



Annual Convention and Exposition

September 7–10, 2016 • San Diego Convention Center & Omni San Diego Hotel
San Diego, California awt.org/annualconvention16



Closed Loop Side Stream Filtration

- John Mohler
- Quantrol, Inc.



SUSPENDED SOLIDS

- Free moving solids can be abrasive
- May cause excessive wear of pump seals
- Under high velocity conditions can cause erosion of piping systems, especially soft metals like copper





SUSPENDED SOLIDS

- Solids tend to settle out in areas of low elevation and low flow
- Provides a place for bacteria to attach and grow
- Increases potential for under-deposit and microbiological corrosion
- Can plug flow path in heat exchangers

SUSPENDED SOLIDS

- Decreases heat transfer efficiency resulting in wasted energy and higher operating cost
- May result in unscheduled shutdowns, increased maintenance, production loss and reduced process capacity





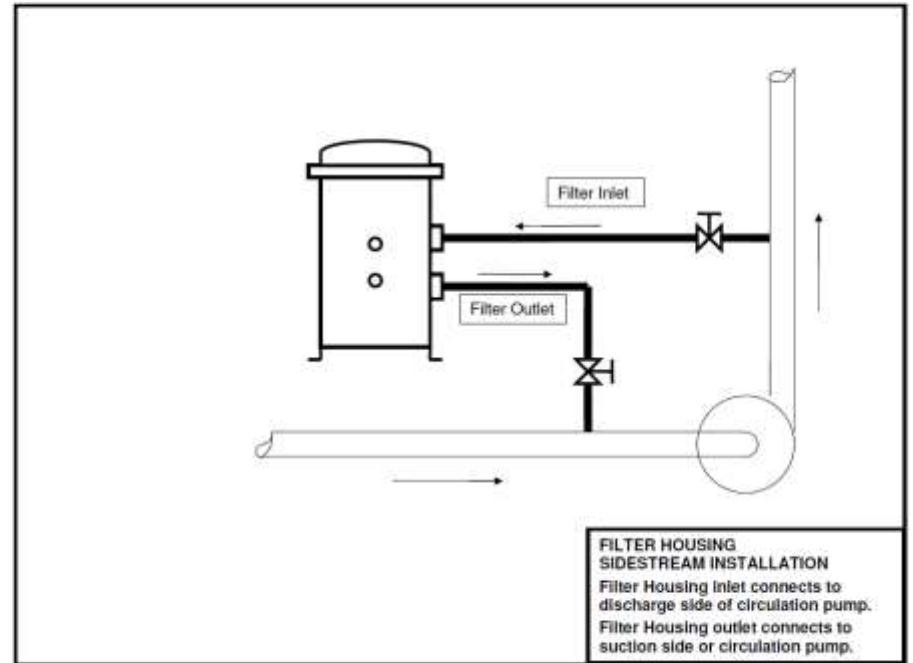
Condenser Deposit Thickness

Deposit Thickness (Inches)	Fouling Factor	% Efficiency Loss
0.0	0.0000	0
0.01	0.0008	9
0.02	0.0017	18
0.03	0.0025	27
0.04	0.0033	36
0.05	0.0042	45

Potential impact of deposits on a 500-ton chiller load running 24 hours a day. Actual increased energy use depends on compressor type, efficiency rating, actual operating head pressure and percent operating load.
AFE Facilities Engineering Paper, Michael McDonald

The Solution

- Side Stream Filtration





Side vs Full Stream Filtration

- Reduced capital cost, 80 GPM housing vs 800
- No shutdown for cartridge change outs
- No reduction of flow to process as cartridges load up
- Cleans up system over time



Benefits

- Aesthetics – Clearer and cleaner appearance
- Less mechanical wear on pump seals and piping systems
- Reduced opportunity for scale formation and fouling
- Reduced potential for under deposit corrosion
- Improved biological control

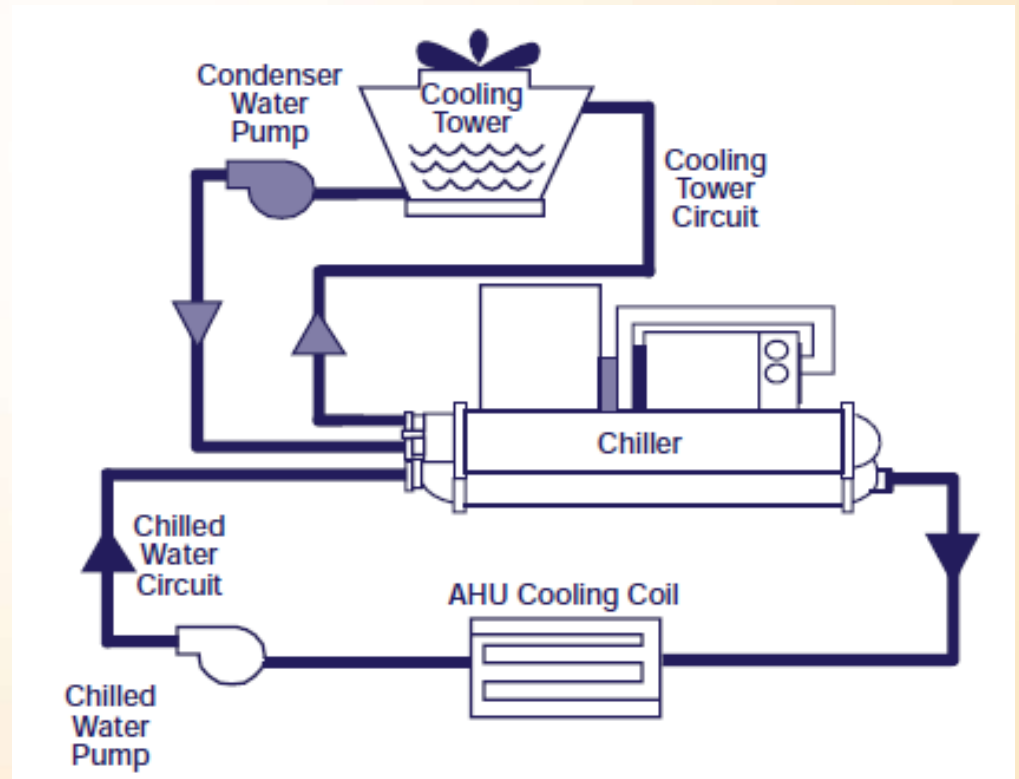


Benefits

- Enhanced chemical performance
- Reduce water and glycol usage
- Maximize heat transfer efficiency and process capacity
- Minimize energy consumption

Design Considerations

- Flow Rate
- Pressure
- Temperature
- Particle Size
- Solids Loading
- Pipe Size





Side Stream Filter Sizing

- Method 1 – System Flow Rate
- System Flow x 10% = recommended housing flow rate
- Example, 120 GPM X 10% = 12 GPM
- Choose a filter housing flow rate => 12 GPM



Side Stream Filter Sizing

- Method 2 – System Volume
- Goal is to filter entire system volume 4 times per day
- Formula is $\text{System Volume} / 360$
- Example $9000 \text{ gallon system} / 360 = 25 \text{ GPM}$
- Choose a filter housing flow rate $\Rightarrow 25 \text{ GPM}$



Side Stream Filter Sizing

- Generally speaking it is better to oversize the filter housing than to undersize
- Lower maintenance due to longer cartridge service intervals
- We use 5 GPM per 10" cartridge to calculate filter housing flow rates

Single Cartridges



- Holds quantity 1, 2.5" OD by 10", 20" or 30" long cartridge
- Flow rate 5, 10 or 15 GPM



Multi-Round Cartridge



- 4, 5, 7 or 12 Round
- 10, 20, 30 and 40" Cartridge lengths
- Flow Rates from 25 to 660 GPM

Jumbo Single



- High flow with single cartridge convenience
- 3 sizes - 50, 100 or 150 GPM

Filter Bags & Housings



- Inside/Outside flow contains solids
- Trade Size # 2 bag (7x32")
- 100 GPM Per Bag
- Up to 12 bags per housing

High Flow



- Inside/Outside Flow contains solids
- Single Cartridge
- Up to 150 GPM depending on micron size

Systems

- Packaged Systems with pump for ease of installation & no loss of downstream flow



Filter Cartridges



String Wound - Melt Blown - Pleated

Media Comparison - Bags

- Well suited for coarse filtration.
- High Flow Rate
- Possible bypass where collar meets housing.
- Limited surface area.
- Particulate contained in bag



Media Comparison - Pleated

- Surface Filtration
- High flow rate
- Low clean pressure drop
- Extended service interval
- May be able to clean and reuse
- High Temp versions expensive
- Most expensive to purchase





Media Comparison - Melt Blown

- Depth Filtration
- Lowest cost
- Limited collapse strength – No center core
- Temperature limit 140 F





Media Comparison- String Wound

- Graduated Density Depth Cartridge
- High dirt holding capacity
- Center core for high collapse strength
- Most common for closed loops
- Low cost





Filter Cartridges

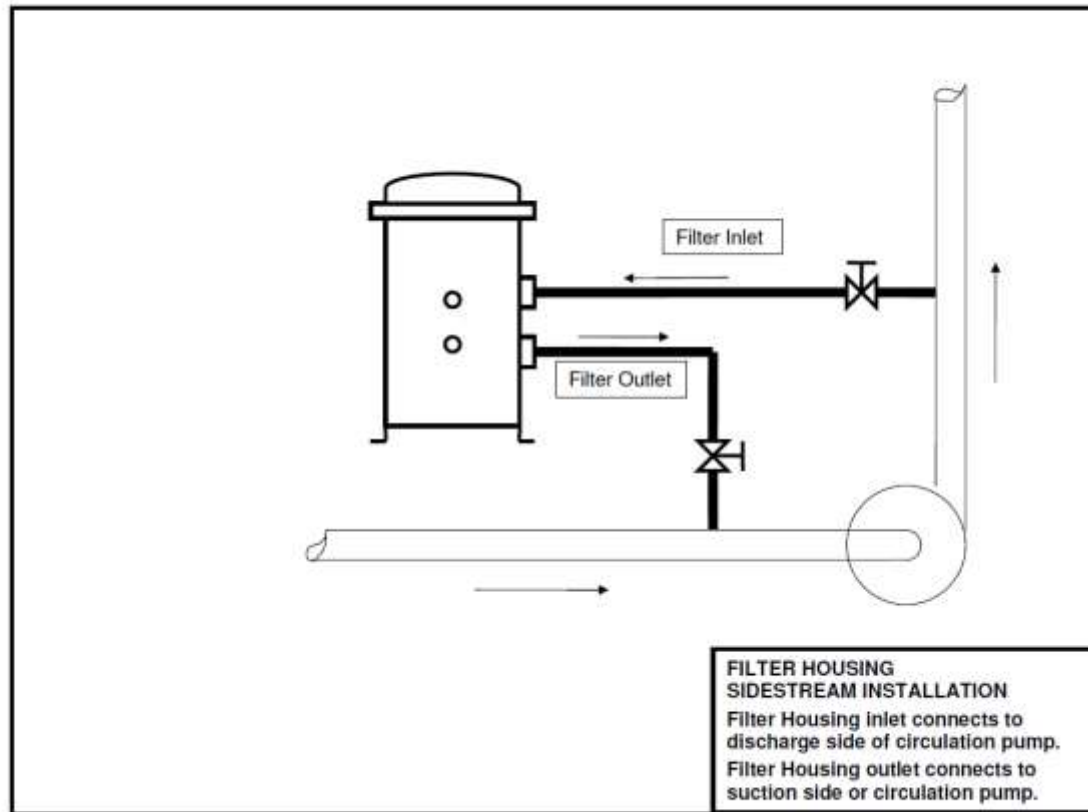
- Micron ratings available from 1 to 100
- For dirty systems start with a higher micron rating and work your way down

Service Interval

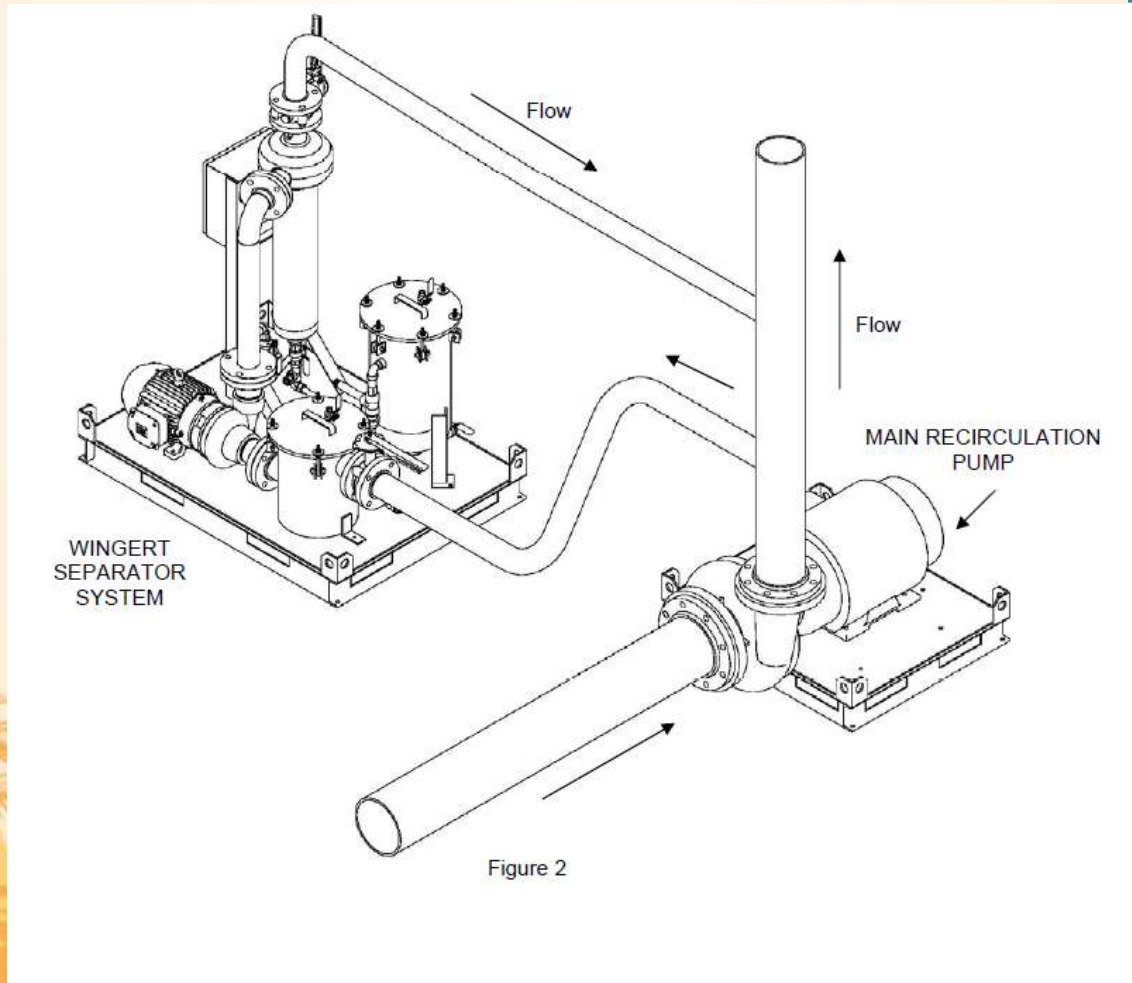
- Monitor inlet and outlet pressure with pressure gauges
- Change filters at or before max psi drop recommended by manufacturer
- Typically ≤ 25 psi



Side Stream Install



Side Stream with Pump





Installation Considerations

- Inlet/Outlet pressure differential to allow for sufficient flow
- Inlet/Outlet ball valves to isolate housing for service
- Inlet/Outlet pressure gauges to determine pressure drop / cartridge changes
- Flowmeter to determine flow rate



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- Questions or comments



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- THANK YOU
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