SANITARY MEMBRANE CATALOG

Synder® Filtration

Membranes that Perform.
People who Deliver.™

Company Profile

OUR COMPANY

Synder Filtration manufactures spiral wound microfiltration, ultrafiltration, and nanofiltration membrane elements and systems. But we were not always a supplier - Synder began as a buyer of spiral membranes in 1989, pioneering their use in industrial enzyme technology. Because we know firsthand what being a buyer in this industry is like, we have unique insight into what users need from their membrane supplier: quality, economy, and support.

We are privately-held and financially independent. This gives us the freedom to make a product that genuinely contributes to our customer's success, rather than maximizing profits at their expense. To achieve these goals, we maintain an international team of representatives and distributors with years of membrane expertise who are dedicated to serving our customers.

We serve a variety of industries including dairy, biotech, automotive, and food & beverage. All sanitary products meet USDA, FDA, and 3-A sanitary standards. Synder manufacturing is certified ISO 9001:2015, ISO-14001:2015, Halal, and Kosher.

We look forward to serving you.

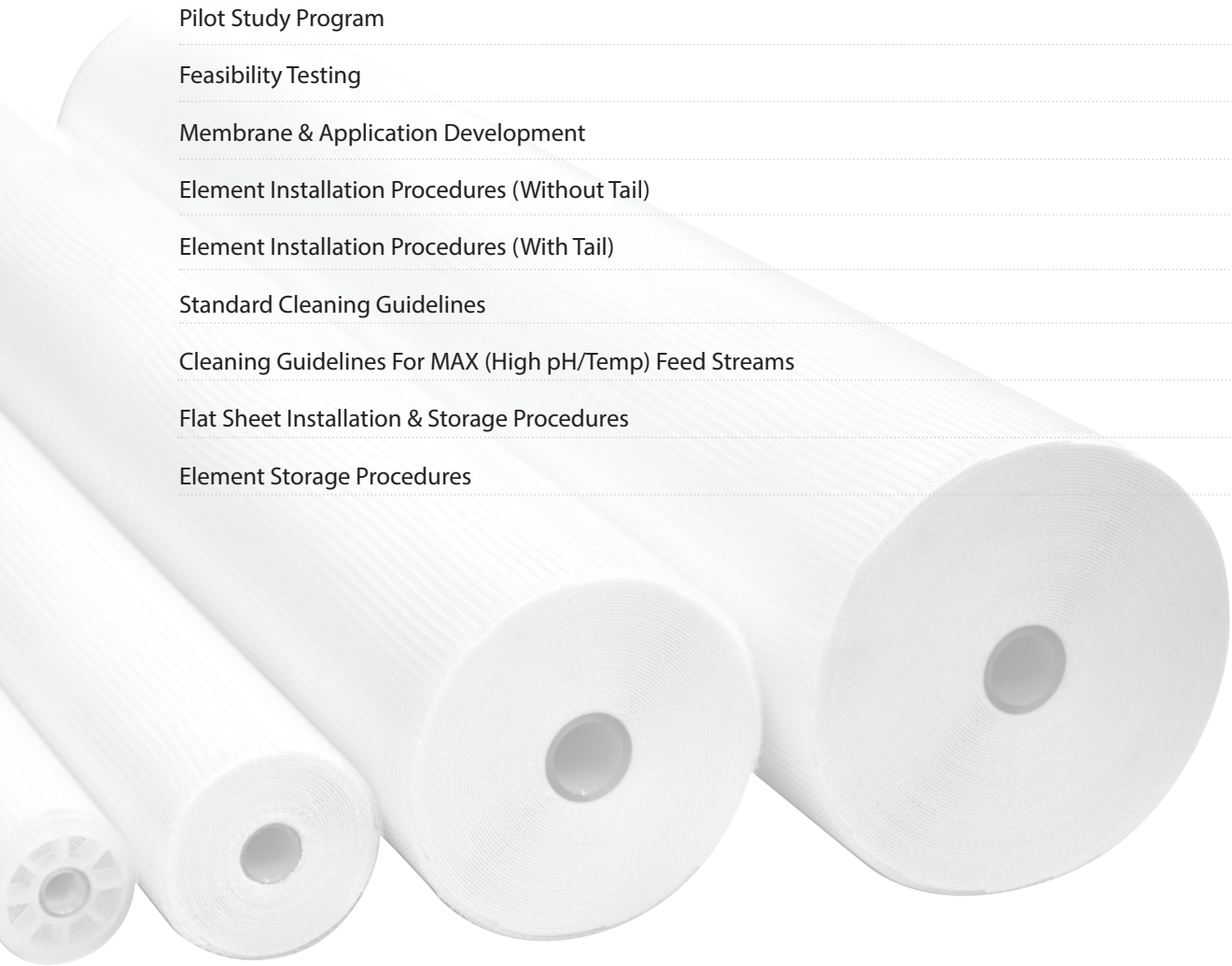
OUR MISSION

Solve the separation challenges of today. Innovate the membrane technologies of tomorrow.

As a company, we strive to be:

RELIABLE - We will be there when you need us.
CREATIVE - High performance begins with innovative ideas.
SUPPORTIVE - Technical or logistical questions? We have a team for that.
AUTHENTIC - Your success is our success.

Contents

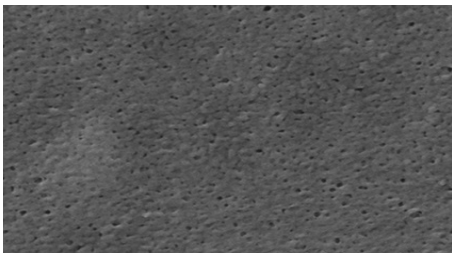


Membrane Technology

SELECTIVE TRANSPORT

Synder Filtration's polymeric membranes are used to separate, concentrate, and/or fractionate a wide variety of liquids. Membranes serve as a thin barrier between miscible fluids that allow for preferential transport of one or more feed components when a driving force is applied, such as a pressure differential.

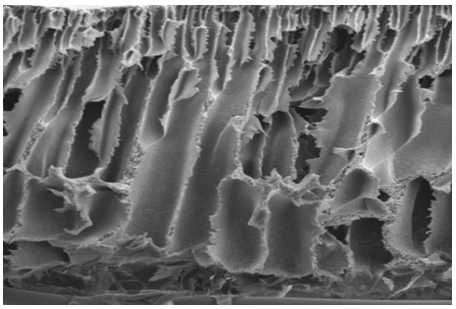
Electron Microscope Images



- Smooth surface reduces fouling tendency.
- Advancements in porosity and more uniform pore size distribution

ASYMMETRIC PORE STRUCTURE

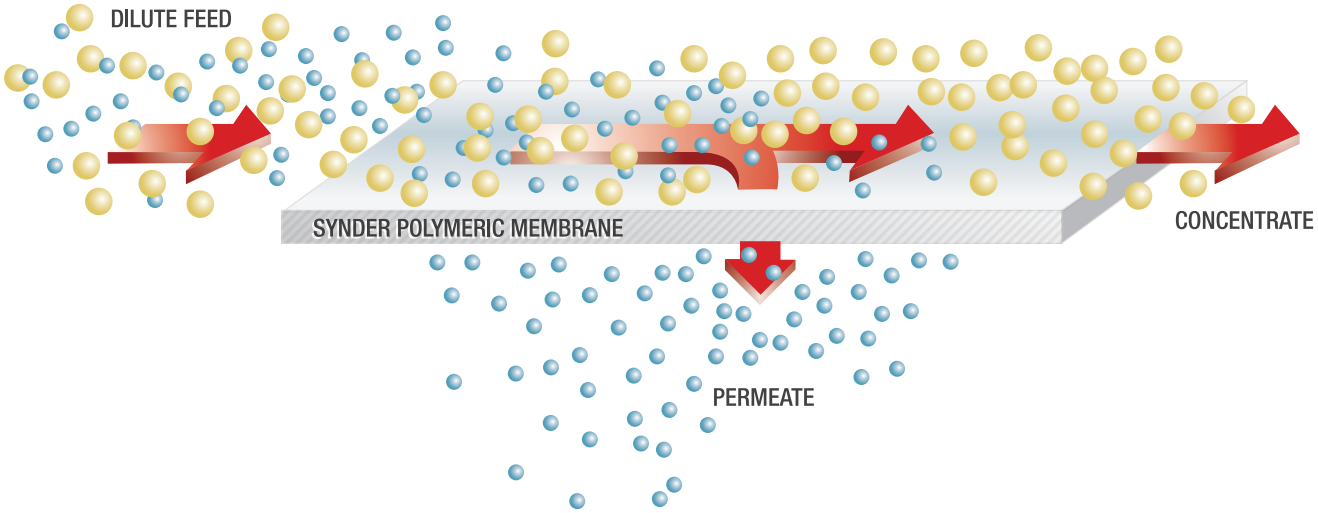
Synder membranes feature an asymmetric pore structure. Small surface pores control rejection of target molecules while large finger-like pores beneath the membrane surface allow permeate to move quickly through to a more open permeate carrier. This combination, along with membrane thickness offers an optimal combination of selectivity and throughput.



- Tiny pores on membrane surface are not visible.
- Finger-like pores beneath membrane surface.
- Larger finger-like pores allowing maximum permeate flow.
- Polyester backing material. (Also available in Polypropylene).

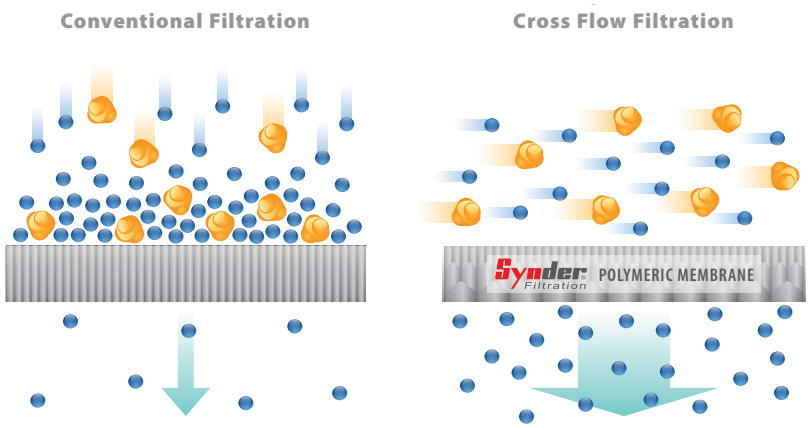
CROSS-FLOW PROCESS

Spiral wound membrane elements are fed tangentially. When sufficient pressure or concentration differentials exist on the surface of the membrane, molecules smaller than the surface pores will be driven through it. This solution that passes through the membrane is called the permeate; while the solution rejected by the membrane is called the concentrate (or retentate).

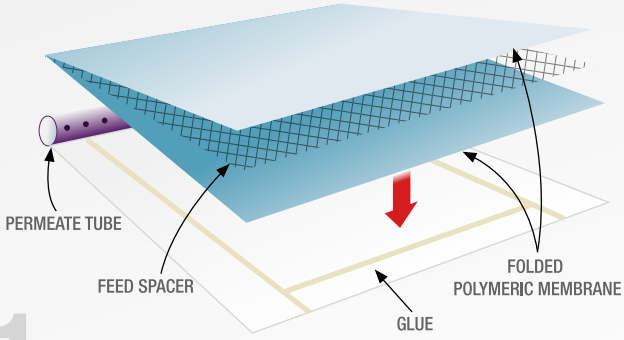


CONVENTIONAL V. CROSS-FLOW

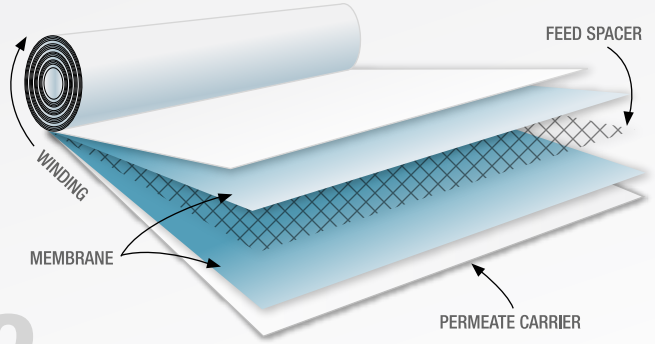
Synder's spiral wound membranes are designed for cross-flow (or tangential flow) filtration, where the feed stream runs parallel to the membrane surface. Unlike conventional filtration where solids and solutes immediately accumulate on the membrane surface, cross-flow creates a shearing force along the surface of the membrane to provide for longer filter life and less frequent cleaning cycles, under normal operating conditions.



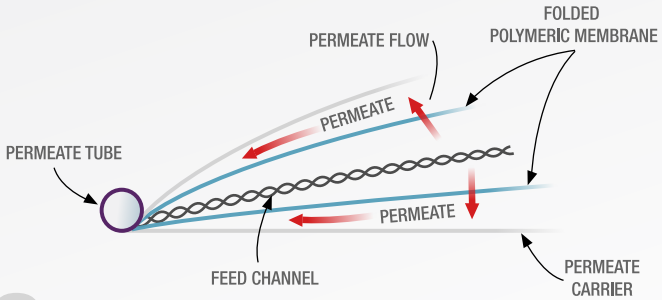
SPIRAL WOUND ELEMENT: A DISSECTION



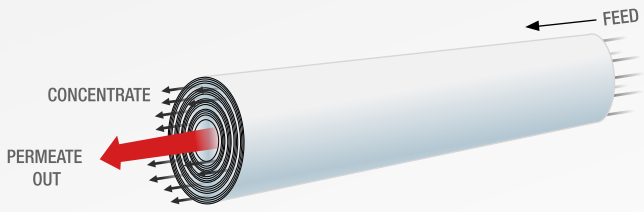
1 Membrane leaf being glued onto the permeate carrier



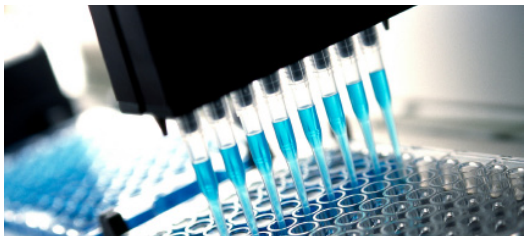
2 Winding of a spiral element



3 Cross section of a membrane leaf



4 Finished spiral element



Finding Solutions with Membrane Technology

With over 25 years of application knowledge and experience, Synder Filtration is committed to creating value with membrane technology. In addition to our most common applications listed below, Synder's process engineers have a deep understanding of how to evaluate new applications efficiently and effectively. Stocking a fleet of pilot systems for all types and sizes of pilot studies, Synder Filtration is ready to help you develop your process.

DAIRY INDUSTRY

Whey Protein Concentrate/Isolate Production

Synder offers a variety of membrane types for whey protein processing, allowing optimization of flux and protein rejection.

RECOMMENDED MEMBRANES fXT (S-PES 1kDa), fMT (S-PES 5kDa), XT (PES 1kDa), VT (PES 3kDa), MT (PES 5kDa), ST (PES 10kDa), NFG (TFC 600-800Da)

Lactose Concentration & Demineralization

Synder's membranes offer an optimal combination of lactose yield, flux, and demineralization of UF permeate or whey.

RECOMMENDED MEMBRANES NFS (TFC 200-300Da), NFX (TFC 150-300Da), NFW (TFC 300-500Da)

Milk Protein Concentrate/Isolate

Synder offers a variety of membrane types for milk protein processing, allowing optimization of flux and protein rejection.

RECOMMENDED MEMBRANES fMT (S-PES 5kDa), MT (PES 5kDa), ST (PES 10kDa), SM (PES 20kDa), MK (PES 30kDa), MQ (PES 50kDa)

Casein/Whey Fractionation

Synder's MF membranes can effectively fractionate dairy proteins, creating opportunities for process standardization and optimization.

RECOMMENDED MEMBRANES FR (PVDF 800kDa), V0.1 (PVDF 0.1µm)

Fat & Microbe Removal

Microfiltration membranes are used for fat and microbe removal in the production of high purity WPC & WPIs. Users typically experience significant cost savings in both CAPEX and OPEX vs. ceramic membranes.

RECOMMENDED MEMBRANES FR (PVDF 800kDa)

Brine Clarification

Ultrafiltration and microfiltration are proven to economically clarify and recover the brine used in the curing of cheese.

RECOMMENDED MEMBRANES BN (PVDF 50kDa), V0.1 (PVDF 0.1µm)

BIOTECH & PHARMACEUTICAL

Enzyme Concentration

UF and MF membranes are the standard for enzyme concentration and clarification/removal of cell bodies, respectively.

RECOMMENDED MEMBRANES MT (PES 5kDa), ST (PES 10kDa), FR (PVDF 800kDa), V0.1 (PVDF 0.1µm)

Antibiotics Production

NF membranes can be used to process a wide range of antibiotics with consistent product purity and performance.

RECOMMENDED MEMBRANES NFX (TFC 150-300Da)

Blood Serum

Synder's nanofiltration membranes are capable of capturing fibrinogen and other clotting compounds with excellent efficiency.

RECOMMENDED MEMBRANES NFX (TFC 150-300Da)

Endotoxin & Pyrogen Removal

Synder UF and MF membranes can efficiently remove endotoxins, pyrogens, microbes, and bacteria.

RECOMMENDED MEMBRANES MT (PES 5kDa), ST (PES 10kDa), V0.1 (PVDF 0.1µm)

Polypeptide Concentration

NF and tight UF membranes can concentrate and purify polypeptides while providing outstanding quality and consistency in operation.

RECOMMENDED MEMBRANES NFW (TFC 300-500Da), NFG (TFC 600-800Da), XT (PES 1kDa)

Organic Acid Concentration

Nanofiltration membranes can concentrate and/or desalt organic acids during fermentation processes.

RECOMMENDED MEMBRANES NFX (TFC 150-300Da), NFW (TFC 300-500Da)

Amino Acid Production

Amino acids produced by a fermentation process contain high levels of suspended solids. MF membranes can be used to not only achieve a high product recovery, but also maintain the amino acid's integrity.

RECOMMENDED MEMBRANES FR (PVDF 800kDa), V0.1 (PVDF 0.1µm), V0.2 (PVDF 0.2µm)

Fermentation Broth Clarification

Synder offers a variety of MF membranes for fermentation broth clarification, providing a cost-effective and high-throughput alternative to classical centrifugation and flocculation techniques.

RECOMMENDED MEMBRANES FR (PVDF 800kDa), V0.1 (PVDF 0.1µm), V0.2 (PVDF 0.2µm)

FOOD & BEVERAGE

Corn Wet Milling

Membranes ranging from MF to NF are commonly used in the wet milling of corn. Numerous applications range from the removal of microorganisms to the concentration and clarification of corn syrup, just to name a few.

RECOMMENDED MEMBRANES NFX (TFC 150-300Da), NFW (TFC 300-500Da), LX (PES 300kDa), FR (PVDF 800kDa), V0.1 (PVDF 0.1µm)

Gelatin Clarification & Concentration

Synder's UF & MF membranes provide optimal retention rates for concentrating gelatin while removing unwanted molecules and microorganisms.

RECOMMENDED MEMBRANES MT (PES 5kDa), ST (PES 10kDa), FR (PVDF 800kDa), V0.1 (PVDF 0.1µm)

Juice Processing

Synder's UF & NF membranes consistently display excellent removal of starch, pectin, proteins, and polyphenolic compounds. Microfiltration can also be utilized for the removal of microorganisms.

RECOMMENDED MEMBRANES NFX (150-300Da), MT (PES 5kDa), ST (PES 10kDa), FR (PVDF 800kDa), V0.1 (PVDF 0.1µm)

Natural Polymers & Xanthan Gum

Synder's MF and NF membranes provide an optimal combination of retention rates and throughput required for commercial production while removing harmful microorganisms.

RECOMMENDED MEMBRANES V0.1 (PVDF 0.1µm), NFX (TFC 150-300Da)

Color, Carbohydrate, and Flavor Removal/ Concentration

Synder's NF membranes can effectively remove small color, flavor, and carbohydrate molecules. Beer, wine, coffee, and other beverages can be modified using Synder membranes to produce alcoholic seltzers, color concentrates, and coffee concentrates.

RECOMMENDED MEMBRANES NFS (TFC 200-300Da), NFX (TFC 150-300Da), NFW (TFC 300-500Da)

Maple Syrup

Concentrating maple sap with spiral wound membranes can reduce overall processing time and operating costs.

RECOMMENDED MEMBRANES NFX (TFC 150-300Da)

Dealcoholization

NF membranes can remove alcohol efficiantly with minimal effect to flavor profile.

RECOMMENDED MEMBRANES NFX (TFC 150-300Da), NFW (300-500Da)

The Synder Difference

INDUSTRY LEADING SHIPPING TIMES

We understand that plant life can be unpredictable, and we pride ourselves in having the best lead times in the industry. Lead time is measured in days or weeks, not months. In addition, we maintain a large stock of our popular models, ready to go at a moments notice.

PERSONAL RESPONSE POLICY

You will hear from us within 24 hours, usually less. It's that simple. Contact us today.

QUALITY & ENVIRONMENTAL POLICY

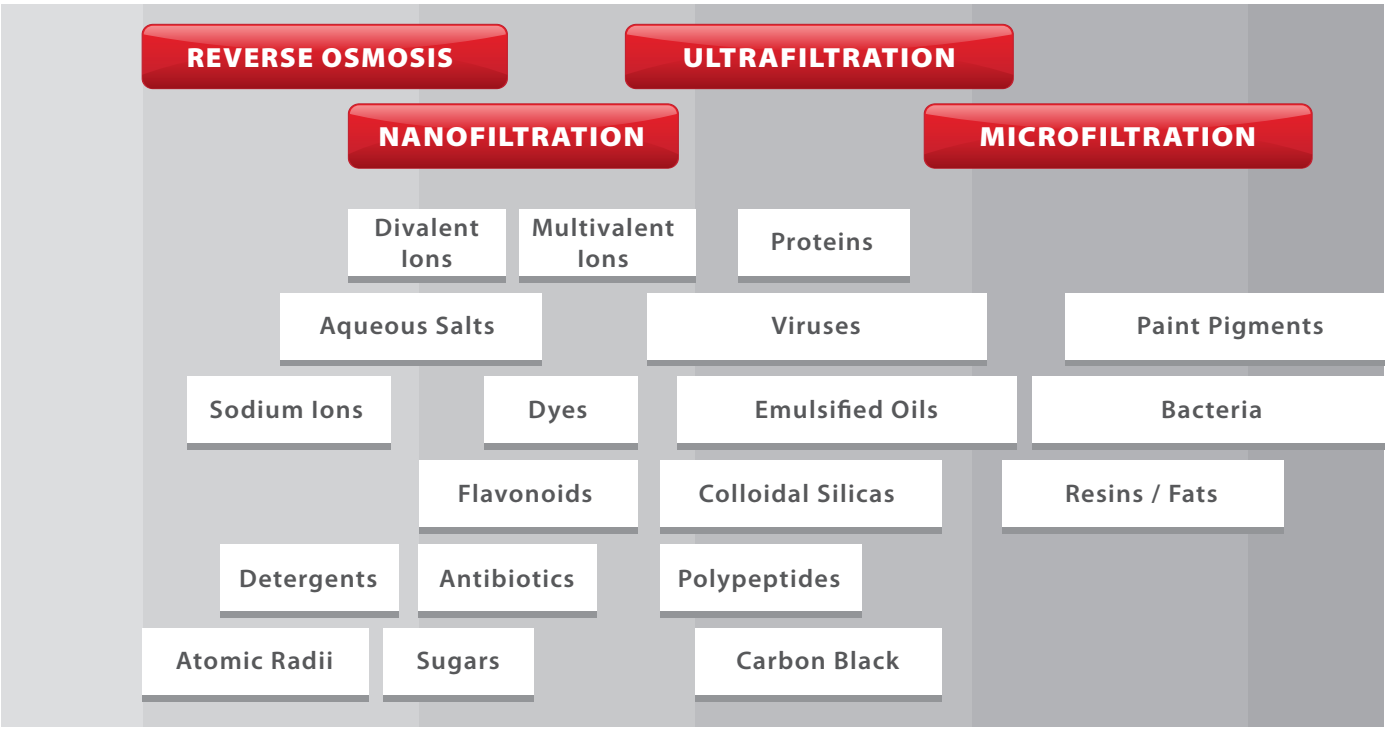
Synder Filtration strives to achieve the best lead times, deliver high-quality products and services to our clients and emphasizes a focus on satisfying our customers' requirements, along with all other applicable standards and legal compliance requirements, while continually improving all our processes. We accomplish this by:

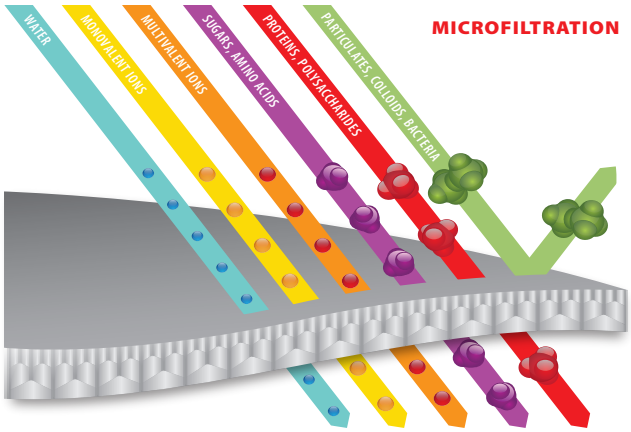
- Monitoring our performance against our established quality and environmental objectives, which measure the effectiveness of our processes and associated optimization efforts
- Protecting our environment and preventing pollution
- Identifying areas where we can improve our processes
- Facilitating a company culture defined by fairness and accountability
- Management commitment and employee training
- Ensuring the sustainability of our processes to promote growth within our organization as well as into new products and applications

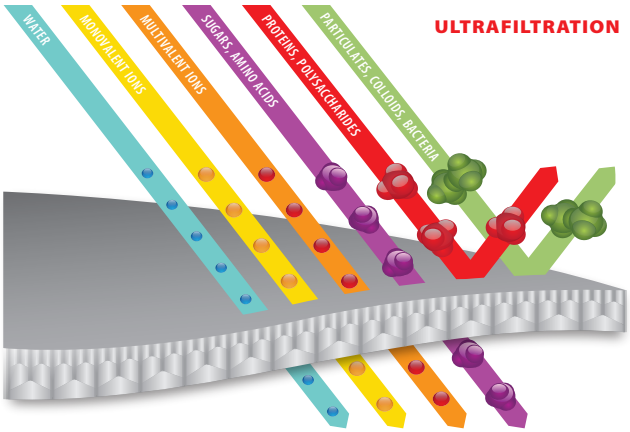
CUSTOM ELEMENTS & PRODUCT DEVELOPMENT

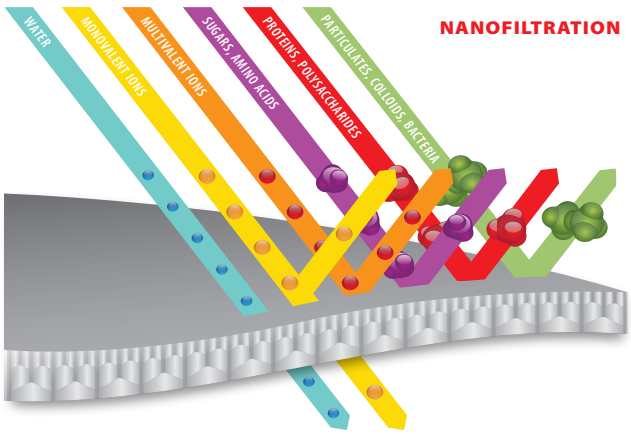
We have the widest range of membrane pore sizes in the industry. However, sometimes customers have needs not met by the standard membrane models. Our team of experts can work with you to help deliver a membrane solution to better suit your application.

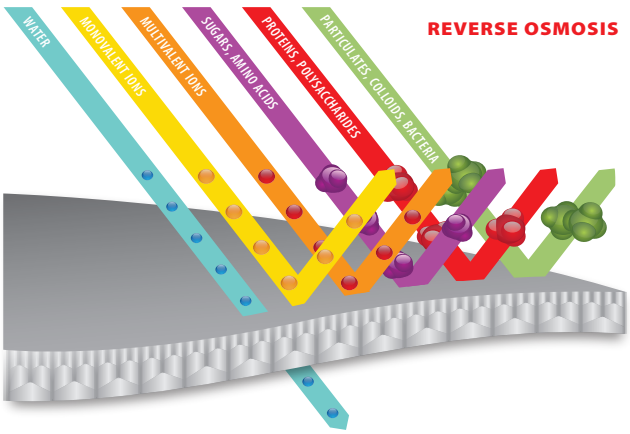
Degrees of Separation











Nanofiltration Membrane Elements

Synder Filtration's nanofiltration membranes are engineered and designed to provide superior separation performance for various application needs. Delivering stable flux and wide range of rejection to monovalent and divalent ions, Synder's NF membranes have been developed specifically for specialty process applications.

MEMBRANE TYPES

Model	Polymer	Approx. Molecular Weight Cutoff	Typical Operating Flux	Average Lactose Rejection[1]	Average $MgSO_4$ Rejection[2]	Average NaCl Rejection[3]
NFX	Proprietary PA TFC	150-300Da	20-25 GFD	99.5%	99.5%	50.0%
NFS	Proprietary PA TFC	200-300Da	25-35 GFD	99.5%	99.3%	40.0%
NFD	Proprietary PA TFC	250-350Da	10-20 GFD	99.5%	99.0%	40.0%
NFDE	Proprietary PA TFC	250-400Da	30-40 GFD	99.0%	98.0%	30.0%
NFW	Proprietary PA TFC	300-500Da	45-50 GFD	98.5%	97.0%	30.0%
NFDC	Proprietary PA TFC	350-550Da	25-30 GFD	98.6%	96.5%	20.0%
NDX	Proprietary PA TFC	500-600Da	30-40 GFD	95.0%	92.0%	40.0%
NDF	Proprietary PA TFC	500-700Da	40-50 GFD	90.0%	80.0%	10.0%
NFG	Proprietary PA TFC	600-800Da	55-60 GFD	60.0%	50.0%	10.0%

[1]Test Conditions 2% Lactose Solution at 110PSI (760 kPa) operating pressure, 77° F (25° C)
[2]Test Conditions 2,000ppm $MgSO_4$ Solution at 110PSI (760 kPa) operating pressure, 77° F (25° C)
[3]Test Conditions 2,000ppm NaCl Solution at 110PSI (760 kPa) operating pressure, 77° F (25° C)

STANDARD SERIES BENEFITS

- Conforms to 3-A, FDA, and USDA sanitary standards
- Wide range of UF MWCOs available
- High resistance to fouling
- Customizable dimensions for unique housings

WHY SYNDER NF MEMBRANES?

- Optimized flux and rejection
- Operate at lower pressures than Reverse Osmosis membranes and still achieve excellent rejection of polyvalent ions
- Greatly reduce levels of hardness, nitrates, sulfates, tannins, turbidity, color, TDS, and moderate levels of salt from feed streams

DAIRY PRODUCTS TOTAL SOLIDS LIMITS

Dairy Product Total Solids Limits	Spacer			
Products	31	46	65	80
Sweet Whey Max. T.S.	15	25	28	30
Acid Whey Max. T.S.	15	24	26	28
Skim Milk Max. T.S.	14	24	26	28
Whole Milk Max. T.S.	15	30	33	35

SANITARY ELEMENT OPERATING SPECIFICATIONS

Pressure	PSI	Bar
Max. Operating Pressure if T<95°F (35°C)	600	41.4
Max. Operating Pressure if T>95°F (35°C)	435	30.0
MAX. Differential Pressure per Element		
24 & 31 mil	12-15	0.8-1.0
46 mil	15-20	1.0-1.4
65 & 80 mil	15-25	1.0-1.7
Max. Permeate Backpressure	5	0.3

NOTE: Soft start on boost pumps required to minimize pressure/flow shocks to elements.

Temperature	Fahrenheit	Celsius
Max. Continuous Operation	122°	50°
Max. CIP Temperature	131°	55°

pH Parameters	pH
Operating Parameters	3.0-10.0
	NFG: 4-10
Cleaning Parameters	1.8-11.0
	NFG: 3-10.5

Chlorine
Dechlorination recommended

NOTE: Trials should be made to determine temperature and viscosity effects.

NF Spiral-Wound Sanitary Elements

ELEMENT DIMENSIONS

Element	Model No.	Diameter (B) in	Length (A) in	PWT ID/OD (in)	Weight lb (kg)
1.8"	1812F	1.8	12	0.63	2 (0.9)
2.5″	2519	2.5	19.25	0.63	4 (1.8)
	2538	2.5	38	0.83	5 (2.3)
	2540	2.5	40	0.63	5 (2.3)
	2540M*	2.5	38	0.75*	5 (2.3)
3.8″	3838	3.8	38	0.83	9 (4.0)
	3838.75	3.8	38.75	0.83	9 (4.0)
	3938.75	4.0	38.75	0.63	10 (4.5)
	3940F	4.0	40	0.63	10 (4.5)
	3940M*	4.0	38	0.75*	10 (4.5)
4.3″	4333	4.3	33	0.83	10 (4.5)
	4335	4.3	35	0.83	10 (4.5)
	4335.5	4.3	35.5	0.83	10 (4.5)
	4336	4.3	36	0.83	10 (4.5)
	4338	4.3	38	0.83	11 (5.0)
5.8″	5838	5.8	38	1.14	18 (8.2)
6.3″	6324	6.3	24	1.14	15 (6.8)
	6338	6.3	38	1.14	20 (9.1)
6.4″	6424	6.4	24	1.14	15 (6.8)
	6438	6.4	38	1.14	20 (9.1)
7.8″	7824	7.8	24	1.14	18 (8.2)
	7838	7.8	38	1.14	28 (12.7)
8″	8038	8.0	38	1.125	28 (12.7)
	8040	8.0	40	1.125	30 (13.6)
	8238	8.2	38	1.14	30 (13.6)
	8240	8.2	40	1.14	30 (13.6)
	8338	8.3	38	1.14	30 (13.6)
	8340	8.3	40	1.14	32 (14.5)

*1″ permeate tube extensions on each end

MEMBRANE AREA (SQ FT)

Element	Model No.	24	31	46	65	80
1.8"	1812F	4.8	4.1	3.1	2.3	1.9
2.5″	2519	16	13	10	8.5	7.4
	2538	30	28	22	17	15
	2540	38	30	22	19	15
	2540M	36	28	20	18	14
3.8″	3838	105	85	70	50	45
	3838.75	107	86	71	51	46
	3938.75	110	99	74	59	50
	3940F	110	99	74	59	50
	3940M	107	96	72	57	49
4.3″	4333	114	98	77	60	49
	4335	121	104	82	64	53
	4335.5	123	106	83	65	54
	4336	125	107	85	66	55
	4338	133	114	90	70	58
5.8″	5838	252	216	170	132	112
6.3″	6324	183	157	125	96	83
	6338	300	258	205	157	136
6.4″	6424	183	161	125	97	83
	6438	300	264	205	160	136
7.8″	7824	275	242	191	146	117
	7838	450	396	315	240	192
8″	8038	470	400	312	247	210
	8040	470	400	312	247	210
	8238	517	440	342	266	228
	8240	517	440	342	266	228
	8338	528	460	351	273	234
	8340	528	460	351	273	234

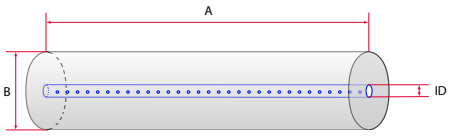
RECOMMENDED ELEMENT CROSS-FLOW RATE

Element		Feed Spacer (in mils) 24	31	46	65	80
1.8"	m^3/hr	1	1	1	2	2
	gpm	4	5	6	7	7
2.5"	m^3/hr	2	2	3	3	3
	gpm	9	10	11	12	13
3.8″	m^3/hr	5	6	7	8	8
	gpm	22	25	29	33	35
4.3″	m^3/hr	6	7	9	10	10
	gpm	29	32	38	44	46
5.8″	m^3/hr	12	13	16	18	19
	gpm	51	59	69	78	83
6.3″	m^3/hr	15	17	20	22	24
	gpm	65	74	88	99	105
8″	m^3/hr	21	24	29	33	35
	gpm	94	107	128	143	154

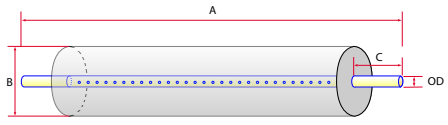
The recommended cross-flow rate will be subject to differential pressure limitations and specific applications.

TECHNICAL NOTES

For element sizes not listed, please call or email Synder Filtration for details. We can design an element to meet your needs.



Female Element (Fig.1)



Male Element (Fig.2)

NFX - 2B - 8038

Membrane Model	
Spacer Size	Model No.
24 mil	1
31 mil	2
46 mil	3
65 mil	4
80 mil	5
90 mil (corrugated)	5C

Outerwrap
A = Control Bypass with Tail
B = Control Bypass without Tail

Ultrafiltration & Microfiltration Elements

Synder Filtration's ultrafiltration and microfiltration elements offer an optimal combination of both flux and rejection in a comprehensive range of MWCOs.

STANDARD SERIES BENEFITS

- Conforms to 3-A, FDA, and USDA sanitary standards
- Wide range of UF MWCOs available
- High resistance to fouling
- Customizable dimensions for unique housings

MEMBRANE MODELS

MODEL	MWCO	MATERIAL
XT	1,000	PES
VT	3,000	PES
MT	5,000	PES
ST	10,000	PES
SM	20,000	PES
MK	30,000	PES
MQ	50,000	PES
LY	100,000	PES
LV	200,000	PES
LX	300,000	PES
PZ	30,000	PAN
PY	100,000	PAN
PX	400,000	PAN
BN	50,000	PVDF
BY	100,000	PVDF
BX	250,000	PVDF
A6	500,000	PVDF
FC	700,000	PVDF
FR	800,000	PVDF
BC	900,000	PVDF
V0.1	0.1 µm	PVDF
V0.2	0.2 µm	PVDF

SANITARY ELEMENT SPECIFICATIONS

Pressure	PSI	Bar
Max. Inlet Pressure	140	9.7
Min. Outlet Pressure	10	0.7
MAX. Differential Pressure per Element		
24 & 31 mil	12-15	0.8-1.0
46 mil	15-20	1.0-1.4
65 & 80 mil	15-25	1.0-1.7
Max. Permeate Backpressure	5	0.3

NOTE: Soft start on boost pumps required to minimize pressure/flow shocks to elements.

Temperature	Fahrenheit	Celsius
Max. Operating	122°	50°
Max. CIP Temperature	131°	55°

pH Parameters	pH
Operating Parameters	3.0-10.0
Cleaning Parameters	1.8-11.0 at 50°C

Chlorine	Norm. ppm	Max. ppm
Free Chlorine in DF Water or Product	0	< 0.1
Chlorine during CIP at: pH 10.8-11.0 and 50°C (PES/PVDF) pH 10.5 and 50°C (PAN)	150	180

NOTE: Maximum chlorine exposure for all elements is 30 minutes per day at pH and temperature conditions listed above.

Peroxide	Max. ppm
Free Peroxide during Operation	< 3 ppm
Peroxide as a Sanitizer at 25°C, pH 6-7 10 minutes recirculation	0.1%

NOTE: Trials should be made to determine temperature and viscosity effects.

UF/MF Spiral-Wound Sanitary Elements

ELEMENT DIMENSIONS

Element	Model No.	Diameter (B) in	Length (A) in	PWT ID/OD in	Weight lb (kg)
1.8"	1812F	1.8	12	0.63	2 (0.9)
2.5″	2519	2.5	19.25	0.63	4 (1.8)
	2538	2.5	38	0.83	5 (2.3)
	2540F	2.5	40	0.63	5 (2.3)
	2540M*	2.5	38	0.75*	5 (2.3)
3.8″	3838	3.8	38	0.83	9 (4.0)
	3838.75	3.8	38.75	0.83	9 (4.0)
	3938.75	4.0	38.75	0.63	10 (4.5)
	3940F	4.0	40	0.63	10 (4.5)
	3940M*	4.0	38	0.75*	10 (4.5)
4.3″	4333	4.3	33	0.83	10 (4.5)
	4335	4.3	35	0.83	10 (4.5)
	4335.5	4.3	35.5	0.83	10 (4.5)
	4336	4.3	36	0.83	10 (4.5)
	4338	4.3	38	0.83	11 (5.0)
5.8″	5838	5.8	38	1.14	18 (8.2)
6.3″	6324	6.3	24	1.14	15 (6.8)
	6338	6.3	38	1.14	20 (9.1)
6.4"	6438	6.4	38	1.14	20 (9.1)
7.8"	7838	7.8	38	1.14	28 (12.7)
8″	8038	8.0	38	1.14	28 (12.7)
	8040	8.0	40	1.14	30 (13.6)
	8238	8.2	38	1.14	30 (13.6)
	8240	8.2	40	1.14	32 (14.5)
	8338	8.3	38	1.14	30 (13.6)
	8340	8.3	40	1.14	32 (14.5)
9"	9838	9.8	38	1.14	45 (20.5)
10″	10338	10.3	38	1.14	53 (24.1)

*1″ permeate tube extensions on each end

MEMBRANE AREA (SQ FT)

		Feed Spacer (in mils)				
Element	Model No.	24	31	46	65	80
1.8"	1812F	4.3	3.6	2.9	2.1	1.8
2.5″	2519F	15	13	10	8	6
	2538	29	25	20	16	14
	2540F	34	30	23	18	16
	2540M	32	29	22	17	15
3.8″	3838	89	76	60	48	40
	3838.75	92	78	62	49	41
	3938.75	102	87	69	53	47
	3940F	102	87	69	53	47
	3940M	96	80	64	49	44
4.3″	4333	99	86	70	55	46
	4335	105	91	74	59	49
	4335.5	107	92	75	60	50
	4336	108	94	76	61	51
	4338	115	100	80	64	54
5.8″	5838	210	184	147	118	102
6.3″	6324	150	134	112	84	76
	6338	264	220	180	136	121
6.4"	6438	264	230	185	145	125
7.8"	7838	400	350	275	225	185
8″	8038	420	375	300	230	205
	8040	420	375	300	230	205
	8238	450	390	315	250	215
	8240	450	390	315	250	215
	8338	465	410	320	255	220
	8340	465	410	320	255	220
9"	9838	640	570	440	350	305
10″	10338	730	635	510	405	250

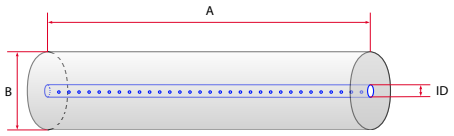
RECOMMENDED ELEMENT CROSS-FLOW RATE

		Feed Spacer (in mils)				
Element		24	31	46	65	80
1.8"	m^3/hr	1	1	1	2	2
	gpm	4	5	6	7	7
2.5"	m^3/hr	2	2	3	3	3
	gpm	9	10	11	12	13
3.8″	m^3/hr	5	6	7	8	8
	gpm	22	25	29	33	35
4.3″	m^3/hr	6	7	9	10	10
	gpm	29	32	38	44	46
5.8″	m^3/hr	12	13	16	18	19
	gpm	51	59	69	78	83
6.3″	m^3/hr	15	17	20	22	24
	gpm	65	74	88	99	105
8″	m^3/hr	21	24	29	33	35
	gpm	94	107	128	143	154
10″	m^3/hr	42	48	57	64	68
	gpm	184	213	250	283	299

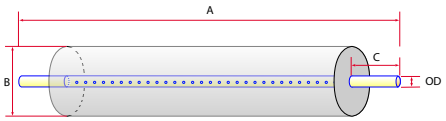
The recommended cross-flow rate will be subject to differential pressure limitations and specific applications.

TECHNICAL NOTES

For element sizes not listed, please call or email Synder Filtration for details. We can design an element to meet your needs.



Female Element (Fig.1)



Male Element (Fig.2)

Membrane Model	ST - 2B - 6338

Spacer Size	Model No.
24 mil	1
31 mil	2
46 mil	3
65 mil	4
80 mil	5
90 mil (corrugated)	5C

Outerwrap
A = Control Bypass with Tail
B = Control Bypass without Tail

MAX Series - High pH / Temperature

Synder Filtration's MAX Series elements offer exceptional physical and chemical durability, with a wide range of MWCO's similar to our standard UF/MF elements.

MAX SERIES BENEFITS

- Conforms to 3-A, FDA, and USDA sanitary standards
- Hot sanitization eliminates chlorine during CIP
- High resistance to pH and temperature
- High resistance to fouling
- Customizable dimensions for unique housings

MEMBRANE MODELS

MODEL	MWCO	MATERIAL
fXT	1,000	S-PES
fMT	5,000	S-PES
XT	1,000	PES
VT	3,000	PES
MT	5,000	PES
ST	10,000	PES
SM	20,000	PES
MK	30,000	PES
MQ	50,000	PES
LY	100,000	PES
LV	200,000	PES
LX	300,000	PES
BN	50,000	PVDF
BY	100,000	PVDF
BX	250,000	PVDF
A6	500,000	PVDF
FC	700,000	PVDF
FR	800,000	PVDF
BC	900,000	PVDF
V0.1	0.1 µm	PVDF
V0.2	0.2 µm	PVDF

MAX SANITARY ELEMENT SPECIFICATIONS

Pressure	PSI	Bar
Max. Inlet Pressure	140	9.7
Min. Outlet Pressure	10	0.7
MAX. Differential Pressure per Element		
24 & 31 mil	12-15	0.8-1.0
46 mil	15-20	1.0-1.4
65 & 80 mil	15-25	1.0-1.7
Max. Permeate Backpressure	5	0.3

NOTE: Soft start on boost pumps required to minimize pressure/flow shocks to elements.

Temperature	Fahrenheit	Celsius
Max. Operating	140°	60°
Max. CIP Temperature	158°	70°

pH Parameters	pH
Operating Parameters	2.0-10.0
Cleaning Parameters	1.8-12.5 (PES) / 1.8-12.0 (PVDF)

Chlorine	Norm. ppm	Max. ppm
Free Chlorine in DF Water or Product	0	< 0.1
Chlorine during CIP at: pH 10.8-11.0 and 50°C (PES/ PVDF)	150	180

NOTE: Trials should be made to determine temperature and viscosity effects.

MAX Spiral-Wound Sanitary Elements

ELEMENT DIMENSIONS

Element	Model No.	Diameter (B) in	Length (A) in	PWT ID/OD in	Weight lb (kg)
1.8"	1812F	1.8	12	0.63	2 (0.9)
2.5″	2519	2.5	19.25	0.63	4 (1.8)
	2538	2.5	38	0.83	5 (2.3)
	2540	2.5	40	0.63	5 (2.3)
	2540M*	2.5	38	0.75*	5 (2.3)
3.8″	3838	3.8	38	0.83	9 (4.0)
	3838.75	3.8	38.75	0.83	9 (4.0)
	3938.75	4.0	38.75	0.63	10 (4.5)
	3940F	4.0	40	0.63	10 (4.5)
	3940M*	4.0	38	0.75*	10 (4.5)
4.3″	4333	4.3	33	0.83	10 (4.5)
	4335	4.3	35	0.83	10 (4.5)
	4335.5	4.3	35.5	0.83	10 (4.5)
	4336	4.3	36	0.83	10 (4.5)
	4338	4.3	38	0.83	11 (5.0)
5.8″	5838	5.8	38	1.14	18 (8.2)
6.3″	6324	6.3	24	1.14	15 (6.8)
	6338	6.3	38	1.14	20 (9.1)
6.4″	6424	6.4	24	1.14	15 (6.8)
	6438	6.4	38	1.14	20 (9.1)
7.8″	7824	7.8	24	1.14	18 (8.2)
	7838	7.8	38	1.14	28 (12.7)
8″	8038	8.0	38	1.14	28 (12.7)
	8040	8.0	40	1.14	30 (13.6)
	8238	8.2	38	1.14	30 (13.6)
	8240	8.2	40	1.14	30 (13.6)
	8338	8.3	38	1.14	30 (13.6)
	8340	8.3	40	1.14	32 (14.5)
9"	9838	9.8	38	1.14	45 (20.5)
10″	10338	10.3	38	1.14	53 (24.1)

*1″ permeate tube extensions on each end

MEMBRANE AREA (SQ FT)

		Feed Spacer (in mils)				
Element	Model No.	24	31	46	65	80
1.8"	1812F	4.3	3.6	2.9	2.1	1.8
2.5″	2519F	15	13	10	8	6
	2538	29	25	20	16	14
	2540F	34	30	23	18	16
	2540M	32	29	22	17	15
3.8″	3838	89	76	60	48	40
	3838.75	92	78	62	49	41
	3938.75	102	87	69	53	47
	3940F	102	87	69	53	47
	3940M	96	80	64	49	44
4.3″	4333	99	86	70	55	46
	4335	105	91	74	59	49
	4335.5	107	92	75	60	50
	4336	108	94	76	61	51
	4338	115	100	80	64	54
5.8″	5838	210	184	147	118	102
6.3″	6324	150	134	112	84	76
	6338	264	220	180	136	121
6.4"	6438	264	230	185	145	125
7.8"	7838	400	350	275	225	185
8″	8038	420	375	300	230	205
	8040	420	375	300	230	205
	8238	450	390	315	250	215
	8240	450	390	315	250	215
	8338	465	410	320	255	220
	8340	465	410	320	255	220
9"	9838	640	570	440	350	305
10″	10338	730	635	510	405	250

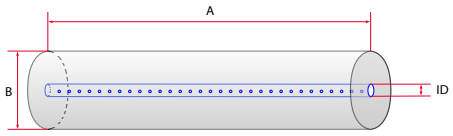
TECHNICAL NOTES

For element sizes not listed, please call or email Synder Filtration for details. We can design an element to meet your needs.

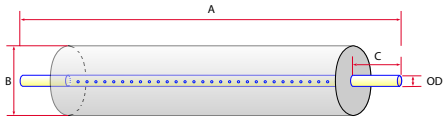
RECOMMENDED ELEMENT CROSS-FLOW RATE

		Feed Spacer (in mils)				
Element		24	31	46	65	80
1.8"	m^3/hr	1	1	1	2	2
	gpm	4	5	6	7	7
2.5"	m^3/hr	2	2	3	3	3
	gpm	9	10	11	12	13
3.8″	m^3/hr	5	6	7	8	8
	gpm	22	25	29	33	35
4.3″	m^3/hr	6	7	9	10	10
	gpm	29	32	38	44	46
5.8″	m^3/hr	12	13	16	18	19
	gpm	51	59	69	78	83
6.3″	m^3/hr	15	17	20	22	24
	gpm	65	74	88	99	105
8″	m^3/hr	21	24	29	33	35
	gpm	94	107	128	143	154
10″	m^3/hr	42	48	57	64	68
	gpm	184	213	250	283	299

The recommended cross-flow rate will be subject to differential pressure limitations and specific applications.



Female Element (Fig.1)



Male Element (Fig.2)

Membrane Model	ST - 2B - 6338MAX

Spacer Size	Model No.
24 mil	1
31 mil	2
46 mil	3
65 mil	4
80 mil	5
90 mil (corrugated)	5C

Outerwrap
A = Control Bypass with Tail
B = Control Bypass without Tail

OptimaFlow Series

Synder Filtration's OptimaFlow Series offer additional membrane area for higher permeate flow, while maintaining the same physical and chemical durability and wide range of MWCO's as our standard UF/MF elements.

OPTIMAFLOW SERIES BENEFITS

- Additional membrane area for higher permeate flow
- Conforms to 3-A, FDA, and USDA sanitary standards
- Wide range of UF MWCOs available
- High resistance to fouling
- Customizable dimensions for unique housings

MEMBRANE MODELS

MODEL	MWCO	MATERIAL
XT	1,000	PES
VT	3,000	PES
MT	5,000	PES
ST	10,000	PES
SM	20,000	PES
MK	30,000	PES
MQ	50,000	PES
LY	100,000	PES
LV	200,000	PES
LX	300,000	PES
PZ	30,000	PAN
PY	100,000	PAN
PX	400,000	PAN
BN	50,000	PVDF
BY	100,000	PVDF
BX	250,000	PVDF
A6	500,000	PVDF
FC	700,000	PVDF
FR	800,000	PVDF
BC	900,000	PVDF
V0.1	0.1 µm	PVDF
V0.2	0.2 µm	PVDF

OPTIMAFLOW SANITARY ELEMENT SPECIFICATIONS

Pressure	PSI	Bar
Max. Inlet Pressure	140	9.7
Min. Outlet Pressure	10	0.7
Max. Differential Pressure per Element		
24 & 31 mil	12-15	0.8-1.0
46 mil	15-20	1.0-1.4
65 & 80 mil	15-25	1.0-1.7
Max. Permeate Backpressure	5	0.3

NOTE: Soft start on boost pumps required to minimize pressure/flow shocks to elements.

Temperature	Fahrenheit	Celsius
Max. Operating	122°	50°
Max. CIP Temperature	131°	55°

pH Parameters	pH
Operating Parameters	3.0-9.0
Cleaning Parameters	1.8-11.0 at 50°C

Chlorine	Norm. ppm	Max. ppm
Free Chlorine in DF Water or Product	0	< 0.1
Chlorine during CIP at: pH 10.8-11.0 and 50°C (PES/PVDF) pH 10.5 and 50°C (PAN)	150	180

NOTE: Maximum chlorine exposure for all elements is 30 minutes per day at pH and temperature conditions listed above.

Peroxide	Max. ppm
Free Peroxide during Operation	< 3 ppm
Peroxide as a Sanitizer at 25°C, pH 6-7 10 minutes recirculation	0.1%

NOTE: Trials should be made to determine temperature and viscosity effects.

OptimaFlow Spiral-Wound Sanitary Elements

ELEMENT DIMENSIONS

Element	Model No.	Diameter (B) in	Length (A) in	PWT ID/OD in	Weight lb (kg)
1.8"	1812F	1.8	12	0.63	2 (0.9)
2.5″	2519	2.5	19.25	0.63	4 (1.8)
	2538	2.5	38	0.83	5 (2.3)
	2540	2.5	40	0.63	5 (2.3)
	2540M*	2.5	38	0.75*	5 (2.3)
3.8″	3838	3.8	38	0.83	9 (4.0)
	3838.75	3.8	38.75	0.83	9 (4.0)
	3938.75	4.0	38.75	0.63	10 (4.5)
	3940F	4.0	40	0.63	10 (4.5)
	3940M*	4.0	38	0.75*	10 (4.5)
4.3″	4333	4.3	33	0.83	10 (4.5)
	4335	4.3	35	0.83	10 (4.5)
	4335.5	4.3	35.5	0.83	10 (4.5)
	4336	4.3	36	0.83	10 (4.5)
	4338	4.3	38	0.83	11 (5.0)
5.8″	5838	5.8	38	1.14	18 (8.2)
6.3″	6324	6.3	24	1.14	15 (6.8)
	6338	6.3	38	1.14	20 (9.1)
6.4″	6424	6.4	24	1.14	15 (6.8)
	6438	6.4	38	1.14	20 (9.1)
7.8″	7824	7.8	24	1.14	18 (8.2)
	7838	7.8	38	1.14	28 (12.7)
8″	8038	8.0	38	1.14	28 (12.7)
	8040	8.0	40	1.14	30 (13.6)
	8238	8.2	38	1.14	30 (13.6)
	8240	8.2	40	1.14	30 (13.6)
	8338	8.3	38	1.14	30 (13.6)
	8340	8.3	40	1.14	32 (14.5)
9"	9838	9.8	38	1.14	45 (20.5)
10″	10338	10.3	38	1.14	53 (24.1)

*1″ permeate tube extensions on each end

MEMBRANE AREA (SQ FT)

Element	Model No.	24	28	31	46	65	80
1.8"	1812F	4.8	4.4	4.3	3.3	2.5	2.0
2.5″	2519	17	16	15	11	9	8
	2538	39	36	34	26	21	18
	2540	40	37	34	26	21	18
	2540M	37	35	33	25	20	17
3.8″	3838	96	88	84	64	51	43
	3838.75	98	89	85	65	52	44
	3938.75	106	98	91	71	56	49
	3940F	106	98	91	71	56	49
	3940M	103	95	89	69	55	47
4.3″	4333	111	103	96	75	60	51
	4335	119	110	103	80	64	55
	4335.5	120	111	104	81	65	55
	4336	122	113	106	82	66	56
	4338	130	120	112	87	70	60
5.8″	5838	235	215	205	160	125	105
6.3″	6324	170	155	150	115	90	75
	6338	280	255	245	190	145	125
6.4″	6424	175	160	150	115	90	80
	6438	285	260	245	195	150	130
7.8″	7824	260	240	220	180	140	120
	7838	430	390	370	290	230	190
8″	8038	450	410	390	300	240	210
	8040	450	410	390	300	240	210
	8238	490	450	430	330	260	220
	8240	490	450	430	330	260	220
	8338	500	460	440	340	270	220
	8340	500	460	440	340	270	220
9"	9838	680	650	620	490	370	320
10″	10338	780	720	680	540	410	360

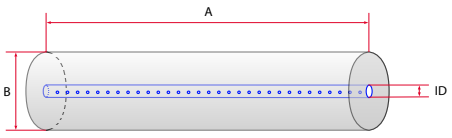
TECHNICAL NOTES

For element sizes not listed, please call or email Synder Filtration for details. We can design an element to meet your needs.

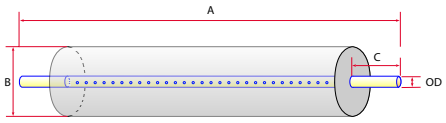
RECOMMENDED ELEMENT CROSS-FLOW RATE

Element		Feed Spacer (in mils) 24	28	31	46	65	80
1.8"	m^3/hr	1.0	1.0	1.1	1.3	1.5	1.5
	gpm	4.3	4.5	4.8	5.8	6.5	6.8
2.5"	m^3/hr	2	2	2	3	3	3
	gpm	10	10	10	12	14	15
3.8″	m^3/hr	5	5	6	7	8	8
	gpm	23	24	26	30	34	36
4.3″	m^3/hr	7	7	8	9	11	11
	gpm	31	33	34	41	46	49
5.8″	m^3/hr	12	13	14	16	18	19
	gpm	55	59	62	72	81	85
6.3″	m^3/hr	15	16	18	21	23	25
	gpm	67	72	77	91	102	108
8″	m^3/hr	23	24	26	30	33	35
	gpm	99	106	113	131	146	156
10″	m^3/hr	42	48	50	58	65	69
	gpm	187	209	219	257	288	303

The recommended cross-flow rate will be subject to differential pressure limitations and specific applications.



Female Element (Fig.1)



Male Element (Fig.2)

Membrane Model	ST - 28BD - 6338

Spacer Size	Model No.
24 mil	1
31 mil	2
46 mil	3
65 mil	4
80 mil	5
90 mil (corrugated)	5C

Outerwrap
AD = OptimaFlow Style with Tail
BD = OptimaFlow Style without Tail

OptimaFlow MAX Series - High pH / Temp.

Synder Filtration's OptimaFlow MAX Series offer additional membrane area for higher permeate flow, while maintaining the same exceptional physical and chemical durability and wide range of MWCO's as our standard UF/MF elements.

OPTIMAFLOW MAX SERIES BENEFITS

- Additional membrane area for higher permeate flow
- Conforms to 3-A, FDA, and USDA sanitary standards
- Wide range of UF MWCOs available
- High resistance to pH and temperature
- High resistance to fouling
- Customizable dimensions for unique housings

MEMBRANE MODELS

MODEL	MWCO	MATERIAL
fXT	1,000	S-PES
fMT	5,000	S-PES
XT	1,000	PES
VT	3,000	PES
MT	5,000	PES
ST	10,000	PES
SM	20,000	PES
MK	30,000	PES
MQ	50,000	PES
LY	100,000	PES
LV	200,000	PES
LX	300,000	PES
BN	50,000	PVDF
BY	100,000	PVDF
BX	250,000	PVDF
A6	500,000	PVDF
FC	700,000	PVDF
FR	800,000	PVDF
BC	900,000	PVDF
V0.1	0.1 µm	PVDF
V0.2	0.2 µm	PVDF

OPTIMAFLOW MAX SANITARY ELEMENT SPECIFICATIONS

Pressure	PSI	Bar
Max. Inlet Pressure	140	9.7
Min. Outlet Pressure	10	0.7
Max. Differential Pressure per Element		
24 & 31 mil	12-15	0.8-1.0
46 mil	15-20	1.0-1.4
65 & 80 mil	15-25	1.0-1.7
Max. Permeate Backpressure	5	0.3

NOTE: Soft start on boost pumps required to minimize pressure/flow shocks to elements.

Temperature	Fahrenheit	Celsius
Max. Operating	140°	60°
Max. CIP Temperature	158°	70°

pH Parameters	pH
Operating Parameters	2.0-10.0
Cleaning Parameters	1.8-11.0 (PES) / 2.0-11.0 (PVDF)

Chlorine	Norm. ppm	Max. ppm
Free Chlorine in DF Water or Product	0	< 0.1
Chlorine during CIP at: pH 10.8-11.0 and 50°C (PES/ PVDF)	150	180

NOTE: Trials should be made to determine temperature and viscosity effects.

OptimaFlow MAX Spiral-Wound Sanitary Elements

ELEMENT DIMENSIONS

Element	Model No.	Diameter (B) in	Length (A) in	PWT ID/OD in	Weight lb (kg)
1.8"	1812F	1.8	12	0.63	2 (0.9)
2.5″	2519	2.5	19.25	0.63	4 (1.8)
	2538	2.5	38	0.83	5 (2.3)
	2540	2.5	40	0.63	5 (2.3)
	2540M*	2.5	38	0.75*	5 (2.3)
3.8″	3838	3.8	38	0.83	9 (4.0)
	3838.75	3.8	38.75	0.83	9 (4.0)
	3938.75	4.0	38.75	0.63	10 (4.5)
	3940F	4.0	40	0.63	10 (4.5)
	3940M*	4.0	38	0.75*	10 (4.5)
4.3″	4333	4.3	33	0.83	10 (4.5)
	4335	4.3	35	0.83	10 (4.5)
	4335.5	4.3	35.5	0.83	10 (4.5)
	4336	4.3	36	0.83	10 (4.5)
	4338	4.3	38	0.83	11 (5.0)
5.8″	5838	5.8	38	1.14	18 (8.2)
6.3″	6324	6.3	24	1.14	15 (6.8)
	6338	6.3	38	1.14	20 (9.1)
6.4″	6424	6.4	24	1.14	15 (6.8)
	6438	6.4	38	1.14	20 (9.1)
7.8″	7824	7.8	24	1.14	18 (8.2)
	7838	7.8	38	1.14	28 (12.7)
8″	8038	8.0	38	1.14	28 (12.7)
	8040	8.0	40	1.14	30 (13.6)
	8238	8.2	38	1.14	30 (13.6)
	8240	8.2	40	1.14	30 (13.6)
	8338	8.3	38	1.14	30 (13.6)
	8340	8.3	40	1.14	32 (14.5)
9"	9838	9.8	38	1.14	45 (20.5)
10″	10338	10.3	38	1.14	53 (24.1)

*1″ permeate tube extensions on each end

MEMBRANE AREA (SQ FT)

Element	Model No.	24	28	31	46	65	80
1.8"	1812F	4.8	4.4	4.3	3.3	2.5	2.0
2.5″	2519	17	16	15	11	9	8
	2538	39	36	34	26	21	18
	2540	40	37	34	26	21	18
	2540M	37	35	33	25	20	17
3.8″	3838	96	88	84	64	51	43
	3838.75	98	89	85	65	52	44
	3938.75	106	98	91	71	56	49
	3940F	106	98	91	71	56	49
	3940M	103	95	89	69	55	47
4.3″	4333	111	103	96	75	60	51
	4335	119	110	103	80	64	55
	4335.5	120	111	104	81	65	55
	4336	122	113	106	82	66	56
	4338	130	120	112	87	70	60
5.8″	5838	235	215	205	160	125	105
6.3″	6324	170	155	150	115	90	75
	6338	280	255	245	190	145	125
6.4″	6424	175	160	150	115	90	80
	6438	285	260	245	195	150	130
7.8″	7824	260	240	220	180	140	120
	7838	430	390	370	290	230	190
8″	8038	450	410	390	300	240	210
	8040	450	410	390	300	240	210
	8238	490	450	430	330	260	220
	8240	490	450	430	330	260	220
	8338	500	460	440	340	270	220
	8340	500	460	440	340	270	220
9"	9838	680	650	620	490	370	320
10″	10338	780	720	680	540	410	360

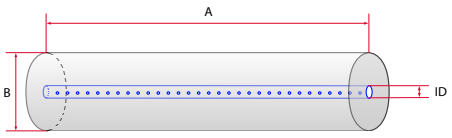
TECHNICAL NOTES

For element sizes not listed, please call or email Synder Filtration for details. We can design an element to meet your needs.

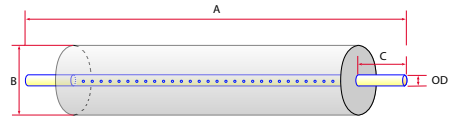
RECOMMENDED ELEMENT CROSS-FLOW RATE

Element		Feed Spacer (in mils) 24	28	31	46	65	80
1.8"	m^3/hr	1.0	1.0	1.1	1.3	1.5	1.5
	gpm	4.3	4.5	4.8	5.8	6.5	6.8
2.5"	m^3/hr	2	2	2	3	3	3
	gpm	10	10	10	12	14	15
3.8″	m^3/hr	5	5	6	7	8	8
	gpm	23	24	26	30	34	36
4.3″	m^3/hr	7	7	8	9	11	11
	gpm	31	33	34	41	46	49
5.8″	m^3/hr	12	13	14	16	18	19
	gpm	55	59	62	72	81	85
6.3″	m^3/hr	15	16	18	21	23	25
	gpm	67	72	77	91	102	108
8″	m^3/hr	23	24	26	30	33	35
	gpm	99	106	113	131	146	156
10″	m^3/hr	42	48	50	58	65	69
	gpm	187	209	219	257	288	303

The recommended cros- flow rate will be subject to differential pressure limitations and specific applications.



Female Element (Fig.1)



Male Element (Fig.2)

Membrane Model ▶ ST - 28BD - 6338MAX

Spacer Size	Model No.
24 mil	1
28 mil	28
31 mil	2
46 mil	3
65 mil	4
80 mil	5
90 mil (corrugated)	5C

Outerwrap
AD = OptimaFlow Style with Tail
BD = OptimaFlow Style without Tail

Polymeric Membranes

Synder Filtration offers a complete line of nanofiltration (NF), ultrafiltration (UF), and microfiltration (MF) membranes in a variety of different flat sheet and membrane roll options. With sizes ranging from one square foot to thousands of linear feet, Synder can supply membrane for all scales of testing, research, and production with exceptionally fast lead times.

Membrane	Type	Polymer	Molecular Weight Cut-Off
NFX	NF	TFC	150-300
NFS	NF	TFC	200-300
NFW	NF	TFC	300-500
NDX	NF	TFC	500-600
NDF	NF	TFC	500-700
NFG	NF	TFC	600-800
fXT	UF*	S-PES	1,000
fMT	UF*	S-PES	5,000
XT	UF*	PES	1,000
VT	UF*	PES	3,000
MT	UF*	PES	5,000
ST	UF*	PES	10,000
SM	UF*	PES	20,000
MK	UF*	PES	30,000
MQ	UF*	PES	50,000
LY	UF*	PES	100,000
LV	UF*	PES	200,000
LX	UF*	PES	300,000
PZ	UF	PAN	30,000
PY	UF	PAN	100,000
PX	UF	PAN	400,000
V3	UF*[1]	PVDF	30,000
V4	UF*[1]	PVDF	70,000
V5	UF*[1]	PVDF	200,000
V6	UF*[1]	PVDF	500,000
V7	UF*[1]	PVDF	800,000
BN	UF*	PVDF	50,000
BY	UF*	PVDF	100,000
BX	UF*	PVDF	250,000
A6	UF*	PVDF	500,000
FC	MF*	PVDF	700,000
FR	MF*	PVDF	800,000
BC	MF*	PVDF	900,000
V0.1	MF*	PVDF	0.1µm
V0.2	MF*	PVDF	0.2µm

*MAX (High pH/Temperature) Models Also Available

[1]Not Approved for Use in Food Contact Applications

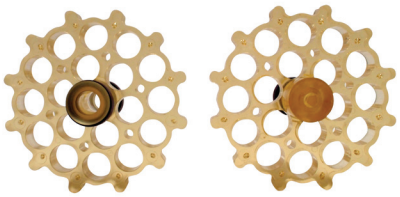
MODEL INFORMATION

Size	Wet/Dry	Notes
12" x 12"	Both Available	Custom Sizes / Shapes Available
1m x 1m		
Flat Sheet Roll		

Membrane Accessories & Spare Parts

Synder Filtration stocks large inventories of the accessories and spare parts required for membrane installation and operation and can supply or replace these accessories with exceptional speed to help prevent delays in production or pilot testing. Contact us to find the most appropriate ATD, lip seal, or housings for your membrane and feed solution.

6″ & 8″ POLYSULFONE ATDS



3.8″ POLYSULFONE ATD INTERCONNECTOR & END PLUG

4", 6″ & 8″ STAINLESS STEEL 316 ATDS & END PLUGS

ANTI-TELESCOPING DEVICES (ATDs)

Size	Configuration	Materials	Features
3.8″	ATD Interconnector	Polysulfone	Industry Standard, Chemically Robust
3.8″	ATD End Plug		
6.3″	ATD Interconnector	Stainless Steel 316	Designed For High Temp / High Pressure Feed Solutions
6.3/8.0"	ABS End Plug		
8.0″	ATD Interconnector		
8.0"	8040 Interconnector (PP)		

EPDM LIP SEALS

VITON LIP SEALS

LIP SEALS

Size	Corresponding Element Model	Available Materials
0.83″	3.8″, 4.3″	EPDM, Viton
1.14″	6.3″, 8.0″	EPDM, VIton

Materials	Features
EPDM	Industry Standard
Viton	Greater Chemical, Temperature and Solvent Resistance

SANITARY GRADE HOUSINGS

Model	Corresponding Element	Available Materials
1812	UF/MF/MF 1812F or 1812M	
2540	UF/MF/NF 2540F or 2540M	Stainless Steel 316
3838	UF/MF/NF 3838	

Sanitary Systems

Synder provides custom sanitary systems with sanitary weld and component requirements. Many of the components are easily removeable and disassembled for cleaning, and have low interior surface roughness. From pilot units to production scale units, Synder's Engineering team will work closely with the customer from design to manufacturing to ensure the system meets all specifications.

STANDARD SANITARY FEATURES

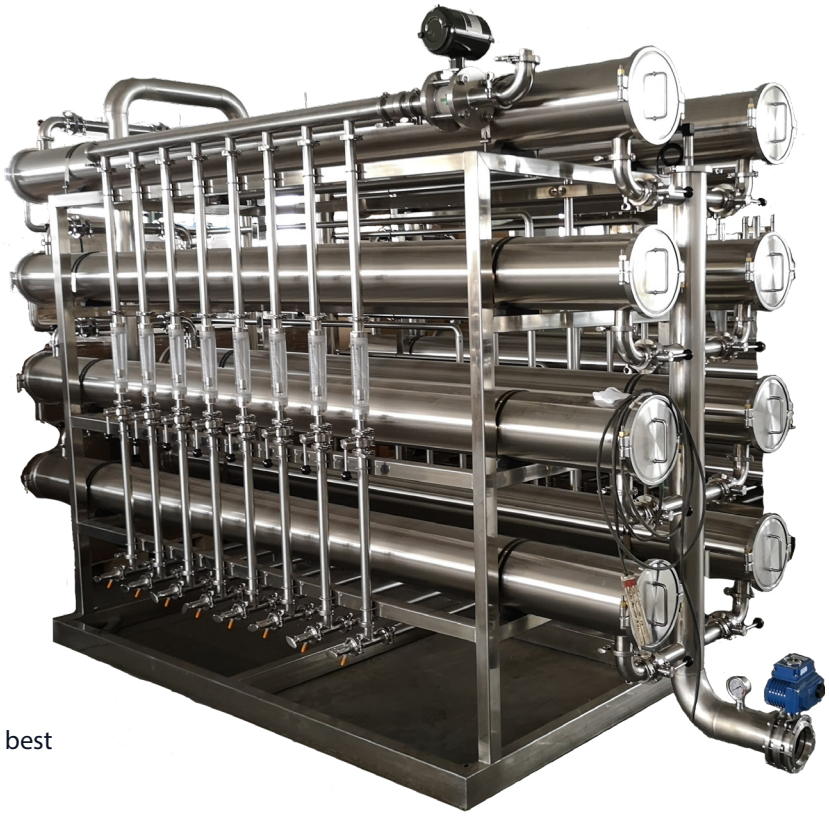
- Housing vessel
- Stainless steel valves
- Pressure gauges
- Pump
- Temperature sensor
- Flow sensor
- Custom tank with level sensor

OPTIONS AND CUSTOMIZATION

- Feed and booster pumps
- Feed and product storage tanks
- Custom system design and configuration
- Automation and controls customization
    - Various PLC and controllers
    - Custom PLC program and alarm features
    - Custom touch screen HMI interfaces
    - Data logging
    - Remote monitoring
- Wide selection of sensors and instrumentation to best suit customer needs
- Synder's Engineering team will work with customers to allow our systems to be seamlessly integrated into their facility

SANITARY SYSTEM BENEFITS

Sanitary components are easily removal and can be disassembled for cleaning. Fine surface roughness and sanitary designs also prevent build-up and potential contamination.



Pilot Study Program

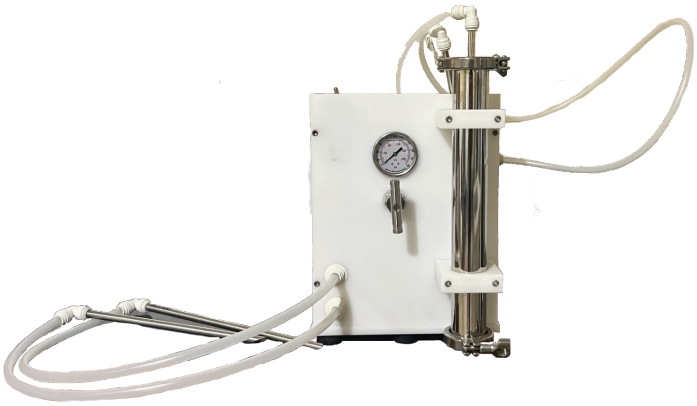
Many new membrane applications require pilot testing during their development phase. Synder offers an extensive pilot study program to help our customers develop innovative applications. As an industry leader in supporting research and development activities, we know the importance of having low cost, flexibility, and quick responsiveness.

Contact us today to learn more about our Pilot Study program. We look forward to serving you.

PILOT STUDIES

For the customers who prefer to let Synder's professionals gauge the feasibility or performance of their application, we run a full range of pilot and feasibility testing at Synder headquarters in Vacaville, CA USA.

- Flat sheet feasibility tests and performance estimations with eight bank cells
- Complete spiral wound Microfiltration, Ultrafiltration, Nanofiltration pilot studies
- Turn key systems available for rental or purchase.



MF/UF/NF 1812 Pilot System

MF/UF/NF 2540 Pilot System

Feasibility Testing

At Synder Filtration, we take pride in providing technical expertise and personal collaboration with our customers. We strive to gain a better understanding of your process goals in order to develop a comprehensive testing plan designed to suit your separation needs. Our unique and collaborative application development program offers great flexibility for further development in specialty process applications.

1. Pilot Study RFQ Form Submission. This helps us to gather important information about the feed stream, operating parameters, and the customer's application goals.

2. RFQ review. Synder account manager schedules review meeting with the customer and the engineering staff to discuss the project and clarify any remaining questions.

3. Feasibility testing. A feasibility test is proposed to the customer, and conducted if approval is received. A feasibility report is prepared with 24-48 hours after test completion.

- Flat sheet feasibility tests: Synder's complete line of NF, UF, and MF and MAX membranes are available in a variety of different flat sheet options for feasibility testing.
- Spiral element feasibility tests: In some cases such as feed streams requiring high operating pressure to obtain additional concentration and flux data, spiral elements may be recommended for use on feasibility tests.
- Analytical capabilities include TOC levels, COD levels, hardness, chloride, sulfate, and iron concentrations, liquid viscosity, turbidity, pH, and conductivity measurements. Synder is also able to outsource other analytical capabilities such as SEM, FTIR, BOD, TSS, and ICP, if the customer accepts 3rd party involvement in the testing.

4. Pilot study testing. If feasibility results are positive, a pilot study is proposed. Pilot studies can last anywhere from one week to several months or longer, depending on the nature of the application and possible variability in the feed stream. See pilot system specs.

5. Full scale system design & fabrication. If the pilot study results are positive, a full scale system is proposed and revised as needed until the customer is satisfied with the design specs, lead time, and projected ROI. Synder then fabricates the system.

6. System installation & commissioning. The final step is installation, commissioning, and training on site. Start up and commissioning service can be done worldwide.

Membranes & Application Development

Membrane filtration systems are the heart of many separation processes. Application research, equipment design, and fabrication quality are all critical factors in the ultimate success of a project. To start, the proper membrane configuration must be selected. Although there are many formats to choose from such as plate & frame, hollow fiber, and tubular, spiral-wound membranes are often preferred due to their well-rounded balance of characteristics. Spiral elements feature excellent membrane packing density (unit area per unit volume), physical and chemical resistance, and unit cost. One important requirement of spiral membranes is that the vast majority of suspended solids and particulates must be removed via pre-filtration.

Synder Filtration is an ISO-9001:2015 certified manufacturer of spiral-wound membranes and membrane systems, capable of engineering and fabricating reverse osmosis, nanofiltration, ultrafiltration, and microfiltration membrane systems. We also offer bespoke options including contract manufacture using custom membranes and spacers. Controls design and panel assembly are done in-house, giving us the ability to customize and modify process designs quickly and competently.

Element Installation Procedures

Outerwrap "Without Tail"

Spiral elements must fit snugly in their vessels in order for them to function properly. If a loose-fitting element is put into operation, one of two unfavorable consequences may result:

a) Too much liquid will bypass the element, going around rather than through it. This can result in lower fluxes, more rapid membrane fouling, lower permeate flow, longer cleaning times, and increased costs of cleaning chemicals.

b) A loose-fitting spiral element may lose some physical integrity by expanding to fit the housing. This can result in buckling, wrinkling, and/or channeling which may cause a premature leakage of the membrane.

A preservative solution is used to prevent microbial growth and membrane dry-out during shipping and storage. While this solution is not classified as hazardous, extra care should be taken to limit exposure. The elements should undergo a standard cleaning (CIP) procedure prior to start up to ensure that preservative has been fully rinsed, and that final rinse water is at a neutral pH.

Recommended Equipment: Sharp knife or scissors, gloves, safety glasses, and dust mask.

Installation Procedures

1. Remove the element from the plastic bag and take this opportunity to do a thorough visual examination of the element. There should be no mold, dust, or dirt anywhere on the element. If preservative fumes are uncomfortable for some, allow bags to air out for 30-60 minutes after opening.

2. Prepare an element loading diagram to document the serial number(s), date, element model number, location within the system, and any other required information for future reference.

3. Attempt to install the element into the pressure vessel. It should fit snugly. Be sure to examine Anti-Telescoping Devices (ATDs) and lip seals and replace if needed.

4. Lip seals should be well lubricated prior to installation with a non-petroleum based lubricant such as glycerine or any mild household liquid detergent. Inserting the ATD with lip seals should be done with a slow twisting motion to ensure a good seal and to prevent leakage.

5. A sufficient flush should be performed on all elements prior to start-up. Clean water at 122°F (50°C) should be used in a non-recirculating mode for at least 10 minutes after installation. This should remove all preservative solutions, glycerine, etc. and will help ensure successful membrane performance. The element should be at a neutral pH and thoroughly flushed prior to start-up. Additionally, a caustic wash is recommended as well prior to start-up. For UF/MF a 30min rinse and 120-125°F (49-52°C) is sufficient, while NF is recommended to have two caustic washes (15min each) at 115-118°F (46-48°C) with clean water rinses in between. The element should be at a neutral pH and thoroughly flushed prior to start-up. See specsheets for pH range limitations.

6. The element is now ready for start-up. Feed and/or recirculation pumps should "ramp-up" RPMs slowly to prevent the element from being shocked. Variable Frequency Drives (VFDs) are recommended for all feed and recirculation pumps to safely control pump RPMs.

7. The following data should be collected at least daily, and may be required in the event of a warranty claim:
    a) Flows (feed, permeate, concentrate)
    b) Pressures (feed, permeate, concentrate)
    c) Operating temperatures (production and CIP)
    d) Hours of operation (production and CIP)
    e) Other cleaning parameters (pH, time, chlorine exposure)
    f) Unexpected events (system upsets, unscheduled shutdowns, etc.)

Outerwrap "With Tail"

To further improve the fit of the element in the vessel, Synder Filtration offers a "trim-to-fit" outerwrap. The inner diameter can sometimes vary between vessels, and this allows for a customized fit for each vessel.

A preservative solution is used to prevent microbial growth and membrane dry-out during shipping and storage. While this solution is not classified as hazardous, extra care should be take to limit exposure.

Recommended Equipment: Sharp knife or scissors, gloves, safety glasses, and dust mask.

Installation Procedures

1. Remove the element from the plastic bag and take this opportunity to do a thorough visual examination of the element. There should be no mold, dust, or dirt anywhere on the element. If preservative fumes are uncomfortable for some, allow bags to air out for 30-60 minutes after opening. Remove the tape strips from the element.

2. Prepare an element loading diagram to document the serial number(s), date, element model number, location within the system, and any other required information for future reference.

3. Attempt to install the element into the pressure vessel.

4. If the element does not fit snugly, trim off the tail from the element at approximately 1/4 of the Outer Diameter (OD) at a time. Test the element's fit after each trimming. Ideally, the element should fit snugly into the vessel.

5. Inspect Anti-Telescoping Devices (ATDs) and lip seals and replace if needed.

6. Lip seals should be well lubricated prior to installation with a non-petroleum based lubricant such as glycerine or any mild household liquid detergent. Inserting the ATD with lip seals should be done with a slow twisting motion to ensure a good seal and to prevent leakage.

7. A sufficient flush should be performed on all elements prior to start-up. Clean water at 122°F (50°C) should be used in a non-recirculating mode for at least 10 minutes after installation. This should remove all preservative solutions, glycerine, etc. and will help ensure successful membrane performance. The element should be at a neutral pH and thoroughly flushed prior to start-up. Additionally, a caustic wash is recommended as well prior to start-up. For UF/MF a 30min rinse and 120-125°F (49-52°C) is sufficient, while NF is recommended to have two caustic washes (15min each) at 115-118°F (46-48°C) with clean water rinses in between. The element should be at a neutral pH and thoroughly flushed prior to start-up. See specsheets for pH range limitations.

8. The element is now ready for start-up. Feed and/or recirculation pumps should "ramp-up" RPMs slowly to prevent element shock. Variable Frequency Drives (VFDs) are recommended for all feed and recirculation pumps to safely control pump RPMs.

9. The following data should be collected at least daily, and may be required in the event of a warranty claim:
    a) Flows (feed, permeate, concentrate)
    b) Pressures (feed, permeate, concentrate)
    c) Operating temperatures (production and CIP)
    d) Hours of operation (production and CIP)
    e) Other cleaning parameters (pH, time, chlorine exposure)
    f) Unexpected events (system upsets, unscheduled shutdowns, etc.)

Standard Cleaning Guidelines

The following procedure is a general guideline for the cleaning/sanitization of spiral elements for most food and dairy applications. Depending on individual process streams, equipment and process time some variations in cleaning procedures may be required for optimal cleaning results. Please consult a qualified chemical supplier for application specific cleaning regimes.

Improper cleaning sequence, chemical concentration or abnormal temperatures/pH/pressure profiles can significantly reduce membrane life and possibly void any warranties offered on the element(s). If you have any questions or concerns about your cleaning regime, please contact Synder Filtration immediately.

Concentrate Displacement and Initial Flush

1. Flush the remaining concentrate in the system back to the concentrate tank or to drain.
2. Using clean water heated to 122°F/50°C (or 131°F/55°C for NF), adequately flush the system in non-recirculation mode to remove any remaining build-up. The retentate and permeate should appear to be clean after this step.
3. Perform a complete Clean-In-Place (CIP) immediately after the initial flush per the following.

Caustic Wash

1. Circulate warm clean water (122°F/50°C, or 131°F/55°C for NF) through the system under standard pressure and flow parameters.
2. Add caustic SLOWLY to achieve a pH of 10.8-11.0. DO NOT EXCEED pH 11.0 (pH 10.5 for NFW/NFG/PZ/PY/PX).
3. Circulate caustic solution for 30 minutes.
4. Flush the system to drain with clean, warm water (same temperature as before).

Acid Wash

1. Circulate warm clean water through the system under standard pressure and flow parameters.
2. Add a sufficient amount of acid SLOWLY to achieve a pH of 1.8. DO NOT EXCEED pH 1.8 (pH 3.0 for NFW/NFG/PZ/PY/PX).
3. Circulate acid solution for 30 minutes.
4. Flush the system to drain with clean, warm water (same temperature as before).

Sanitation (Caustic/Chlorine Solution) - FOR UF/MF

1. Circulate warm clean water through the system under standard pressure and flow parameters.
2. Add caustic SLOWLY to achieve a pH of 10.8-11.0. DO NOT EXCEED pH 11.0 (pH 10.5 for PZ/PY/PX).
3. Add chlorine SLOWLY to achieve constant level of 150 ppm. DO NOT EXCEED 180 ppm.
4. Circulate the caustic/chlorine solution for 30 minutes.
5. Periodically check and maintain a chlorine concentration of 150 ppm.
6. Flush the system to drain with clean, warm water (same temperature as before).
   Note: For NF, dechlorination is recommended.

Synder Filtration believes the information and data on pages 25 and 26 here to be accurate. However, said information is offered in good faith, but without guarantee of results since the conditions and methods used are beyond Synder Filtration's control. Synder Filtration assumes no liability as to the application of the previously mentioned data.

MAX Cleaning Guidelines (High pH / Temp.)

The following procedure is a general guideline for the cleaning/sanitization of MAX spiral elements for most food and dairy applications. Depending on individual process streams, equipment and process time some variations in cleaning procedures may be required for optimal cleaning results. Please consult a qualified chemical supplier for application specific cleaning regimes. Improper cleaning sequence, chemical concentration or abnormal temperatures/pH/pressure profiles can significantly reduce membrane life and possibly void any warranties offered on the element(s). If you have any questions or concerns about your cleaning regime, please contact Synder Filtration immediately.

Concentrate Displacement and Initial Flush

1. Flush the remaining concentrate in the system back to the concentrate tank or to drain.
2. Using clean water heated to 122°F/50°C, adequately flush the system in non-recirculation mode to remove any remaining build-up. The retentate and permeate should appear devoid of suspended solids after this step.
3. Perform a complete Clean-In-Place (CIP) immediately after the initial flush per the following.

Caustic Wash

1. Circulate warm clean water (122°F/50°C) through the system under standard pressure and flow parameters.
2. Add caustic SLOWLY and DO NOT EXCEED recommended limits.
3. Circulate caustic solution for 30 minutes.
4. Flush the system to drain with clean, warm water (same temperature as before).

Acid Wash

1. Circulate warm clean water 122°F/50°C through the system under standard pressure and flow parameters.
2. Add a sufficient amount of acid SLOWLY to achieve a pH of 2.0-2.2.
3. Circulate acid solution for 30 minutes.

High Temperature/pH Sanitation

1. Circulate hot clean water 158°F (70°C) through the system under standard pressure and flow parameters.
2. Add caustic SLOWLY to achieve a pH of 11. DO NOT EXCEED pH 11.
3. Circulate the caustic solution for 30 minutes.
4. Flush the system to drain with clean, warm water 122°F/50°C.

Alternative Sanitation Method (Caustic/Chlorine Solution)

Note: This cleaning method can be used in place of the High Temperature/pH Sanitation method mentioned above. Do not combine sanitation methods.

1. Circulate warm clean water through the system under standard pressure and flow parameters.
2. Add caustic SLOWLY to achieve a pH of 10.8-11.0. DO NOT EXCEED pH 11.
3. Add chlorine SLOWLY to achieve constant level of 150 ppm. DO NOT EXCEED 180 ppm.
4. Circulate the caustic/chlorine solution for 30 minutes.
5. Periodically check and maintain a chlorine concentration of 150 ppm.
6. Flush the system to drain with clean, warm water (same temperature as before).

Heatin/Cooling Rate

1. Increase the system temperature to the target CIP temperature (up to 90°C / 194° F) at a rate no higher than 5° C / 9° F per minute.
2. After CIP, cool the system back down to room temperature at the same rate (no higher than 5° C / 9° F per minute).
3. Add caustic SLOWLY to achieve a pH of 11. DO NOT EXCEED pH 11.

Pressure Drop per Element

1. Monitor and adjust cross flow during the CIP so that the pressure drop does not exceed 2 psi per element.

General Comments on Time and Temperature

1. Maintain the target CIP temperature (up to 90°C / 194° F) for 30 - 60 minutes to ensure effective cleaning.

Flat Sheet Installation & Storage Procedure

This guideline is intended for use with flat sheet membranes, and does not offer any guarantees of performance whether directly stated or implied.

INSTALLATION

1. Remove the new flat sheet from its storage bag and ensure that the flat sheet has not been damaged or tampered with. Look for any scratches, wrinkles, and/or deformities that could hinder performance.
2. Carefully rinse the flat sheet with RO or DI water before usage. This will flush out any preservatives and other unwanted materials attached to the flat sheet.
3. Make sure your hands are clean before handling the flat sheet. Hold onto the ends of the flat sheet when transferring it around. avoid contaminating the membrane as much as possible, as this could potentially hinder performance.
4. Place the flat sheet onto the filtration cell body and secure tightly.
5. Increase the pressure in the system slowly until you reach your desired pressure level. It is important not to rapidly increase pressure as this may cause over compaction in the membrane.
6. Properly store the flat sheet when it is not in use. It is important that you do not allow the membrane to dry out at any point in time. See proper storage methods below.

STORAGE

Synder Filtration's dry flat sheet membranes come packaged with a coated layer of glycerine; wet flat sheet membranes are in solution with 2% sodium metabisulfite (MBS).

Note: After removing the flat sheet from the storage bag, you must always first rinse the flat sheet with either RO or DI water to remove preservatives. Only use or store the flat sheet once this cleaning process is complete.

1. Unopened flat sheets may be stored in a refrigerator for up to 2 months. Flat sheets that are not properly refrigerated risk drying out due to evaporation.
2. Opened flat sheets that are not in use should be kept in a solution of either 1% sodium metabisulfite (0.1% MBS for NF) or 50% glycerine to prevent microbial growth, and the preservative solution must be maintained regularly.

Contact Synder Filtration's Technical Services Department if you have any questions about installation and/or storage with your Flat Sheet Membranes at +1-707-451-6060.

Element Storage Procedure

6 Months or Less (Short Term)

Immediately following the final CIP flush, the system should be filled with 1% Sodium Metabisulfite (MBS) solution (0.1% MBS for NF elements) with a pH of 4.0-5.0. Every 7-10 days the following procedure should be performed:

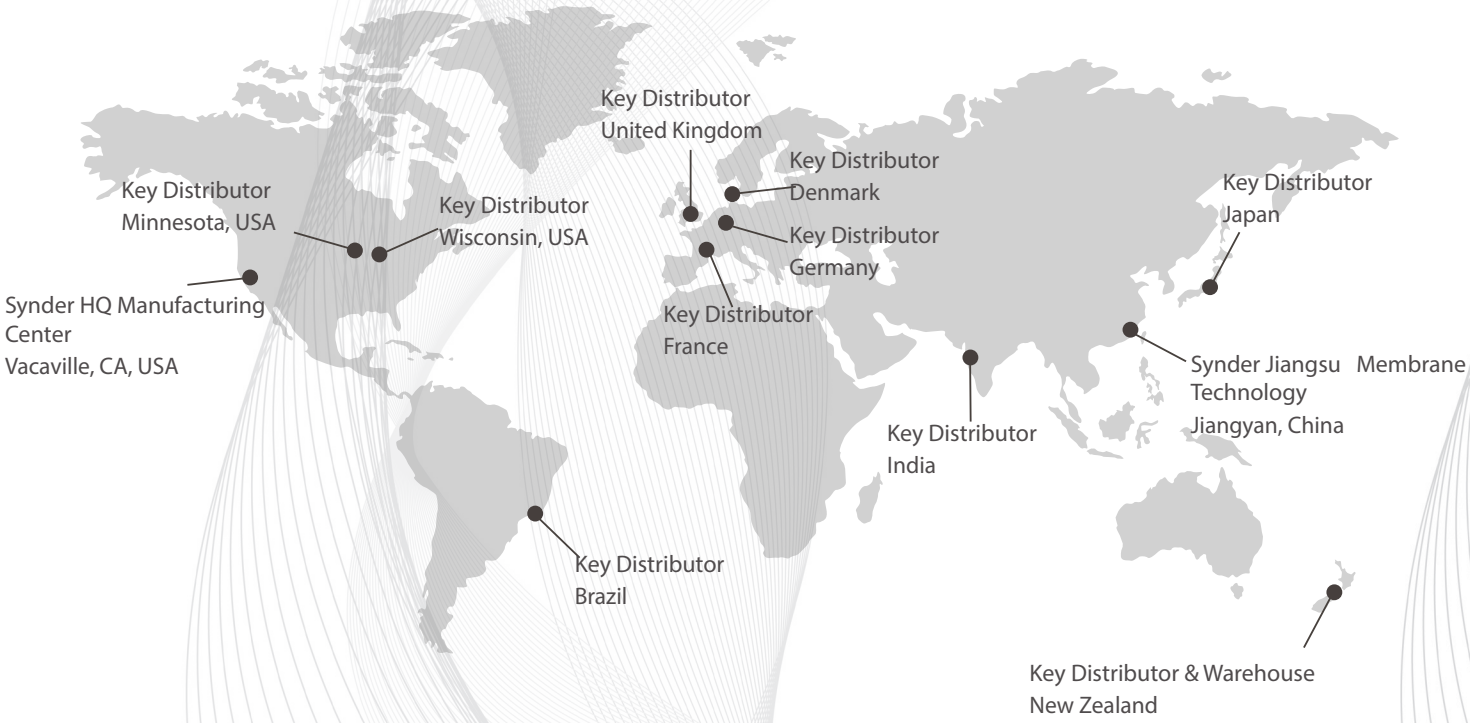
1. Drain MBS solution from the system and flush to drain with clean water.
2. Run a caustic wash. (See caustic wash directions on p. 17 and 18)
3. Flush to drain with clean water.
4. Recharge the system with a fresh bath of MBS.

Longer than 6 Months (Long Term)

A long term shutdown (over 6 months) can be handled easily and efficiently. This involves the removal of elements from the system, soaking them in preservative solution (vertically if possible), and sealing in a plastic bag for future use.

1. The preservative solution should include:
   - 20% Glycerine
   - 2% Sodium Metabisulfite (0.1% Sodium Metabisulfite for NF elements)
   - pH 4.0-5.0
2. Remove the element from the vessel, drain the elements in a vertical position to avoid extensive dilution of the preservative solution.
3. Place the element in a preservative for a minimum of 15 minutes.
4. Remove the element from the preservative and allow it to drain for approximately 10 seconds, then place the element back in the bag.
5. Seal the bag either via heat seal or waterproof tape. This should be done well to prevent any leakage during storage/transport.
6. Depending on the number of elements, the preservative solution may become diluted. In that event, add more preservative to maintain pH 4.0-5.0.
7. Element storage in 50°F - 59°F (10°C - 15°C) will increase storage life of the elements. If refrigeration is possible, it is highly recommended by Synder Filtration.
8. Contact Synder Filtration prior to storing any elements to discuss any remaining element warranty.

Synder Filtration believes the above information and data herein to be accurate. However, said information is offered in good faith, but without guarantee of results since the conditions and methods used are beyond our control. Synder Filtration assumes no liability as to the application of the previously mentioned guidelines.



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