AMS FILTRATION

Titanium

Filtration Membranes and Complete Systems

Wastewater

Bringing Membrane Separation to Wastewater

The key to AMS Membrane Filtration technologies are the 100% titanium membranes. Traditionally, membrane technologies have had limited use in the treatment of wastewater due to their tendency to foul, low flux rates, limited useful operating ranges (temperature, pH, corrosion and pressure), poor selectivity and high cost. AMS Filtration titanium membranes adopt the superior industrial performance properties of titanium and overcome these limitations. They deliver advanced solid/liquid separation that allows businesses to improve both their environmental and financial performance.

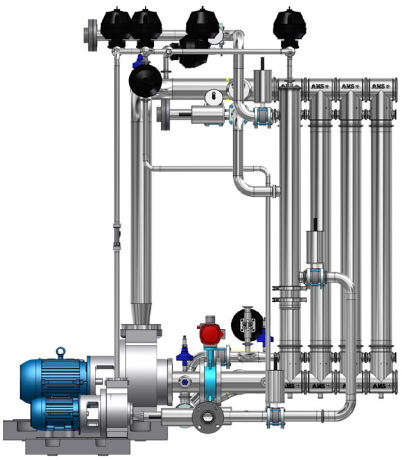
Why Titanium?

Titanium has superior industrial performance properties that make it ideal for use as a separation material:

- Exceptional Strength Properties - Holds Shape in all Conditions
- Fouling Resistant - CIP Back to 'Day 1' Condition
- Non Corrosive
- pH Resistant - Allowable pH Range 0.0 - 14.0
- Temperature Resistant - Process to 550°C
- Pressure Resistant - High Fracture Toughness

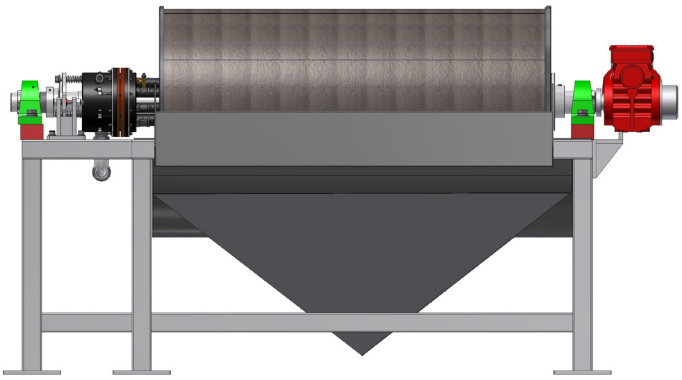
Tubular Cross Flow Titanium Filtration Systems

Cross flow filtration systems that are fully automated and incorporate AMS tubular titanium membranes. They provide liquid/solid separation to 0.05 micron (ultrafiltration), deliver unparalled performance in a vast range of operating conditions (temperature, pressure, pH and corrosion) and can build-up retentate suspended solid loadings to 95 - 99%.



Titanium Rotary Drum Vacuum

A rotary drum vacuum (RDV) that incorporates AMS filtration radius flat sheet titanium membrane and provides continuous dewatering and separation without a filter aid. It delivers exceptional performance in a vast range of operating conditions (temperature, pressure, pH and corrosion) and produces a 'spadable' dry retentate. The AMS RDV is suitable for all industries that require separation of slurries.



AMS Titanium Membrane Systems Deliver Exceptional Performance

- **CLEANING:** Membranes can be cleaned in place back to 'Day 1' condition using chemicals across the pH range (eg caustics, nitric acid, sodium hydrochlorides) and steam. Membrane flux is returned to 'Day 1' for the life of the membrane.
- **SELECTIVITY:** Membranes have superior strength and structural properties so they hold uniformity across all operating conditions. This controlled pore size means the membranes will always achieve desired separation.
- **LOW OPEX:** Systems have low energy requirements (operate at low pressure), only require chemicals for cleaning, are fully automated and do not require highly skilled labour. Membranes are non-corrosive and have a 10-year warranty.
- **TEMPERATURE:** Membranes withstand elevated temperatures and can process feed streams up to 550°C. Membranes can also be cleaned with nitric acids at high temperature.
- **REMOVE GREASE, OILS AND FATS:** Systems deliver superior performance in removing grease, oils and fats (GOF), with up to 99.87% removal in a single pass.
- **HIGH SOLID LOADINGS:** Tubular membranes build up suspended solid loadings to 99%. The RDV delivers a 'spadable' dry retentate.
- **COMPLIANCE:** Systems deliver desired separation to improve wastewater discharge quality and meet regulatory compliance levels.
- **HIGH FLUX RATES:** Systems design plus membrane hydrophilicity and strength deliver high flux rates for extended periods.

AMS FILTRATION'S TITANIUM MEMBRANE SYSTEMS ARE EXCEPTIONAL AT REMOVING SUSPENDED SOLIDS, GREASE, FATS AND OILS SO THAT BUSINESSES CAN MEET THEIR WASTEWATER COMPLIANCE LEVELS, REDUCE WASTEWATER DISCHARGE COSTS AND IMPROVE FINANCIAL PERFORMANCE.

Test Results - Water Quality Analysis

Various feed streams from the Textiles, Poultry, Milk Processing, Cheese Processing and Meat Processing industries were processed, in a single pass, through an AMS 0.2 micron filtration system. The water quality of both the feed stream and filtrate were analysed by the Australian Water Quality Centre (AWQC).

	DESCRIPTION	BOD mg/L	SS mg/L	Grease mg/L	COD mg/L
Sample 1	Feed	3,340	2,600		12,500
	Filtrate	1,520	15		4,390
	Reduction	1,820	2,585		8,110
	% Reduction	**54.49%**	**99.42%**		**64.88%**
Sample 2	Feed	28,900	19,800		61,900
	Filtrate	4,170	9		10,500
	Reduction	24,730	19,791		51,400
	% Reduction	**85.57%**	**99.95%**		**83.04%**
Sample 3	Feed	15,500	17,300		61,300
	Filtrate	6,920	50		14,400
	Reduction	8,580	17,250		46,900
	% Reduction	**55.35%**	**99.71%**		**76.51%**
Sample 4	Feed	1,650		370	2,890
	Filtrate	608		13	791
	Reduction	1,042		357	2,099
	% Reduction	**63.15%**		**96.49%**	**72.63%**
Sample 5	Feed	3.460	1,400		4,620
	Filtrate	466	49		810
	Reduction	2,994	1,351		3,810
	% Reduction	**86.53%**	**96.50%**		**96.50%**
Sample 6	Feed	1,600	607		2,850
	Filtrate	354	1		619
	Reduction	1,246	606		2,231
	% Reduction	**77.88%**	**99.84%**		**78.28%**
Sample 7	Feed	4,770	1,690		5,070
	Filtrate	283	46		448
	Reduction	4,487	1,644		4,622
	% Reduction	**94.07%**	**97.28%**		**91.16%**
Sample 8	Feed	17,300	1,740	1,500	20,400
	Filtrate	6,150	3	2	13,000
	Reduction	11,150	1,737	1,498	7,400
	% Reduction	**64.45%**	**99.83%**	**99.87%**	**36.27%**
Sample 9	Feed	2,030	1,270	11,400	2,870
	Filtrate	148	1	22	318
	Reduction	1,882	1,269	11,378	2,552
	% Reduction	**92.71%**	**99.92%**	**99.81%**	**88.92%**

ELIMINATE NEED TO BALANCE FEED STREAMS

REMOVE UP TO 99% GREASE, OILS AND FAT

REMOVE UP TO 99% SUSPENDED SOLIDS

REDUCE WASTEWATER DISCHARGE COSTS

LOW CHEMICAL REQUIREMENTS

LOW ENERGY REQUIREMENTS

Tubular Cross Flow Titanium Filtration System Technical Overview

Membrane

Membrane Structure:	Tubular
Membrane Substrate Layer:	Titanium 40 - 60% porosity
Active Surface Layer:	Titanium
Lumen Internal Diameter (ID):	2 - 17 mm
Pore Range (microns):	0.05 - 5 µn Ultrafiltration Microfiltration

Operating and Design Information

Membrane Module Sizes (Diameter):	100/200/300 mm
Maximum Operating Temperature:	550°C
Allowable pH Continuous Operation:	0.0 - 14.0
Cleaning:	Clean-in-Place (CIP)
Allowable pH - CIP:	0.0 - 14.0

Complete cross flow systems are custom designed and fabricated to order based on:

1. Batch vs Continuous Processing
2. Volume
3. Quality of Feed Stream
4. Output Objectives

Radius Flat Sheet Titanium RDV Technical Overview

Membrane

Membrane Structure:	Radial Flat Sheet
Membrane Substrate Layer:	Titanium 40 - 60% porosity
Active Surface Layer:	Titanium
Pore Range (microns):	0.05 - 20 µn
Active Surface Depth:	< 30 µm
Filtration Area:	1 m^2 to 10 m^2

Operating and Design Information

Maximum Operating Temperature:	550°C
Allowable pH Continuous Operation:	0.0 - 14.0
Cleaning:	Clean-in-Place (CIP)
Allowable pH - CIP:	0.0 - 14.0

Open RDV: Operating in Atmosphere

Positive pressure:	101 kPa
Negative Pressure:	25 - 60 kPa
Pressure Differential:	Approx. 10 inches

Closed RDV: Operating in Inert Environment

Environment:	CO_2, Nitrogen or Argon
Negative Pressure:	Depend on Environment
Positive pressure:	10 kPa
Pressure Differential:	Approx. 6 - 7 inches

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