

EQUIPMENT GUIDE / FILTRATION & SEPARATION

Filtration System Design Guide

Which filtration, softening, and disinfection architecture holds up against your actual feed water and process fluid — not the generic "removes contaminants" answer.

THE PROBLEM THIS GUIDE SOLVES

System design should be process-first, not component-first

A filtration system spec'd component-by-component treats the job like a catalog transaction. Real system design matches removal technology, softening chemistry, disinfection method, and downstream protection to the actual feed water — hardness, chlorine vs. chloramine, scale-forming salts, biological load — before equipment gets ordered.

This guide organizes real, vendor-documented selection data by filtration/separation category, not by brand. Every material and process call-out is sourced to a named vendor document, a LibertyCES field record, or the chemical-compatibility chart.

ARCHITECTURE SELECTION, AT A GLANCE

Filtration & separation categories, by what they're actually built to remove

Architecture family	Built for	Watch for
Strainer (basket, Y-strainer)	Coarse solids removal upstream of pumps, valves, and instrumentation	Seawater and abrasive scrubber fluids need exotic-alloy or composite baskets, not standard 316SS
Filter System (cartridge, bag, carbon adsorber)	Fine particulate and dissolved-contaminant removal on plating, metal-finishing, and process lines	Standard activated carbon handles chloramines poorly — a separate catalytic-carbon media exists specifically for that
Sterilizing-Grade & Depth Filtration	Biopharmaceutical, beverage, and endotoxin-critical process fluids	A cartridge's absolute micron rating isn't the whole story — zeta-potential media removes charged particles smaller than its own rating
Water Softening System	Hardness removal before it loads downstream valves, piping, heaters, and process equipment	Resin cross-linkage percentage (8% vs. 10%) sets chlorinated-feedwater tolerance — the spec most likely to be missed
RO/UF/EDI System	Dissolved-solids removal, membrane-based purification	CIP cleaning chemistry must match the foulant — inorganic scale needs acid, organic fouling needs alkaline/NaOH
Deionization / EDI System	Ultrapure water for pharmaceutical, semiconductor, and boiler-feed applications	Single-bed and mixed-bed DI both need chemical regeneration and batch downtime; CEDI is the only chemical-free continuous option
UV Disinfection / Sterilization System	Chemical-free microbial control, chlorine-resistant parasite protection	UV protects against chlorine-resistant <i>Cryptosporidium</i> and <i>Giardia</i> specifically — it's a targeted answer, not a chlorination replacement
Media Filtration System / Media Filter	Chlorine, chloramine, iron, manganese, and sediment removal	A municipality switching from free chlorine to chloramine disinfection changes the correct media from activated carbon to catalytic carbon
Silt Separator	Scale-precursor removal as a chemical-free alternative to antiscalant dosing	Targets calcium carbonate scale precursors via nucleation-seed removal, not filtration in the traditional sense

BASKET STRAINER / Y-STRAINER — EVIDENCE: STRONG

Seawater, scrubber liquor & abrasive service



Fluidtrol Glass Ceramic Matrix Composite Basket Strainer

Also: [Fluidtrol FRP Basket Strainers](#) · [GS Series thermoplastic-lined FRP](#) · [WYE Series Y-strainers](#) · [Duplex Basket Strainers](#)

Sea Water

Salt Water

Scrubber Liquor

The Glass Ceramic Matrix Composite (fiberglass + ceramic + vinyl ester) is a genuinely novel material in this dataset — marketed specifically for combined corrosion *and* abrasion, naming seawater and scrubber systems explicitly. Most strainer materials address one property or the other, not both. The FRP series uses FRP as the primary chemical barrier in a 5-layer laminate (10 mil Nexus veil chemical barrier, 100 mil chopped strand anti-wicking barrier, 55° filament-wound structural layer, repeat chemical barrier, 10 mil polyester gel coat) while the GS Series instead uses a thermoplastic liner (PVC/CPVC/PP/PVDF) with fiberglass only for structural strength — two different engineering answers to the same corrosion problem.

Material flag: the compatibility chart shows sea water rates "Excellent" across PVC/PP/PVDF/PFA/PTFE/316SS, but saturated salt water drops 316SS to "Fair" at both 40°C and 80°C — a real divergence between two similar-looking media that changes the basket-material answer. Exotic alloy basket options (AL6XN, Hastelloy, Monel, Titanium) exist specifically for seawater and abrasive/aggressive scrubber-system fluids.

Duplex configurations give continuous uninterrupted operation — a requirement in any recirculating aquatic or scrubber loop where flow cannot stop for basket cleaning.

STRAINER — EVIDENCE: LIGHT

Acids & solvents (general-purpose service)

Y-strainers are cataloged alongside Griffco's sulfuric-acid bulletin hardware and Hayward's PVDF chemfeed sub-catalog, using 316SS, Hastelloy, or CPVC construction — contextual, gauge-guard-adjacent evidence rather than a dedicated acid-service datasheet. Fil-Trek's 98 Series automatic strainer explicitly notes a -50°F rating for methanol service, using stainless steel wire mesh.

FILTER SYSTEM — EVIDENCE: STRONG

Plating & metal-finishing acid/salt service



Filter Pump A/AA/AB/ASF/BF/CTM-CTL/MF Filter Systems

Also: MR-SR Metal Recovery Chamber/Filter System • Perry Fiberglass Carbon Adsorber Filter Systems

Phosphoric Acid

Citric Acid

Lactic Acid

Sulfuric Acid

Alkaline Cyanide

Named acids are directly tied to plating and metal-finishing filter-system applications, using CPVC, polypropylene, PVDF, or 316/304SS wetted construction. The MR-SR Metal Recovery Chamber/Filter System is explicitly named for alkaline cyanide and high-chloride plating-bath filtration — a different chemistry pairing than the general acid-service filter systems above it.

Chlorine/ammonia adsorption: Perry Fiberglass's Carbon Adsorber Filter Systems use proprietary impregnated dry media — sodium-thiosulfate-impregnated media for chlorine, phosphoric-acid-impregnated media for ammonia — a chemistry-matched adsorbent, not generic activated carbon.

STERILIZING-GRADE & DEPTH FILTRATION — EVIDENCE: STRONG

Biopharmaceutical, beverage & endotoxin-critical fluids

Strainrite Pur-MAXX SG & Mem-Pleat SG · Endo-MAXX CN · Vent-MAXX

Beer

Wine

Biopharmaceutical Media

Endotoxin-Bearing Fluids



The compliance stack is the real content here: ISO 9001:2015, cGMP manufacturing in validated ISO Class 7 clean rooms, USP Class VI biological reactivity, LAL endotoxin testing, bacterial challenge validation to ASTM F838, FDA-listed materials, steam and gamma sterilization validation, and every cartridge individually integrity-tested via air diffusion test. Endo-MAXX CN's positive zeta-potential mechanism is genuinely differentiated — it removes charged particles *smaller* than its own 0.2µm absolute rating, a capability no other filtration line in this dataset has.

Pur-MAXX SG and Mem-Pleat SG use a 0.2µm sterilizing-grade PES membrane, bacterial-retention validated to *Brevundimonas diminuta*. Vent-MAXX's double-layer hydrophobic PTFE construction is purpose-built for tank vent and gas filtration, validated to both air and liquid standards. The vendor cites domestic US manufacturing specifically to avoid the 6–12-month delivery delays it says competitors face.

CARTRIDGE FILTER HOUSING — EVIDENCE: STRONG

AXEON FST/FSD-Series: the certification pairing is the selection logic worth publishing plainly — NSF/ANSI 42 covers aesthetic effects (taste, odor, chlorine, particulate) while NSF/ANSI 53 covers health effects (specific contaminant reduction), and AXEON only carries 53 on select models. A food or beverage plant needs to know which claim it's actually buying.

WATER SOFTENING SYSTEM — EVIDENCE: STRONG

Resin cross-linkage is the spec most likely to be missed**AXEON WS-Series & TS-Series · Fleck Single · Fleck Twin**

Hard Process Water

Sodium Chloride Brine (regenerant)

Potable Water

The resin cross-linkage percentage is the spec most likely to be missed and worth leading with: 10% cross-linked resin (AXEON Fleck Single) tolerates chlorinated feedwater better than 8% (WS-Series, TS-Series, Fleck Twin) — a food plant on municipal chlorinated supply will otherwise see premature resin degradation. Fleck Twin is positioned specifically for heavy-industrial, continuous soft-water demand at 8% cross-linkage.

FIELD RECORD — 25,000 GPD INDUSTRIAL WATER SOFTENER DESIGN

Three interconnected failures drove this design: hardness scale formation across valves, piping, heaters, and downstream equipment; water-quality instability during regeneration cycles and demand swings; and microbial exposure risk post-softening combined with over-reliance on manual intervention.

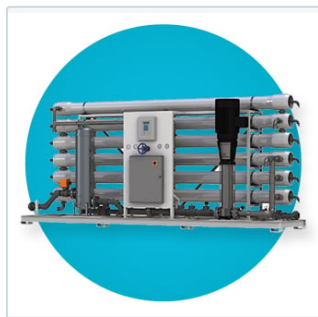
Process-first, not component-first

Fiberglass ion-exchange pressure vessels remove hardness before it loads downstream assets. Cross-linked polyethylene brine tanks make regeneration support core infrastructure, not an afterthought. A UV disinfection system handles microbial risk post-softening without adding a second chemical loop. SCADA-ready controls shift operation from reactive manual adjustment to proactive alarm-based management.

"The value is in matching the right components, materials, and control logic to the real application instead of treating the job like a catalog transaction" — the same design principle applies across every category in this guide, not just softening.

RO/UF/EDI SYSTEM — EVIDENCE: STRONG

CIP cleaning chemistry must match the foulant

**AXEON BWRO/SWRO/PWS-Series · CIP-Series**

Also: Epiphene CPH-16 (chemical-free antiscalant alternative)

Antiscalant (Calcium Carbonate)

Citric/Hydrochloric Acid (CIP)

Sodium Hydroxide (CIP)

AXEON's CIP-Series foulant-to-cleaning-chemical reference table maps the cleaning chemistry directly to the fouling mechanism: inorganic scale maps to acid/citric/HCl cleaning, while organic fouling maps to alkaline/NaOH cleaning — the wrong cleaning chemistry for the actual foulant wastes a CIP cycle without removing what's actually fouling the membrane. Antiscalant dosing for RO membrane scale protection is confirmed across multiple AXEON product lines; Epiphene's CPH-16 offers a chemical-free physical alternative or complement using nucleation-seed removal technology.

Oxidizers/disinfectants — evidence: moderate. UV protects RO/UF membranes against chlorine-resistant parasites, but membrane systems still require upstream de-chlorination protection — UV is a complement to de-chlorination here, not a replacement for it.

DEIONIZATION / EDI SYSTEM — EVIDENCE: STRONG

Single-bed, mixed-bed & chemical-free continuous EDI



AXEON EDI-Series · Single-Bed & Mixed-Bed Down Flow Deionization

Boiler Feed Water

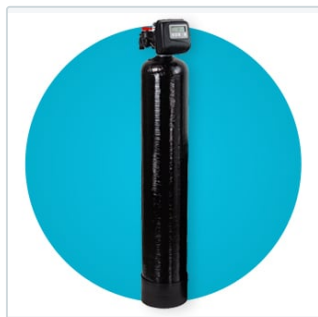
Ultrapure Water

Acid/Caustic Regenerants

A real, quantified tradeoff: Single-Bed and Mixed-Bed DI both use chemical regeneration and require batch downtime, while continuous electrodeionization (CEDI) is the only chemical-free continuous option of the three — 99.9% dissolved-ion removal across the family. The EDI-Series' Thin-Concentrate Non-Scaling Technology, paired with a non-scaling electrode system and no concentrate recirculation, addresses the specific EDI failure mode of scale buildup on the electrode/concentrate side — a detail captured from no other DI/EDI vendor in this dataset. Applications span pharmaceutical, semiconductor, power-generation boiler feed, cosmetics, automotive, and glass/mirror production.

MEDIA FILTRATION SYSTEM – EVIDENCE: STRONG

Activated carbon vs. catalytic carbon – the chloramine switch



AXEON AC-Series · CC-Series · ZE-Series · Upflow Granulated Carbon

Chlorine

Chloramines

Iron

Manganese

The AC-vs-CC distinction is the most useful selection fact here and is frequently missed: standard activated carbon (AC-Series) handles chloramines poorly, which is why AXEON sells a separate catalytic-carbon series (CC-Series) specifically for chloramine removal. Any municipality that has switched from free chlorine to chloramine disinfection changes the correct answer from AC to CC – using the same activated coconut-shell carbon housing but different media chemistry.

Also real and quotable: the Upflow Carbon line uses a Clack 1191 control valve while AC/CC/ZE use a separate unnamed "Advanced" valve – a parts/service compatibility fact worth confirming before ordering spares.

UV DISINFECTION / STERILIZATION SYSTEM – EVIDENCE: STRONG

Chlorine-resistant parasites, without a second chemical loop



AXEON PRO50 · K+ · SHF · VH410 · S2Q-PA

Cryptosporidium

Giardia

Wastewater Final Effluent

UV protects against chlorine-resistant Cryptosporidium and Giardia specifically – it's the answer where chlorination alone is insufficient, and it adds no second chemical loop, which is exactly the reasoning the LibertyCES industrial water softener case study used to select UV over an additional chemical disinfectant. Optional solenoid-valve integration stops flow if UV output drops below a safe threshold, converting UV from a monitored process into an interlocked one. AXEON explicitly names wastewater treatment as a final disinfection step before environmental release or reuse.

SILT SEPARATOR – EVIDENCE: LIGHT

Epiphene's CPH-16 uses chemical-free nucleation-seed removal technology targeting calcium carbonate scale precursors as an alternative to chemical antiscalant dosing. Wetted materials are not disclosed by the vendor beyond general marketing claims – treat this as a spec-review item pending direct confirmation.

NEXT STEP

Send LibertyCES the process data, not a part number.

Nine filtration and separation architectures, real vendor selection data, one guide — but your actual feed water still has specific hardness, chlorine/chloramine, and scale-precursor conditions that determine which technology is correct. A spec review checks the exact conditions against the exact system, before equipment gets ordered.

Feed water source, hardness, disinfectant type, flow rate, downstream equipment, and current infrastructure — that's what a real spec review needs to start.

Request a spec review

sales@libertyces.com

(559) 395-5500

libertyces.com