	A19
FPS20	PVDF	1.5-10.5	7	60	200,000 MW	1	+++	A37
FP200	PVDF	1.5-12	10	80	200,000 MW	1	+++	B1

[1] Retention character depends on several parameters, including nature of the test solution. This information should therefore be used as a guide only.
[2] 1 low, 5 high
[3] + low, +++ high
[4] Available as CA2MF and CA2MP
[5] Maximum pressure limited by module.

Applications

Applications where tubular membranes have been selected as the best process solution include:

- Wood pulp bleach wastewater separation
- Side-stream (external) membrane bioreactors (MBRs)
- Manufacture of fine chemicals (various)
- Fruit juice clarification
- Lignosulphonate fractionation
- Landfill leachate treatment
- Textile dye processing (e.g. desalting)
- Textile process wastewater treatment/reuse
- Metal finishing wastewater separation
- Drinking water treatment
- Clean In Place (CIP) solution recovery
- Product recovery
- Acid purification
- Process R & D (academic and industrial)



PCI's range of over 20 tubular membranes incorporates products that are suitable for all these applications. The variety of materials employed provides a range of chemical compatibilities, with their exhaustive development delivering unmatched performance. The range also incorporates products with UK Drinking Water Inspectorate approval, proving their suitability for municipal applications.

PCI Membranes supplies its products as components to OEM systems builders, directly to end users (either as components or as complete membrane solutions) and as spares for our own and others' tubular membrane systems.

Quality Assurance

PCI Membranes designs, manages the manufacture of, and supplies equipment for liquid separation to the quality standard: BS EN ISO 9001:2000

Approval Certificate No. 881195/A

Destructive testing is carried out on samples of every membrane batch, as well as 100% performance testing of all RO and NF membranes. Finished membranes are preserved and stored under carefully-controlled conditions to prevent deterioration during storage. A computerised records and bar-coding system provides for complete traceability of each membrane produced, and facilitates traceability to confirm that the membranes meet 'high quality standards. PCI's products are offered with guarantees commensurate with their application and conditions of use.

Additionally PCI's experience of delivering membrane solutions allows us to provide extensive process performance guarantees when offering complete systems.

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