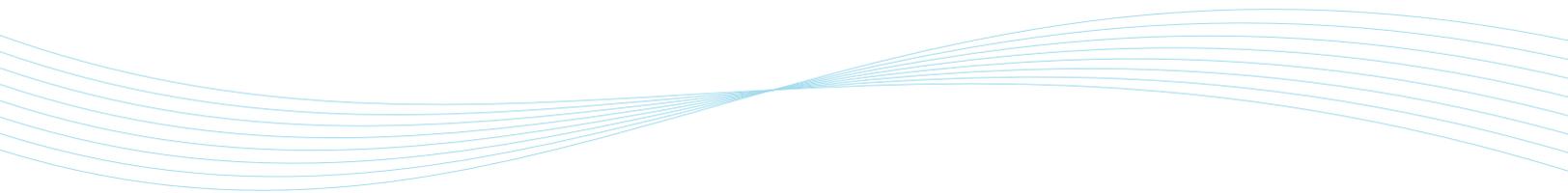




evoqua
WATER TECHNOLOGIES

VORTISAND®
C-SERIES FILTER

**SUBMICRON SIDE
STREAM FILTRATION
FOR COMMERCIAL
COOLING LOOPS**



Why Filter Your Cooling Water?

As energy efficiency and resource conservation gain more importance, facility owners and engineers are recognizing the dramatic improvements they can achieve by efficiently filtering their cooling water.

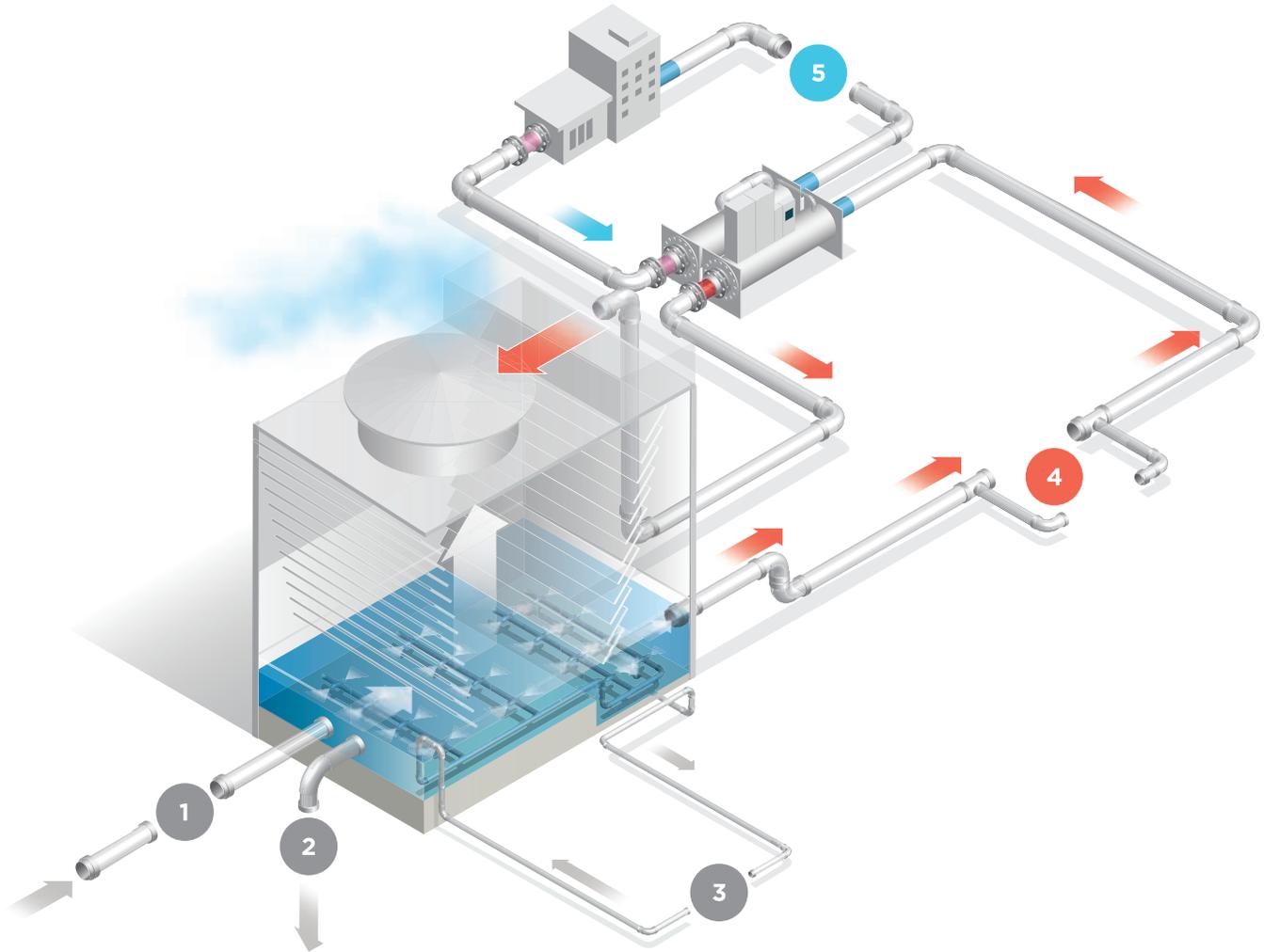
Cooling waters, in both open and closed loops, accumulate suspended solids as they recirculate. By count, the vast majority of these suspended solids are less than 10 micron in size and yet most filtration technologies are not able to remove them so they remain in the water to begin and fuel the fouling process.

The advantages of side stream filtration include:

- Reduced energy consumption by reducing fouling on heat transfer surfaces
- Improved effectiveness of anti-corrosion and biocide treatment
- Decreased nutrient sources and habitat for potential Legionella growth
- Minimized maintenance and downtime

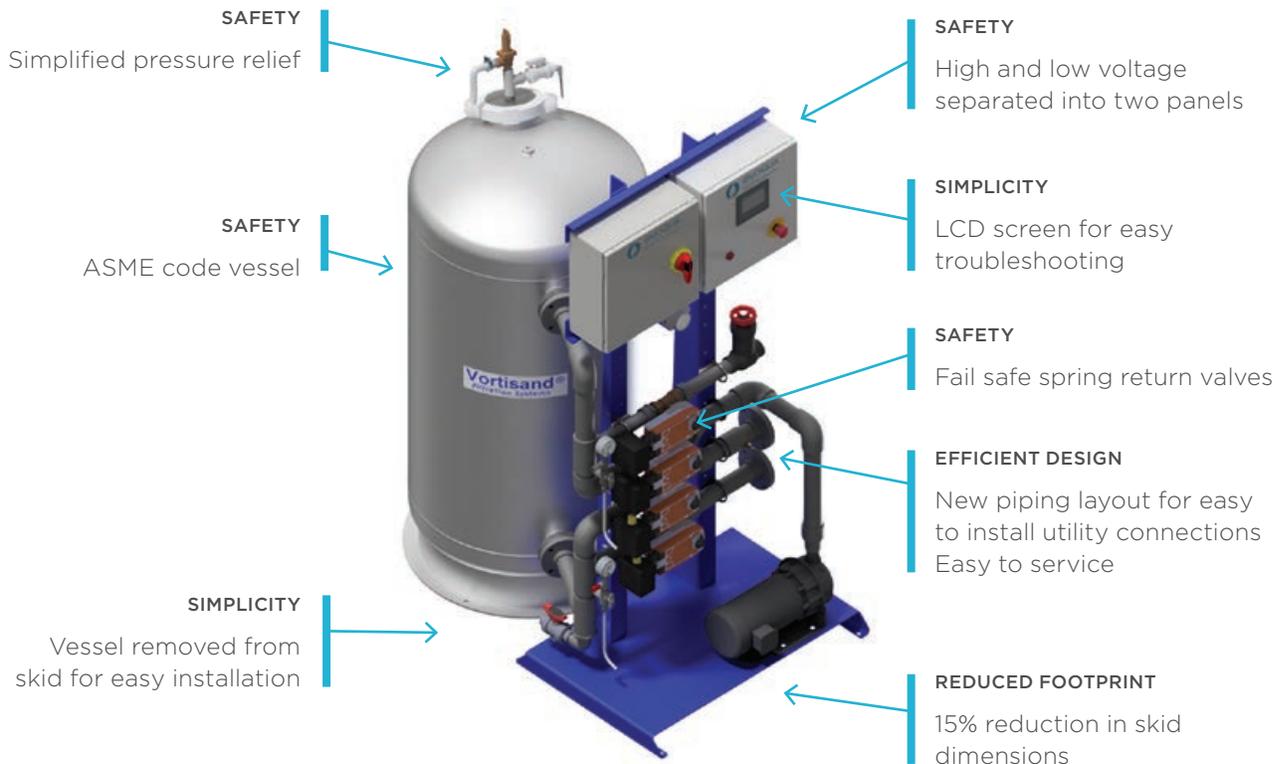


Cooling Tower Water Treatment Process



| Cooling Water Process | Evoqua Technology Recommendations |
|---|---|
| 1 Make-up Water | VAF™ Filtration Systems V-Series™ Screen Filter VAF™ Filtration Systems Hydrocyclone Separator |
| 2 Blowdown Treatment | Contact Evoqua Representative |
| 3 Basin Agitation and Filtration | VAF™ Filtration Systems V-Series™ Screen Filter |
| 4 Side Stream/Full Flow Filtration | Vortisand® Microsand C-Series Filter VAF™ Filtration Systems V-Series Screen Filter |
| 5 Chilled Loop Filtration | Vortisand® Microsand C-Series Filter |

Vortisand® C-Series System Components: A Closer Look



Choosing the Right Filter for Your Cooling Application

Although many technologies have been used for side stream filtration, for over thirty years Vortisand submicron filters have been recognized as a leader in both performance and continued innovation in the industry.

The new C-Series builds on years of experience and customer feedback to provide a range of filters ideal for commercial cooling applications such as HVAC, data centers, central utility plants, hospitals, district energy facilities and many more. Some of the enhancements include:

FEATURES & BENEFITS

Optimized Layout

- 15% reduced footprint
- Simple, intuitive controls for easier operation and troubleshooting
- Piping layout designed for ease of installation and service
- Split skid design for maneuverability in tight spaces such as mechanical utility rooms

Dependable Safety and Reliability

- Dedicated enclosures for high and low voltage electronics to improve safety during operations
- Fail-closed valves to enhance safety and operational integrity
- Pressure vessels built to ASME code for added reliability and longevity

How it Works

FILTRATION MODE

Vortisand® filtration systems use exclusive VortiJet™ diffusers to generate a cross-flow pattern that flows parallel to the surface of the media. Combining this cross-flow pattern with fine 0.15 mm microsand media allows the filter to remove contaminants in two ways: (1) large contaminants are blocked by the microsand while the cross-flow patterns holds them in suspension and prevents them from blocking the surface, (2) finer contaminants that enter the microsand layer are trapped within the small voids between the media.

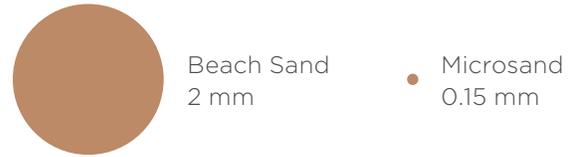
BACKWASH MODE

Contaminants trapped in suspension and within the microsand media (depth filtration) are easily removed using an automatic backwash cycle. Since the microsand media is lightweight, Vortisand filters' backwash cycles require less flow and shorter durations than traditional sand or multi-media filters.

The result is a technology that removes particles less than 1 micron in size at 4 to 5 times the hydraulic flow rate of other media filters, while requiring up to **50% less water for backwash**.

MICROSAND VS BEACH SAND

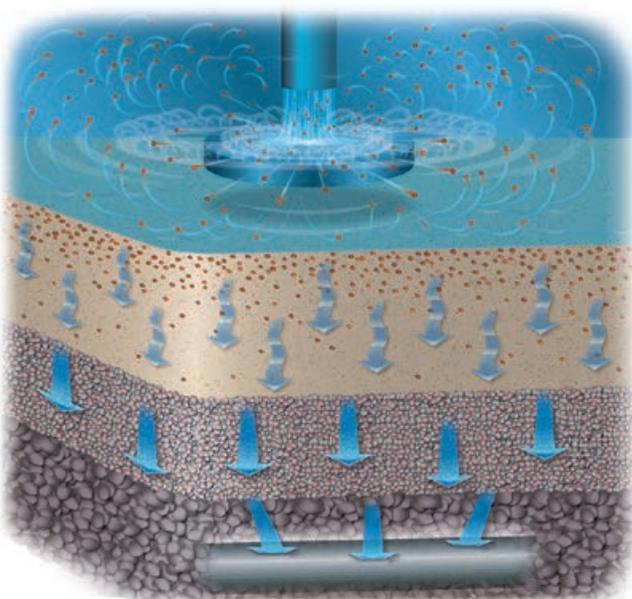
*Relative size comparison. Not to scale.



Technology Benefits for Cooling Loops

- **Submicron filtration:** Removing the fine particles responsible for fouling cooling systems helps to keep cooling equipment operating at peak efficiency.
- **Reduced footprint:** High filtration rates mean Vortisand filters have one of the smallest footprints of any media filter.
- **Automated operation/minimal maintenance:** Vortisand filters are fully automated, require minimal maintenance and have a user-friendly interface complete with maintenance reminders.
- **Lower cost of operation:** Since the microsand media backwashes easily, Vortisand filters use up to 50% less water for backwashing than conventional media filters.

VORTISAND C-SERIES FILTER: AN INSIDE LOOK

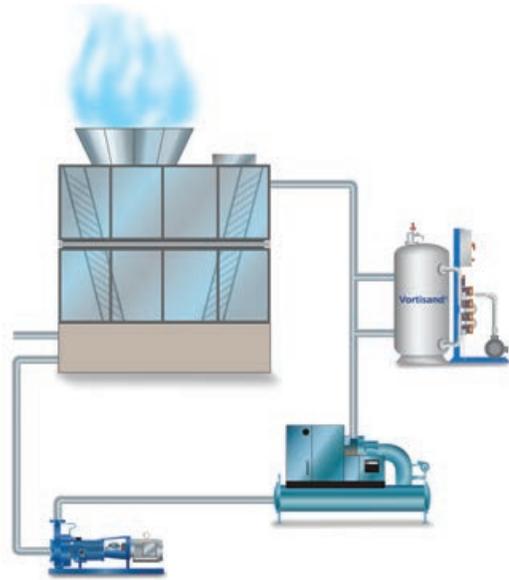


- ← **Cross-Flow:** VortiJet injector induces a cross-flow pattern across surface of media. Large particles are kept in suspension which prevent media surface blinding.
- ← **Microsand:** Small particles penetrate the fine microsand media bed where they are trapped within the small voids between the media.
- ← **Support Structure:** Larger media is used to act as a support structure for the microsand. These layers do not perform filtration.
- ← **Underdrain:** Filtered water flows through the support layers and out through the wedge wire underdrain.

OPEN LOOPS

Sizing Your Side Stream Filter for Open Loops

While there are several possible configurations for installing a side stream filter on an open loop, Evoqua recommends the Vortisand® filter draw a side stream from the pressurized section of the loop downstream of the main recirculation pumps. This ensures adequate suction pressure to the Vortisand filter feed pump.



| Cooling Tower Capacity Range (tons) | Cooling Tower Recirculation Rate (gpm)* | Model | Filter Capacity (gpm) |
|-------------------------------------|---|--------|-----------------------|
| 290-490 | 870-1,470 | VC-50 | 50 |
| 430-725 | 1,290-2,175 | VC-75 | 75 |
| 670-1,100 | 2,010-3,300 | VC-100 | 100 |
| 930-1,550 | 2,790-4,650 | VC-140 | 140 |
| 1,333-2,222 | 4,000-6,667 | VC-200 | 200 |
| 1,867-3,111 | 5,600-9,333 | VC-280 | 280 |
| 2,300-3,900 | 6,900-11,700 | VC-350 | 350 |
| 3,900-6,700 | 12,000-20,100 | VC-600 | 600 |

*** Note Assumptions:** Flowrate 3 gpm per cooling tower ton (12,000 BTU/hr). Based on 3-5% recirculation range. If there is overlap between two models, we recommend selecting the larger model to ensure the best water quality can be achieved. All selections should be confirmed by an Evoqua application engineer.

| System Volume (thousands of gallons) | Model | Filter Capacity (gpm) |
|--------------------------------------|--------|-----------------------|
| 60-190 | VC-50 | 50 |
| 90-280 | VC-75 | 75 |
| 145-430 | VC-100 | 100 |
| 200 - 600 | VC-140 | 140 |
| 300 - 900 | VC-200 | 200 |
| 400 - 1,200 | VC-280 | 280 |
| 500 - 1,500 | VC-350 | 350 |
| 860 - 2,600 | VC-600 | 600 |

CHILLED LOOPS

Sizing Your Side Stream Filter for Chilled Loops

Vortisand filters provide far better performance and require less labor than the bag or cartridge filters that are commonly used in closed loops, especially for larger loops. Sizing a side stream Vortisand filter for chilled and other closed loops is based on the volume of water in the loop. Evoqua recommends a Vortisand filter with a capacity sufficient to filter the entire volume once every 24 to 72 hours. A final selection should be made with the assistance of an Evoqua application engineer and taking into account the water quality, age of the piping and materials present.

Vortisand® C-Series Filter Models

VORTISAND C-SERIES FILTER FLOW MODEL PACKAGES

The Vortisand C-Series Filter comes in an indoor and outdoor trim package for your specific project needs.

| Model | VC-50 | VC-75 | VC-100 | VC-140 | VC-200 | VC-280 | VC-350 | VC-600 |
|--------------------------|-------|-------|--------|--------|--------|--------|--------|--------|
| Capacity (gpm) | 50 | 75 | 100 | 140 | 200 | 280 | 350 | 600 |
| Min Flow Rate (gpm) | 22 | 33 | 50 | 70 | 100 | 140 | 140 | 240 |
| Backwash Flow Rate (gpm) | 22 | 35 | 50 | 70 | 100 | 140 | 75 | 150 |

Vortisand C-Series Filter Trim Packages



INDOOR SERIES

- PVC Piping offers economy option and enhanced chemical compatibility
- NEMA 2 valve actuators



OUTDOOR SERIES

- Highest level components and specification
- Full 304 stainless steel system including both vessel and piping
- Improved welding quality (AWS D1.1) spec over copper
- Provides enhanced corrosion resistance to carbon steel
- NEMA 4X valve actuators

TRANSFORMING
WATER
— ENRICHING —
LIFE



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