



**CUNO Filter
Systems for
the Bottled
Water Industry**

Applications

- Particulate Reduction**
- Equipment Protection**
- Microbiological Control**

Bottled Water

Why do bottled water producers and their customers rely on CUNO Filter Systems?



CUNO Filter Systems – the choice is clear.

Cost Effective Quality

CUNO's filtration technology can be used in the continuing drive to lower manufacturing costs. The correct application of specialized filtration technology at critical process steps can reduce total filtration costs significantly. The system-wide approach to filtration will:

- ▶ Increase filter life
- ▶ Eliminate system downtime
- ▶ Protect process equipment
- ▶ Decrease overall operating costs

Performance

CUNO is a recognized leader in many high quality separation and filtration markets, providing high performance solutions to the ever increasing demand for purer products. Advances in CUNO filtration technology provide:

- ▶ Improved water quality
- ▶ Reduced waste and disposal costs
- ▶ More durable filter cartridges
- ▶ Longer filter service life

Reliability

Consumer demand for increased water quality compels bottlers to vigilantly maintain high operating standards. CUNO satisfies this demand with filtration systems that meet or exceed industry quality standards.

- ▶ More NSF listed filters than any other supplier
- ▶ ASME Code designed filter housings
- ▶ Absolute rated filter cartridges
- ▶ Total Quality Management system approach
- ▶ ISO 9001 certified quality systems around the globe



Fluid Purification

CUNO Incorporated, with over 90 years of providing cost effective solutions to industry, designs and manufactures filtration and separation systems for a broad customer base including:

- ▶ **Consumer–Drinking water, Food Service, and Commercial**
- ▶ **Health Care–Pharmaceutical, Biotechnology Food & Beverage, and Diagnostics**
- ▶ **Industrial–Oil and Gas, Chemical/Petrochemical, Coatings, and Electronics**

Contents

The Multi-Barrier Approach to Bottled Water	2
▶ Particulate Reduction	4
▶ Equipment Protection	8
▶ Microbiological Control	10
Filter Products	
▶ Beta-Klean® Filter Cartridges	13
▶ Betapure® Filter Cartridges	14
▶ Econo-Klean™ Filter Cartridges	15
▶ PolyNet™ Filter Cartridges	16
▶ Betafine® XL Filter Cartridges	17
▶ LifeASSURE® BW Filter Cartridges	18
▶ Microfluor® II Filter Cartridges	19
▶ Express Series™ Filter Housings	20
▶ DC & SD Filter Housings	21
▶ ZWB & ZWC Filter Housing	21
CUNO...A World Leader In Fluid Purification	22
Scientific Applications Support Services (SASS)	23
Quality Management & ISO Standards	23

The Multi-Barrier Approach to Bottled Water

Bottled Water Systems

Bottled water systems vary from the relatively simple, “source-to-bottle” design to the more complex multiple plant - multiple product systems. Accordingly, CUNO provides a wide variety of filter products that meet the varying needs of the industry.

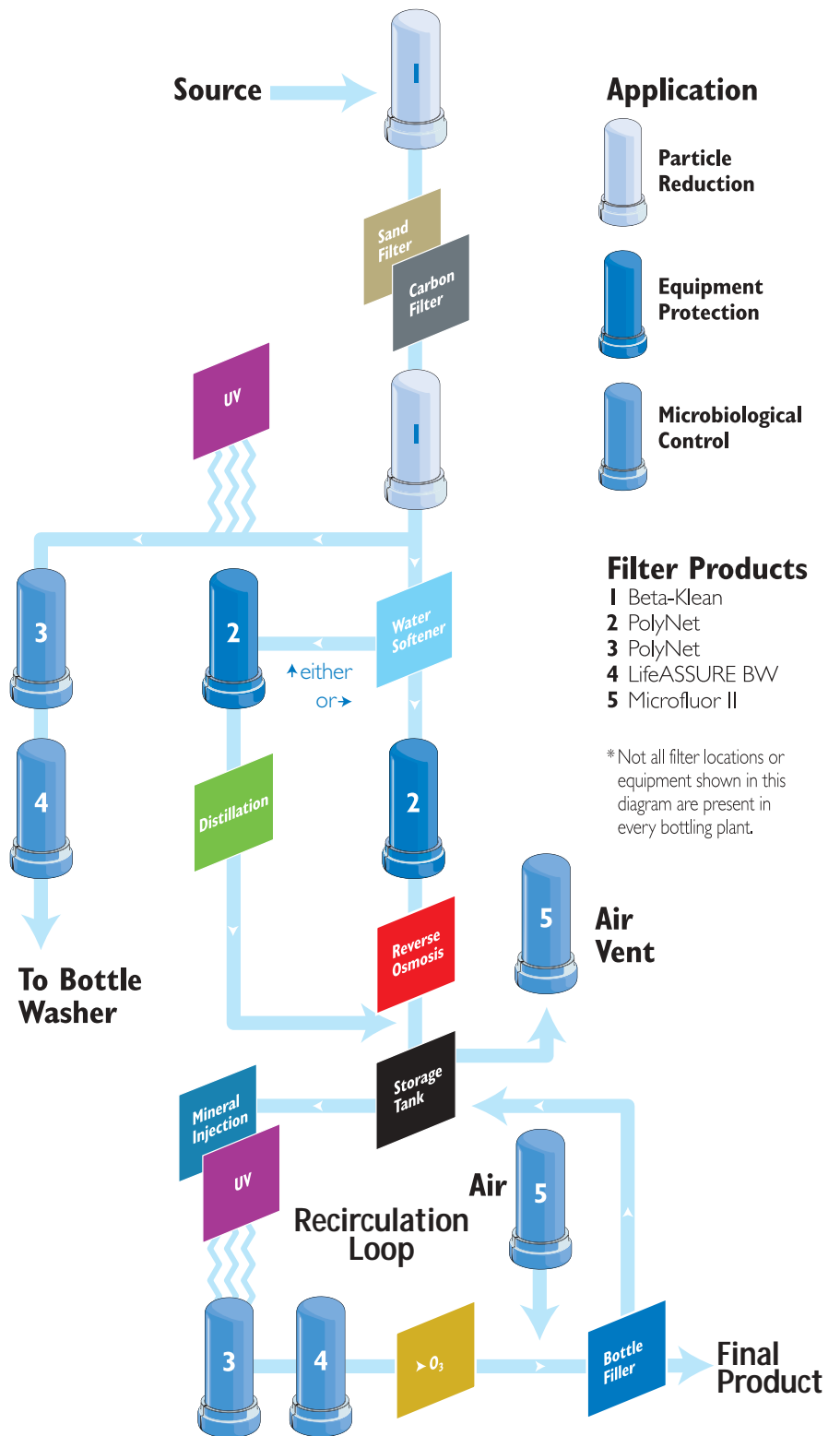
As advocated by the International Bottled Water Association (IBWA), CUNO supports the concept of “Multi-Barrier” practice. The schematics to the right for drinking water and spring water encompass multiple points of filtration. Not all filter applications may be present in any single facility, but are included here for illustration purposes.

About This Catalog

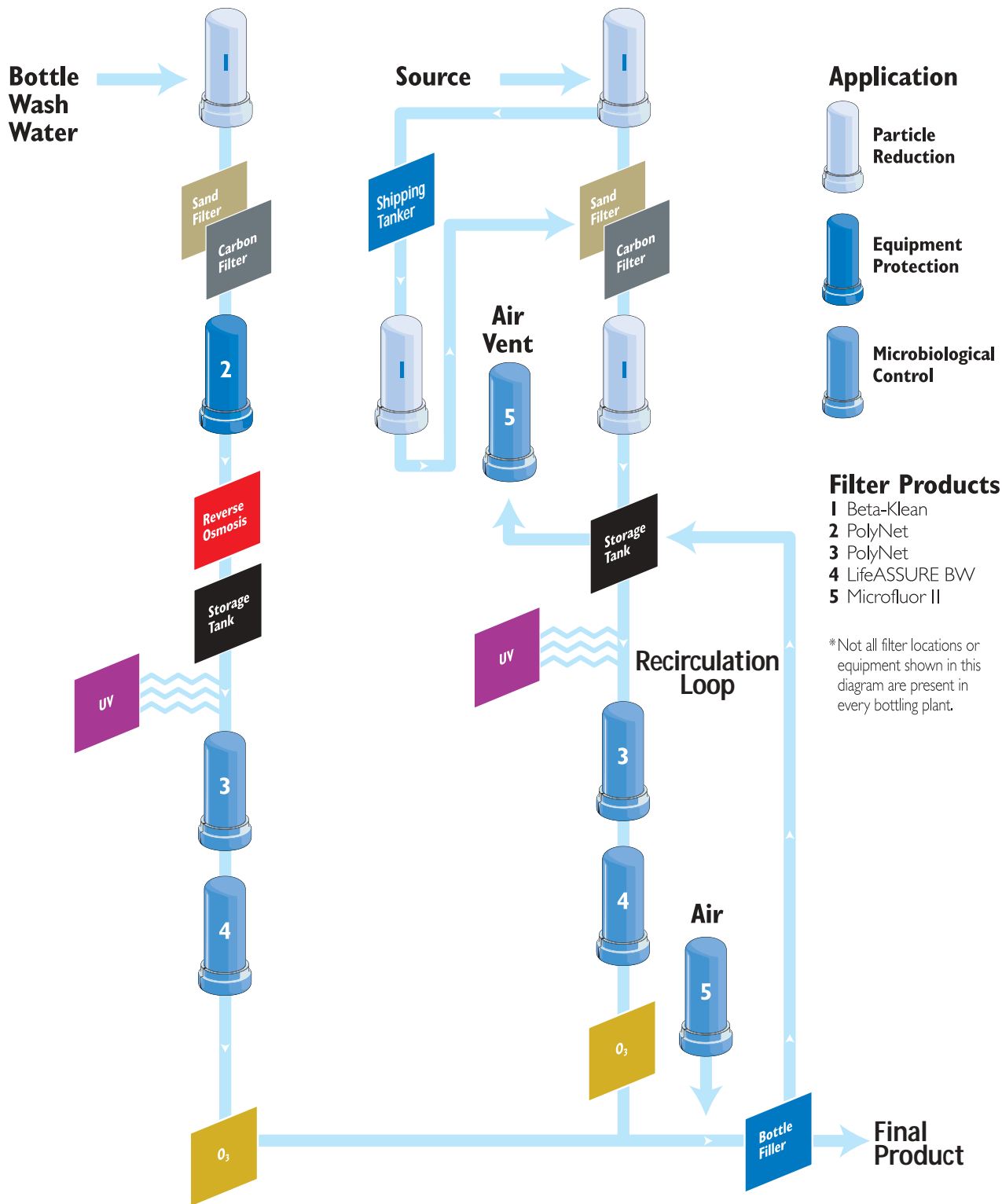
For the purpose of this catalog, filtration applications in water bottling operations are grouped into the three functional categories as shown in the system diagram: particulate reduction, equipment protection, and microbiological control. Although these categories may combine different operations and, perhaps, production methods, the function of filtration within the process remains the same.

Each section of the catalog, including the filter product section, is designed to provide the most current information available. However, as bottled water processes change, regulatory mandates or policies evolve, or CUNO develops new products, this catalog will be updated. To ensure that you receive the latest materials for reference or evaluation, contact your local CUNO Master Distributor.

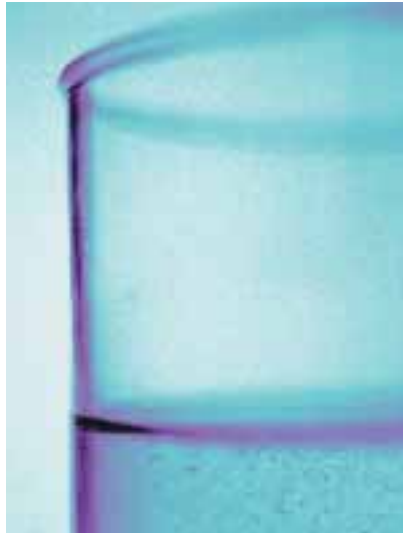
Drinking Water*



Spring Water*



Particle reducing filters are used to reduce or eliminate solid and semi-solid materials that cause turbidity in water before entering the bottling process. Filtration at this stage ensures product clarity that is demanded by the end user.



“Turbidity control, first and foremost, is the primary concern of successful and profitable bottled water companies.”

The Problem

Since the particle content of the source water can vary greatly, these filters must feature a high contaminant holding capacity to address the range of particle loading encountered, exhibit the structural stability required to eliminate particle unloading under rapid change in differential pressure, and be comprised of materials that will not alter the original taste and smell. To compound the particle reduction problem, variation in particle loading can be caused by seasonal changes, such as water table fluctuation. Contaminating particles can consist of:

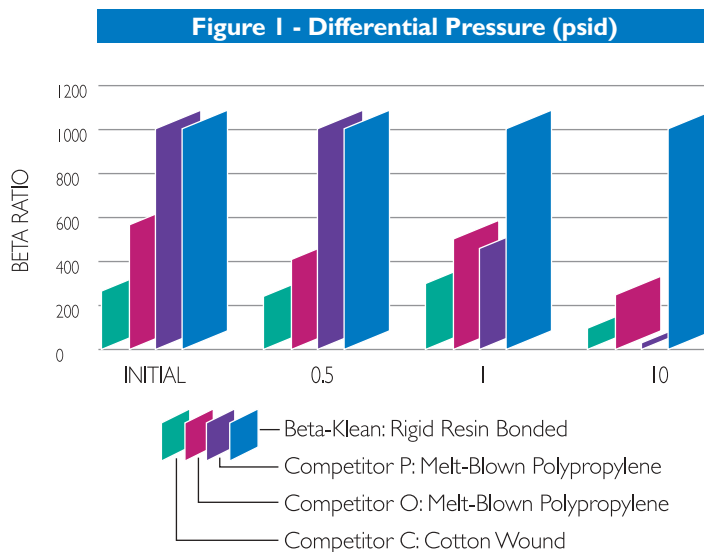
- ▶ Sand, silt, and general organic matter from springs or other sources,
- ▶ Pipe scale, rust or other particulate from transfer piping or hoses, and
- ▶ Debris from holding tanks and tanker car surfaces

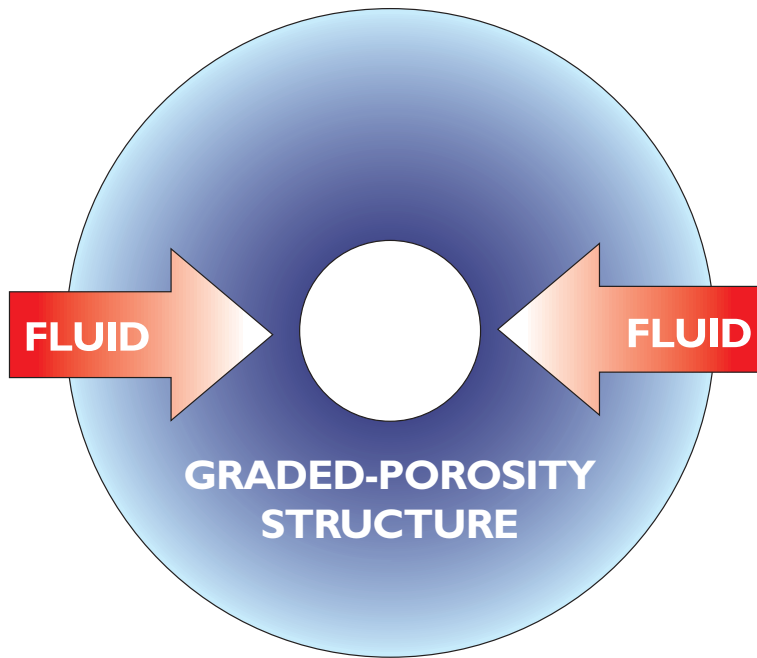
Water source filtration is required for two main reasons. The first is to remove particulate from the water to ensure the product meets turbidity specification and the S.D.I. target. The second reason is to protect the downstream process from contamination with particulate and organic matter. Filter installation locations include the exit of the spring, bore hole, or other water source, as well as tanker filling or off-loading into the bottling facility. Bottle wash water, usually from a source other than the product water, also requires particulate filtration to ensure that containers are not contaminated prior to filling.

The Solution

CUNO particle reduction filter cartridges are an easy-to-use, cost effective solution for producing turbidity free water. CUNO’s Beta-Klean filter cartridge is the latest advance in turbidity reducing filtration technology.

Figure 1 - Illustrated is the decline in performance of common melt-blown polypropylene filters and conventional string wound filters over their service life. As differential pressure builds, these compressible filter structures unload particles into the water causing an increase in turbidity.





“Unloading of cheap, deformable filter cartridges or bag filters can result in hours of system clean-up and lost productivity.”

Figure 3 - Each fiber in the filter matrix is locked in place by a thermosetting binder to create a rigid medium that traps large particles near the outer surface and smaller particles near the filter's inside diameter.

The unique rigid, graded-porosity construction of the Beta-Klean filter cartridge provides efficient removal of particulate and general organic debris resulting in crystal clear product water.

Innovative manufacturing techniques result in a filter that provides substantially longer service life, and lower running costs, than competitive offerings. Important Beta-Klean benefits include the following:

- ▶ **Absolute ratings from 10 to 60 microns that can be tailored to meet incoming water quality with consistent, reproducible results**
- ▶ **Rigid cartridge construction eliminates the possibility of bypass or unloading as differential pressure builds on the filter—unlike bags or compressible filters**
- ▶ **Graded-porosity construction, combined with an optimized grooving pattern, results in high dirt hold capacity, longer service life and dramatic cost savings**

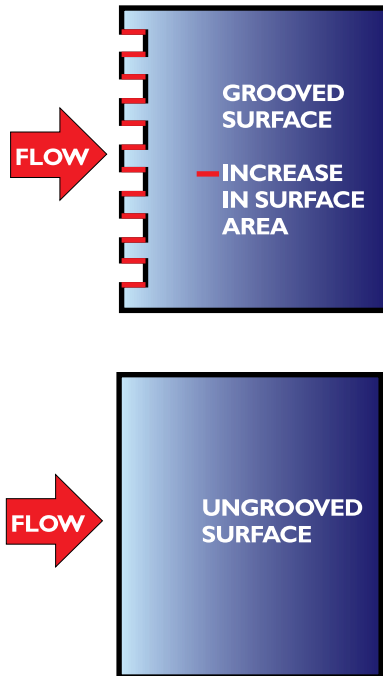


Figure 4 - The grooves increase surface by 65% and prevent premature blinding of the outer surface by large particles.



Figure 2 - CUNO's Beta-Klean filter cartridge—rigid particle reduction

Consistent, Absolute Performance

Beta-Klean filter cartridges are manufactured using a proprietary process that results in progressively more fibers towards the core of the filter. This creates a true graded-porosity structure, capable of far greater contaminant holding capacity than competitive filter designs. Additionally, the Beta-Klean filter cartridge is rigid, and will not unload particulate as differential pressure increases during the life of the filter. Unloading of particles is common among bag filters and compressible filters.

Figure 5 - Contaminant Holding Capacity

10 Micron Z2 Series Beta-Klean vs. Competitive Filters of Comparable Efficiency

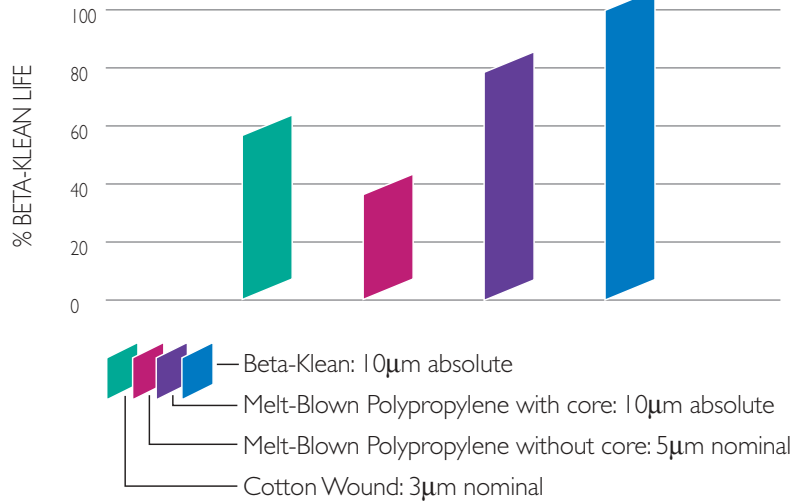
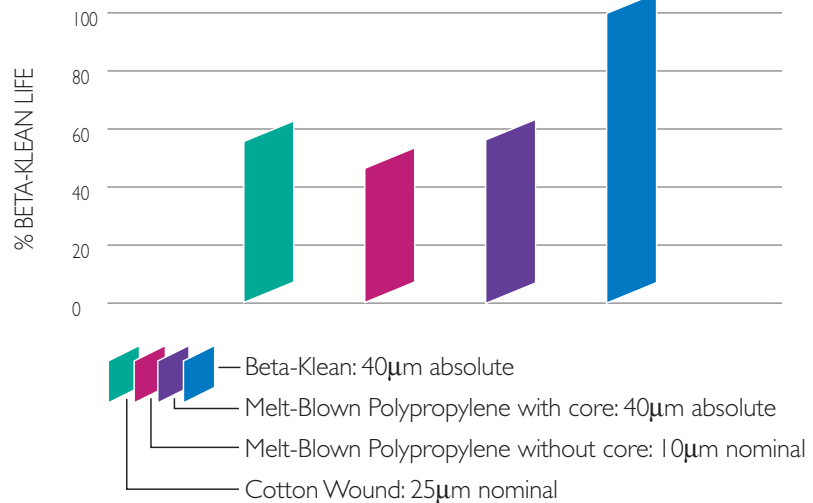


Figure 6 - Contaminant Holding Capacity

40 Micron Z2 Series Beta-Klean vs. Competitive Filters of Comparable Efficiency



Figures 5 & 6 - Illustrated is the superior contaminant holding capacity of the innovative Beta-Klean structure. These data were compiled through extensive filter performance testing measuring the contaminant added as a basis of comparison. To establish an accurate comparison, the filters were chosen based on their actual rather than published retention ratings.



Alternative Filter Selections

Particles that cause turbidity vary greatly in composition, size, and concentration depending on the source water. The condition of the system's piping and equipment, and seasonal differences further influence the source water's contaminant content. For this reason, CUNO offers alternative filter selections to help meet individual user requirements.

CUNO's Econo-Klean series of filter cartridges offer consistent filtration performance while maintaining an economical turbidity reducing process. Unlike compressible string-wound or melt-blown filters, Econo-Klean filters will not deform under high differential pressure eliminating bypass and unloading of contaminants while providing long on-stream service life. Econo-Klean filters—the performance leader in cost effective filtration.

Econo-Klean filters not only outperform string-wound and melt-blown cartridges, they last longer. Figure 7 shows the amount of contaminant added to for each filter to reach 20 psid. Note that Econo-Klean filters hold more than twice as much contaminant than the nearest competitor. Premium performance and superior service life without having to pay the premium price.

Figure 7 - Service Life Comparison
of Rigid Filter Cartridges

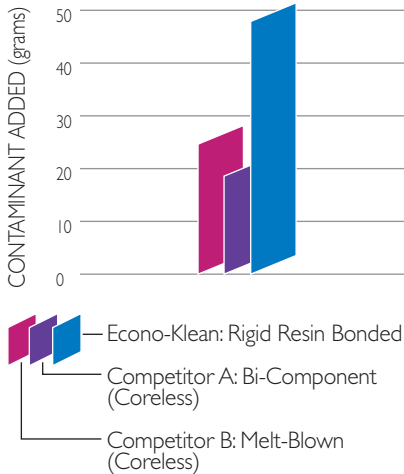


Figure 8 - Comparison of Filtration Efficiency
Econo-Klean vs. "Compressible" Filter Cartridges

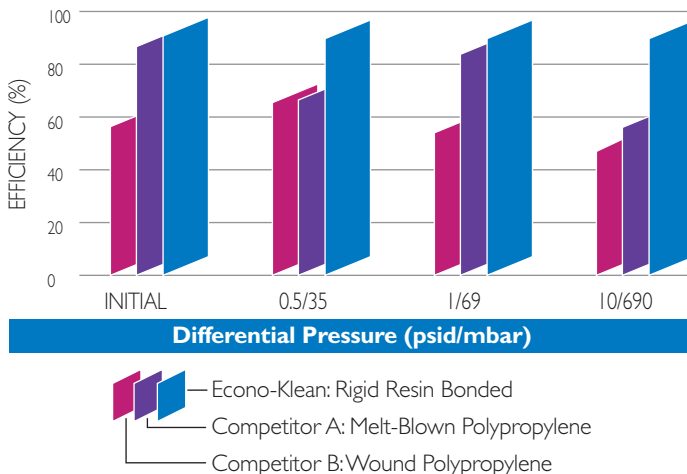


Table 1 Particle Reduction Filtration Recommendations						
Application	Location on Pages 1 & 2	Filter Recommendation	Housing Recommendation	Filter Rating (µm)	Purpose	Refer to Page
Particulate Reduction	1	Beta-Klean or	SD Series	60 or 30 absolute	Particulate and organic debris removal	13
		Econo-Klean	or ES Series	20 or 5 nominal		15

Bottled water plants often include equipment that requires protection from incoming particulate to operate efficiently and economically. Reverse osmosis (RO) membranes, distillation units and ion-exchange beds all perform better when the water entering them is prefiltered. In fact, the leading equipment manufacturers recommend prefiltration as part of standard operating procedures.



Figure 9 - PolyNet—the highest level of cleanliness and protection

“Even a single premature change-out of RO membranes caused by fouling can cost thousands of dollars in lost profits.”

The Problem

Upstream equipment employed in bottled water production, including sand or carbon beds, release particulate unpredictably, contaminating the downstream process unless equipment protection filters are installed. Cartridge filtration is an extremely cost effective method to protect critical processing steps from either premature fouling or from contamination from upstream process steps.

Particulate from source water, or generated from upstream equipment such as sand or carbon beds, can foul expensive process equipment like RO membranes or distillation units, leading to higher operation costs. Protection of expensive processing equipment is an important factor when operating a profitable bottled water process. For instance, premature fouling of RO membranes can result in thousands of dollars in extra costs. This includes not only the replacement costs for the membranes themselves, but the labor involved in replacement, as

well as the cost of lost productivity while the membranes are being changed. By not employing equipment protection filters, bottle water plants may incur:

- ▶ **Frequent cleaning and change-out of RO membranes, resulting in greater maintenance and operational costs**
- ▶ **Elevated energy costs associated with fouled distillation equipment**
- ▶ **System contamination with carbon or sand particles that increase product turbidity**
- ▶ **Higher labor costs and down-time associated with more frequent cleanings**

The Solution

PolyNet filter cartridges provide the ultimate in equipment protection. The patented all-polypropylene filter construction utilizes flow enhancing filter media and an innovative flow pattern. CUNO designed the PolyNet cartridge to provide significantly superior service life while maintaining a consistent filtration efficiency. PolyNet filters achieve this through an innovative cartridge design that allows uniform distribution of fluid flow and contaminant throughout the entire depth of the cartridge. PolyNet filter construction combines a unique polypropylene media with fluid distribution netting to form

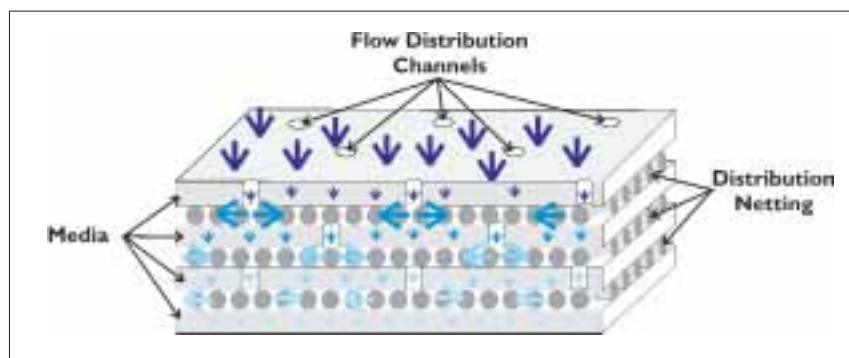


Figure 10

multiple layers (see Figure 10). Critically positioned media flow channels allow greater movement of fluid from one layer to the next. Three distinct media sections, made from multiple media/netting layers, are combined to form a filter cartridge.

This unique construction provides the user with:

- ▶ **Superior service life— as much as 4 times greater dirt-holding capacity than competitive filters**
- ▶ **Absolute-rated retention performance for consistent filtration quality**
- ▶ **Durable all-polypropylene construction for broad sanitation chemical and temperature compatibility.**

Alternative Filter Selections

Betapure filter cartridges feature a unique bonded bi-component fiber matrix that results in a rigid cartridge structure resistant to unloading retained particles. Unloading is a common problem with competitive filters constructed with more compressible filter media. As differential pressure builds across the filter during use, compressible filter media can shift and release previously retained particles into the water. This uneven filtrate quality results in turbidity spikes and premature fouling of downstream equipment, including subsequent filters. The rigid nature of the Betapure filter cartridge protects against unloading, resulting in reliable, consistent performance and excellent protection of downstream equipment.



Figure 11 - Betapure Filter Cartridge

Table 2 Equipment Protection Application Guide						
Application	Location on Pages 1&2	Filter Recommendation	Housing Recommendation	Filter Rating (µm)	Purpose	Refer to Page
Equipment Protection	2	PolyNet or Betapure	SD Series or ES Series	30 or 20 absolute 30 or 20 absolute	Extend equipment service and protect system cleanliness	16 14

What you can't see can hurt you. Microbiological control with filtration removes unwanted microorganism from product water. Microfiltration is employed in-line to the bottler to prevent any external contamination prior to filling.



Figure 12 - CUNO's LifeASSURE BW filter cartridge—bottled water producers demand its efficiency and economy.

“For pennies a day, CUNO filtration provides insurance against cyst or microbiological contamination.”

The Problem

As part of the multi-barrier philosophy, microbiological control using filtration is often practiced in conjunction with UV light and/or ozonation providing added assurance of microorganism removal. For optimum process economy, filter systems typically consist of two filters in series: a prefilter followed by a final filter. The prefilter protects and extends the life of the final filter and is typically rated at 1-5 μ m. The final filter removes bacteria and cysts, and is typically rated at 0.2-1 μ m. Integrity testable filters are preferable since they provide the user with an easy method to ensure that the filters are installed and are operating properly each day. Microorganisms in water can run the gamut from innocuous and harmless to pathogenic and fatal. This is of greatest concern to infants, the elderly, or people with compromised immune systems. Microorganisms of concern include:

- ▶ **Pathogenic protozoa such as *Giardia* and *Cryptosporidium***
- ▶ **Heterotrophic Plate Count bacteria (HPC)**
- ▶ **Off-flavor producing *Pseudomonads***
- ▶ **Coliform bacteria**
- ▶ **Algae and nematodes**

Even with protected water sources, microorganisms can enter and colonize process systems through a variety of means including:

- ▶ **Cracked transfer pipes, unsanitary valves, gaskets and fittings**
- ▶ **Faulty employee hygienic practice**
- ▶ **Contaminated carbon or sand beds**
- ▶ **Ineffective cleaning protocols**
- ▶ **Contaminated air or gas supplies**

The Solution

Microbial protection with LifeASSURE BW membrane filters

LifeASSURE BW membrane filter cartridges are used as final filters in bottled water and other beverage grade water protecting against the presence of pathogenic cysts like *Cryptosporidium* and *Giardia*, heterotrophic plate count bacteria (HPC), and other microorganisms. LifeASSURE BW BLA100 1.0 micron rated filters have been tested and certified by NSF International to Standard 53 for cyst reduction.

This standard was developed in conjunction with the bottled water industry to certify filter performance in removing



Tested and certified by NSF International against ANSI/NSF Standard 53 for the reduction of cysts and material requirements only

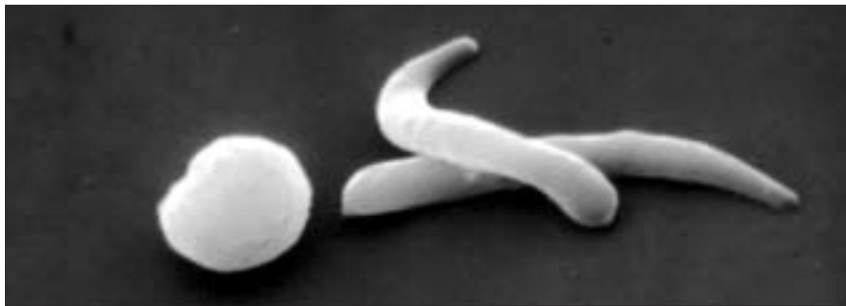


Figure 13 - SEM of *Cryptosporidium parvum*.

Cryptosporidium and *Giardia* cysts, and meets EPA and CDC recommendations. The BLA100 filter also provides excellent control of HPC bacteria, especially in comparison to competitive filters also rated at 1.0 micron, as indicated in Table 3. Furthermore, LifeASSURE BW filters are available in tighter retention ratings (0.2, 0.45, 0.65, and 0.8µm) for those bottlers who wish even greater microbiological control.

Even in tests with *Brevundimonas diminuta*, (considered one of the smallest bacteria) LifeASSURE BW BLA020 and BLA045 grade filters exhibited log reduction values (LRV) significantly higher than similarly rated filters.

Microbiological Control without Disinfection Byproducts

LifeASSURE BW filters are an effective means of providing microbiological control in water without the need for disinfection byproduct producing ozone. Ozone can generate unwanted disinfection byproducts such as bromate, leading the EPA to introduce regulations restricting the level of bromate in drinking water to <10µg/1 (10ppb).

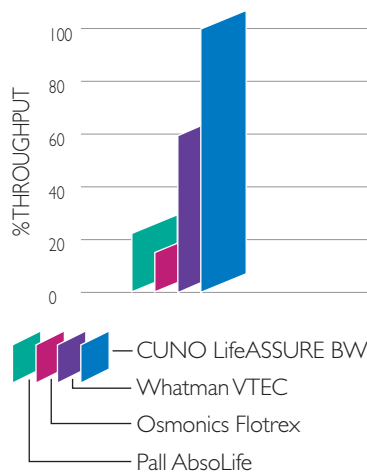
The International Bottled Water Association recommends membrane filtration as an option in providing microbiological control without the use of ozone, as part of a “multi-barrier” approach to water safety.

Optimized Service Life

As the data in Table 3 and Figure 14 demonstrate, LifeASSURE BW cartridges are designed to provide both enhanced service life without sacrificing filtrate quality or microorganism retention. A laboratory study was conducted to measure the relative service life of filters marketed as cyst reducing using a model contaminant (kaolin clay and anhydrous sodium pyrophosphate at 10 ppm) to induce plugging. Filters were tested side by side at a constant flow rate of 3 GPM. Filter service life was measured until a terminal differential pressure of 20 psid was observed.

As the data show, LifeASSURE BW filters lasted 56% longer than the nearest competitor, and nearly **four times longer** than the competitor with the least throughput.

Figure 14 - Throughput Comparison



“The EPA, CDC and NSF all recommend 1.0µm filtration to reduce the threat of cyst contamination.”

Table 3
LifeASSURE BW vs. Competitive Average LRV

Tests Conducted with <i>Pseudomonas fluorescens</i> Filter	Average LRV*
CUNO LifeASSURE BW BLA100	6.5
Osmonics Flowtrex™ GF	0.8
Whatman VTEC	1.5
Pall Absolife™	0.1
Tests Conducted with <i>Brevundimonas diminuta</i> Filter	Average LRV*
CUNO LifeASSURE BW BLA020	7.3
Millipore Milligard® CWSS	4.5
CUNO LifeASSURE BW BLA045	3.5
Millipore Milligard® CWSC	2.6

*LRV=log10 number of organisms in/number of organisms out
FlowTrex is a trademark of Osmonics, Incorporated. VTEC is a registered trademark of Whatman, plc.
Absolife is a trademark of Pall Corporation. Milligard is a registered trademark of Millipore Corporation.

The Importance of Prefiltration

In some circumstances, better process economies are achieved by installing less expensive prefilters before the final membrane filters. High inlet particle counts, broad particle distribution, and seasonal water upsets all favor the use of prefilters. Prefilters protect and extend the life of more expensive final filter, resulting in fewer change-outs.

The all-polypropylene **PolyNet** depth filter effectively protects final membrane filters with a unique construction featuring media flow distribution channels combined with fluid distribution netting to form multiple particle-trapping layers. The end result is a filter that provides superior service life and consistent protection. Even as differential pressure builds across the PolyNet filter, its efficiency remains constant, unlike alternative filters that tend to compress and unload previously trapped particles. This consistency provides reliable protection of downstream membrane filters. time after time. PolyNet filters are recommended in water applications exhibiting a relatively wide range of particles or in applications where the water source quality is variable.



Figure 15 - Advanced Pleat Technology

In consistent water sources with relatively narrow range of particles, **Betafine XL** pleated polypropylene surface filters are recommended. The Betafine XL filter delivers fast, per-cartridge flow rates combined with absolute retention of particulate. The filter employs Advanced Pleating Technology, APT, which maximizes *usable* filtration surface area. The staggered nature of the pleating allows the filter to trap larger particles at the periphery of the pleats and smaller ones toward the center. This limits media “blinding” that can result in short, or unpredictable filter life as experienced by competitive filters with standard pleat technology.

Alternative Filter Selections

SterASSURE 0.2 and 0.1 micron rated membrane filters are validated, sterilizing grade filters. The filters are validated for complete retention of *B. diminuta* (ATCC 19146) following American Society of Testing and Materials (ASTM) methodology at a minimum challenge level of 10⁷ CFU/cm² of filter area. SterASSURE filters incorporate a double layer of CUNO’s FlexN membrane for robust sterilizing filtration performance and exceptionally high throughput.

Sterile Air, Gas, and Tank Vents

Air and gas supplies that makes contact with product water should be 0.2 micron filtered to prevent bacterial contamination via vegetative organisms, or spores. The same filtration should be applied to the tank vent since evacuation of the tanks draws in potentially contaminated air from the bottling plant. CUNO Microfluor II filters are ideal for these applications. The validated, 0.2 micron rated filters employ hydrophobic PTFE membrane as a permanent barrier against microbiological contamination. Steam sterilizable and integrity testable by the user, Microfluor II filter cartridges deliver optimal air or gas service performance.

Table 4
Microbiological Control Application Guide

Application	Location on Pages 1&2	Recommended Filter	Recommended Housing	Filter Rating (µm)	Purpose	Refer to Page
Prefilter	3	PolyNet or BetaFine-XL	SD Series	3.0, 2.0 or 0.5	Protection of final membranes	16 17
Final Filter	4	LifeASSURE BW or SterASSURE	ZWC Series	0.2 or 1.0	Microorganism removal and pathogenic cysts	18
Air/Gas Filter	5	Microfluor II	ZMS/ZVS Series	0.2	Microorganism removal	19

Beta-Klean Filter Cartridges



Absolute rated Beta-Klean is a rigid, graded-porosity filter cartridge constructed of cellulose and glass microfibers, bound together with a chemically resistant thermosetting resin. Beta-Klean filters provide reliable, consistent entrapment of turbidity causing particles and organic debris. Beta-Klean cartridges are grooved to significantly increase surface area and greatly extend service life. Beta-Klean is manufactured to absolute ratings and tested to deliver quality, consistency and cost effective filtration performance.

The initial beta-ratio for all grades of Beta-Klean filter cartridges is equal to or greater than 1000. More important, each Beta-Klean cartridge performs at or above this initial value throughout its usable life, unlike many filters made of wound string or melt blown fiber which tend to unload particles and lose efficiency over time.

Beta-Klean Advantages

- ▶ **Absolute retention**—protection from contaminant at or larger than the specified size throughout the filter's life
- ▶ **Grooved surface**—provides long filter life and lower total filtration costs
- ▶ **Rigid structure**—retains contaminant even as differential pressure increases or upset conditions occur
- ▶ **Graded-porosity structure**—enhances contaminant loading capacity and increases service life
- ▶ **No cores or metal parts**—easy disposal, suitable for incineration or shredding

For more information, please ask for CUNO literature number [LITCBK002](#)

Table 5
Beta-Klean Selection Guide

Cartridge Type	Length	Grade-Micron Absolute	Surface	Packaging	Temperature Option	End Modification	Gasket/O-Ring
Beta-Klean	9 3/4"	10	Grooved	Standard	Standard	222 O-Ring & Spear	Silicone
	10"	20	Ungrooved	Shrink Wrap		222 O-Ring & Flat Cap	Fluorocarbon
	19 1/2"	30		Bulk Pack		None	EPR
	20"	40				Polypropylene	Nitrile
	29 1/4"	60				None	PE Foam
	30"					Core Extender	
	39"					Closed Cap with Spring	
40"				SS Core Extender			

Betapure Filter Cartridges



Betapure is an absolute rated depth filter providing excellent contaminant holding capacity to protect processing equipment. The rigid structure eliminates pore size changes, unloading and bypassing that are common with other filters used in the industry. Betapure utilizes state of the art fiber technology combined with innovative process technology to provide a clean, rigid filter structure with consistent and reproducible filtration characteristics. Betapure is constructed using long bicomponent fibers. When heated, the outer sheath melts first and a matrix of the fibers becomes permanently bonded in a three-dimensional network. This high degree of fiber-to-fiber bonding eliminates both the need for a core support and any possibility of media migration. The matrix is rigid and consistent.

For more information, please refer to CUNO literature number [LITCBP001](#)

Betapure Advantages

- ▶ Improves profitability by consistently meeting product specifications, and providing long, on-stream service life
- ▶ Contaminant will not unload or bypass into the final product; rigid non-deformable filter structure

Table 6
Betapure Selection Guide

Cartridge Type	Length	Grade-Micron Absolute	Media Option	End Modification	Gasket/O-Ring
Betapure	9 3/4	2	Polyolefin	Millipore	Silicone
	10	3		Code 7 Bayonet Lock	Fluorocarbon
	19 1/2	5		Code 8 Double O-Ring	EPR
	20	7		Double Open End w/Hard Cap	Nitrile
	29	10		10" Nom. Length	Polyethylene
	30	12		Double Open End w/Hard Cap	None
	39	15		9-3/4" Nom. Length	
	40	20		Code 3 Double O-Ring	
		30		Code 3 Single O-Ring	
		40		w/Polypropylene Snap Ring	
		70		Gelman Internal O-Ring	
		90		None	
		100			
		140			
	160				
	190				

Econo-Klean Filter Cartridges



Econo-Klean cartridges are the latest addition to a proven line of high performance rigid resin-bonded filters. Available with nominal removal ratings from 1 to 40 microns, the filter's resin-bonded structure provides consistent filtration efficiency. Unlike compressible string-wound and melt-blown filters, Econo-Klean filters will not deform under high differential pressure eliminating bypass and unloading of contaminants while providing long on-stream service life. Econo-Klean filters—the performance leader in cost effective filtration!

Rigid vs. Compressible Filters

By design, the rigid structure of Econo-Klean cartridges provide filtration characteristics that are far more consistent than other competitively priced compressible filters. The following filtration efficiency graph depicts typical consistency over the entire life of each type of filter cartridge.

Figure 16 clearly shows Econo-Klean rigid filter's ability to trap and hold 20 micron contaminants at the initial pressure through 10 psid. Despite a similar initial efficiency, melt-blown competitor "A" shows a tendency to bypass or unload in response to increased differential Pressure. Wound polypropylene competitor "B" exhibits an unacceptable filtration efficiency.

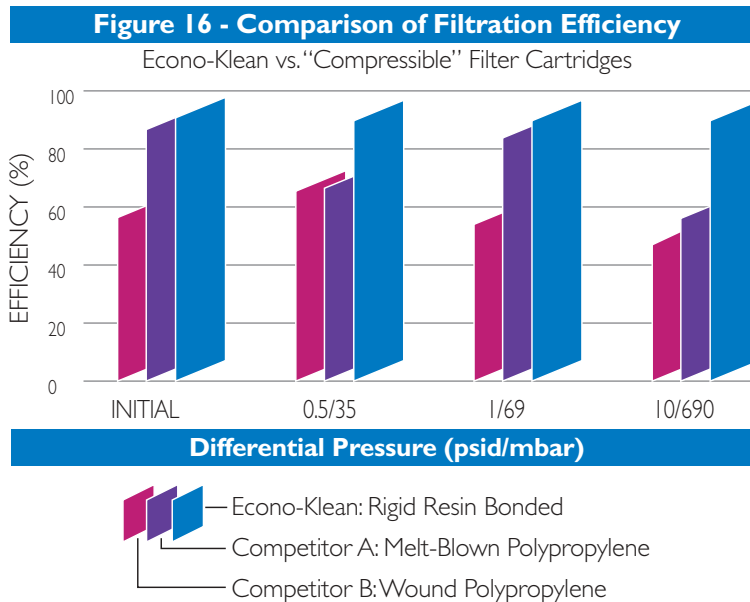


Table 7
Econo-Klean Selection Guide

Cartridge Type	Length*	Grade-Micron Nominal	End Modification	Gasket/O-Ring
Econo-Klean	9 3/4"	1	None	None
	10"	5	222 O-Ring & Spear	Polyethylene
	19 1/2"	10	222 O-Ring & Flat Cap	Silicone
	20"	20		Fluorocarbon
	29 1/4"	40		EPR
	30"			Nitrile
	39"			
	40"			

* Lengths are multiples of 9 3/4" or 10" depending upon end modification.

PolyNet Filter Cartridges



PolyNet filter elements, CUNO'S latest advance in polypropylene filtration technology, features a patented construction that combines a unique flow enhancing media with flow distribution layer. The resulting filter matrix is significantly less compressible than other melt-blown filters, uses the majority of filtration depth for contaminant removal, and exhibits an exceptionally long filter life—all while maintaining consistent Beta 1000 absolute-rated filtration performance!

PolyNet Advantages

- ▶ **Flow enhancing perforations in the media and a diffusion layer provide twice the life of competitive cartridges at equivalent ratings**
- ▶ **Rigid Polypropylene Structure eliminates bypass and unloading commonly associated with the compressible structure of melt-blown filters**
- ▶ **Filter change-out at up to 35 psid for total filtration cost savings**
- ▶ **Absolute Beta 1000 Rated Performance for consistent filtration quality**

The PolyNet cartridge manufacturing process is the first to result in a polypropylene melt-blown filter cartridge that is essentially non-compressible and exhibits the filtration benefits associated with a rigid depth filter structure. PolyNet filters eliminate the contaminant unloading and filter bypass under increasing differential pressure usually found with melt-blown structures without restricting flow or service life. To accomplish this, uniformly distributed perforations are cut from the media that forms about 2/3 the depth of the filter. Each layer is separated by a flow distribution layer that ensures the even distribution of fluid while enhancing uniform flow. The result is that larger contaminants can be removed by the inner media layers instead of just the filter surface, utilizing far more depth than typical melt-blown filters. The even distribution of contaminated fluid throughout as much as 85% of the depth of the cartridge utilizes far more of the available filter area than the typical melt-blown depth filter and is the key to longer filter life and lower pressure drops.

For more information please ask for CUNO literature number [LITCPN1](#)

**Table 8
PolyNet Cartridge Selection Guide**

Cartridge Type	Length*	Grade-Micron Absolute	Packaging Option	Support Ring Option	End Modification	Gasket/O-Ring
PolyNet	9 3/4"	0.5	Individual Poly Bag 1 High: 30/carton	None	226 O-Ring & Spear	Silicone
	10"	1		Polysulfone	222 O-Ring & Spear	Fluorocarbon
	19 1/2"	2	2-4 High: 15/carton	Stainless Steel	222 O-Ring & Flat Cap	EPR
	20"	3			None	Nitrile
	29 1/4"	5		Polypropylene Core Extender	Polyethylene	
	30"	10		SOE End Cap without Spring		
	39"	20		SOE End Cap with Spring		
	40"	30		Single O-Ring (40" length only)		
		40				
		50				
70						

* Lengths are multiples of 9 3/4" or 10" depending on an end modification.

Betafine-XL Filter Cartridges



Betafine-XL is a highly efficient, economical pleated polypropylene filter with large surface area. It is especially suited for filtration of low-viscosity solvents and water.

Betafine-XL Advantages

- ▶ Absolute rated filter media removes a broad range of contaminants
- ▶ Increases filter service life—high surface area pleated media
- ▶ Reduces filter time—high surface area, high flow capacity of the filter
- ▶ Meets the application requirements—chemically compatible polypropylene construction
- ▶ Increased profitability—minimizes downstream filtration costs and quality problems

For more information please ask for CUNO literature number [LITCBFXL](#)

Table 9
Betafine-XL Cartridge Selection Guide

Cartridge Type	Length	Grade-Micron Absolute	Media Option	End Modification	Gasket/O-Ring
Betafine-XL	9 3/4"	0.2	Polypropylene	226 O-Ring & Spear No Reinforcing Ring	Silicone
	10"	0.5		226 O-Ring & Spear Polysulfone Ring	Fluorocarbon
	19 1/2"	1.0		226 O-Ring & Spear Stainless Steel Ring	EPR
	20"	2.5		222 O-Ring & Spear No Reinforcing Ring	Nitrile
	29 1/4"	5.0		222 O-Ring & Spear Polysulfone Ring	Polyethylene
	30"	10		222 O-Ring & Spear Stainless Steel Ring	PTFE Encapsulated Viton
	39"	20		Double Open End (DOE)	
	40"	40		222 O-Ring & Flat Cap No Reinforcing Ring	
				222 O-Ring & Flat Cap Polysulfone Ring	
				222 O-Ring & Flat Cap Stainless Steel Ring	
				DOE with Polypropylene Core Extender	
				Single Open End (SOE)	
				70	SOE with Spring

LifeASSURE BW Filter Cartridges



LifeASSURE BW membrane filter cartridges are used as final filters in bottled water and other beverage grade water requiring high retention of *Cryptosporidium*, *Giardia*, heterotrophic plate count (HPC) bacteria, and other microorganisms. Encompassing two leading edge technologies, FlexN membrane manufacture and MaxMedia pleating construction, the LifeASSURE BW series of filters offers an unmatched combination of exceptionally high microorganism retention and long service life.

LifeASSURE BW BLA100 filters have been tested and certified by NSF International to Standard 53. This standard was developed in conjunction with the bottled water industry to certify filter performance in removing *Cryptosporidium* and *Giardia* cysts and meets EPA and CDC recommendations.

LifeASSURE BW filters are an effective means of providing microbiological control in water without the need for ozone. Ozone can generate unwanted disinfection by-products, such as bromate, leading the EPA to introduce regulations restricting the level of bromate in drinking water to <10 µg/L (10 ppb). The International Bottled Water Association (IBWA) recommends membrane filtration as an option in providing microbiological control, without the use of ozone, as part of a “multi-barrier” approach to water safety.

LifeASSURE BW Advantages

- ▶ Multi-zone, FlexN Nylon membrane for high HPC microorganism retention, extended service life with no disinfection by-products
- ▶ MaxMedia construction provides high membrane surface area for fast per-cartridge flow rates
- ▶ ANSI/NSF Standard 53 certified for reliable cyst reduction
- ▶ 100% integrity testing ensures proper installation and operation

For more information please ask for CUNO literature number [LITLABWINSF](#)

Table 10
LifeASSURE BW Cartridge Selection Guide

ANSI/NSF Standard 53 Certified Configuration

Cartridge Grade	Length	Grade-Micron Absolute	Configuration	End Modification	Gasket/O-Ring
LifeASSURE	10"	1.0	Pleated MaxMedia Configuration	226 O-Ring & Spear	Nitrile
	20"			222 O-Ring & Spear	
	30"			222 O-Ring & Flat Cap	
	40"			226 O-Ring & Flat Cap	
Cartridge Grade	Length	Grade-Micron Absolute	Configuration	End Modification	Gasket/ O-Ring
LifeASSURE	10"	0.20	Pleated MaxMedia Configuration	226 O-Ring & Spear	Silicone
	20"	0.45		222 O-Ring & Spear	Fluorocarbon
	30"	0.65		Double Open End (10")	EPR
	40"	0.80		Double Open End (9 3/4")	Nitrile
				222 O-Ring & Flat Cap	Clear Silicone*
				226 O-Ring & Flat Cap	

*O-Ring only

Microfluor II Filter Cartridges



Microfluor II PTFE membrane filters offer the ultimate in microorganism retention for air and gas streams without sacrificing air flow capacity. For critical applications where sterilization of air and gas streams or aggressive liquids is required, Microfluor II is validated for complete retention of *B. diminuta* based on *liquid* challenge following American Society of Testing and Materials (ASTM) methodology at a minimum challenge level of 10^7 CFU/cm² of filter area. In addition, Microfluor II filters are validated for retention of Phi X-174 bacteriophage based on aerosol testing.

Microfluor II membrane filters provide reliable sterilizing performance and extremely high air flow rates. High airflow per filter assembly ensures the most economical and highest performing solution possible for tank vent filtration and fermentation air sterilization possible. Microfluor II filters employ a patent pending construction consisting of PTFE membrane and specially selected polypropylene support layers that combined provide higher airflow rates than competitive PTFE membrane filters.

Cartridge and Capsule Configurations to Meet Any Process Requirement

Microfluor II membrane filters are available in 5 to 40-inch cartridges, 2.5 and 5-inch Mini Cartridges and 2.5, 5, 10, 20 and 30-inch capsules. With the exceptionally high Microfluor II flow rates, smaller and more economical assemblies can provide the same airflow as larger, more-costly competitive PTFE filters.

Microfluor II Applications

Microfluor II filters are optimized for applications requiring air or gas flow. The hydrophobic PTFE filter membrane prevents wetting with aqueous liquids or moisture that can block free airflow. Some applications, however, may require filtration of aggressive fluids such as acids or bases. Depending on compatibility, Microfluor II can be used to provide sterile filtration of these fluids by prewetting the membrane with a low surface tension fluid such as alcohol. Applications include sterile:

- ▶ Venting of process tanks
- ▶ Filtration of process air and aseptic filling lines
- ▶ Filtration for lyophilizer vacuum breaks
- ▶ Filtration for autoclave vents
- ▶ Filtration of fermentation inlet and exhaust air
- ▶ Filtration of aggressive liquids

For more information please ask for CUNO literature number [LITCMR2](#)

Table 11
Microfluor II Selection Guide

Cartridge Type	Length	Grade-Micron Absolute	End Modification	Gasket/O-Ring
Microfluor II	10"	0.20	226 O-Ring & Spear	Silicone
	20"		222 O-Ring & Spear	Fluorocarbon
	30"		222 O-Ring & Flat Cap	EPR
	40"		226 O-Ring & Flat Cap	Nitrile
	50"			

Express Series Filter Housings



The Express Series (ES) filter housings are ASME code vessels constructed from carbon steel, 304L or 316L stainless steel and are available in a broad range of sizes to match virtually any process flow requirement. ES housings have a heavy duty cover lifting device and swing bolt cover fasteners to facilitate easy cover removal and cartridge change-out.

Express Series Advantages

- ▶ The ASME Code design meets plant safety requirements
- ▶ Durable construction for long service life
- ▶ Easy access for filter removal as well as swing bolts and cover lifting device allow for rapid cartridge change-outs
- ▶ The flexible housing design accepts a wide range of filter cartridges.
- ▶ Fewer parts to clean means easy maintenance and clean-up

For more information please ask for CUNO literature number [LITCHSES1](#)

Table 12
Express Series Filter Housing General Specifications

Model	Construction Material	Standard Flange Size
ES08	Carbon Steel,	2"
ES12	304L Stainless Steel, or	3"
ES14	316L Stainless Steel	4"
ES16		4"
ES20		6"
ES24		6"
ES30		8"
ES36		10"

Table 13
Express Series Filter Housing Selection Guide

Housing Model	Housing Diameter	Construction Material	Pressure Rating	Gasket Materials	Outlet Location
For Standard Cartridges					
ES	8	Carbon Steel, 304L Stainless, or 316L Stainless	150 psi or 300 psi	Nitrile, EPR, Viton, or PTFE Encapsulated Viton	Bottom,
	12				Side 90°,
	14				Side 180°, or
	16				Side 270°
	20				
	24				
	30				
	36				
Express Series Options					
Cover Lifting Device Location		Radiography	Surface Finish		
Side 90°		Full, Spot, or None	Painted (Carbon Steel)		
Side 180° or			Grit Blast, or		
Side 270°			Pickle & Passivate		

DC & SD Housings



The DC and SD range of stainless steel filter housings provide filtration up to 400 GPM. Both DC and SD housings have a simple band clamp closure design for easy and rapid replacement of filter cartridges. The DC line is offered in 304L stainless steel and accepts double-open-end (DOE) style filter cartridges. The SD line is offered in 316L stainless steel and can accept both DOE and, with the addition of an optional pressure plate, double O-Ring, single open end (SOE) cartridges as well.

DC and SD Advantages

- ▶ Quick and easy cartridge change out with a single band clamp closure
- ▶ Easy maintenance and cleanup with fewer parts to clean
- ▶ Flexible use of either DOE or SOE filter cartridges (SD model only)
- ▶ Excellent durability and service life provided by the all stainless steel construction

For more information please ask for CUNO literature numbers [LITHSDC1](#) and [LITHSSD1](#)

Table 14
DC & SD Housing Selection Guide

Model	Material/Closure	Cartridge Style	Number of Filters	Cartridge Length	Maximum Flow Rate
DC	304L SS, Clamp	DOE	4, 5, 12, or 22	9 3/4" to 40"	Up to 400 GPM (1514 LPM)
SD	316L SS, Clamp	222 O-Ring or DOE	5, 12, or 22	9 3/4" to 40"	Up to 400 GPM (1514 LPM)

ZWB & ZWC Housings



The ZWC and ZWB series of filter housings are constructed from mirror polished 316L stainless steel. The ZWC version utilizes a clamp closure rated to 75 psi, while the ZWB version utilizes a bolt closure that is rated for service up to 150 psi. Both housing styles accept single open end filter cartridges with 226 O-Ring "bayonet locking" adapters (CUNO's 70002 or "B" style filter connection).

ZWB and ZWC Advantages

- ▶ Sanitary design construction with sanitary connections
- ▶ Rapid cartridge change outs with the easy to use closure clamp or bolts
- ▶ Mirror polished, 316L stainless steel surface limits microbial adhesion

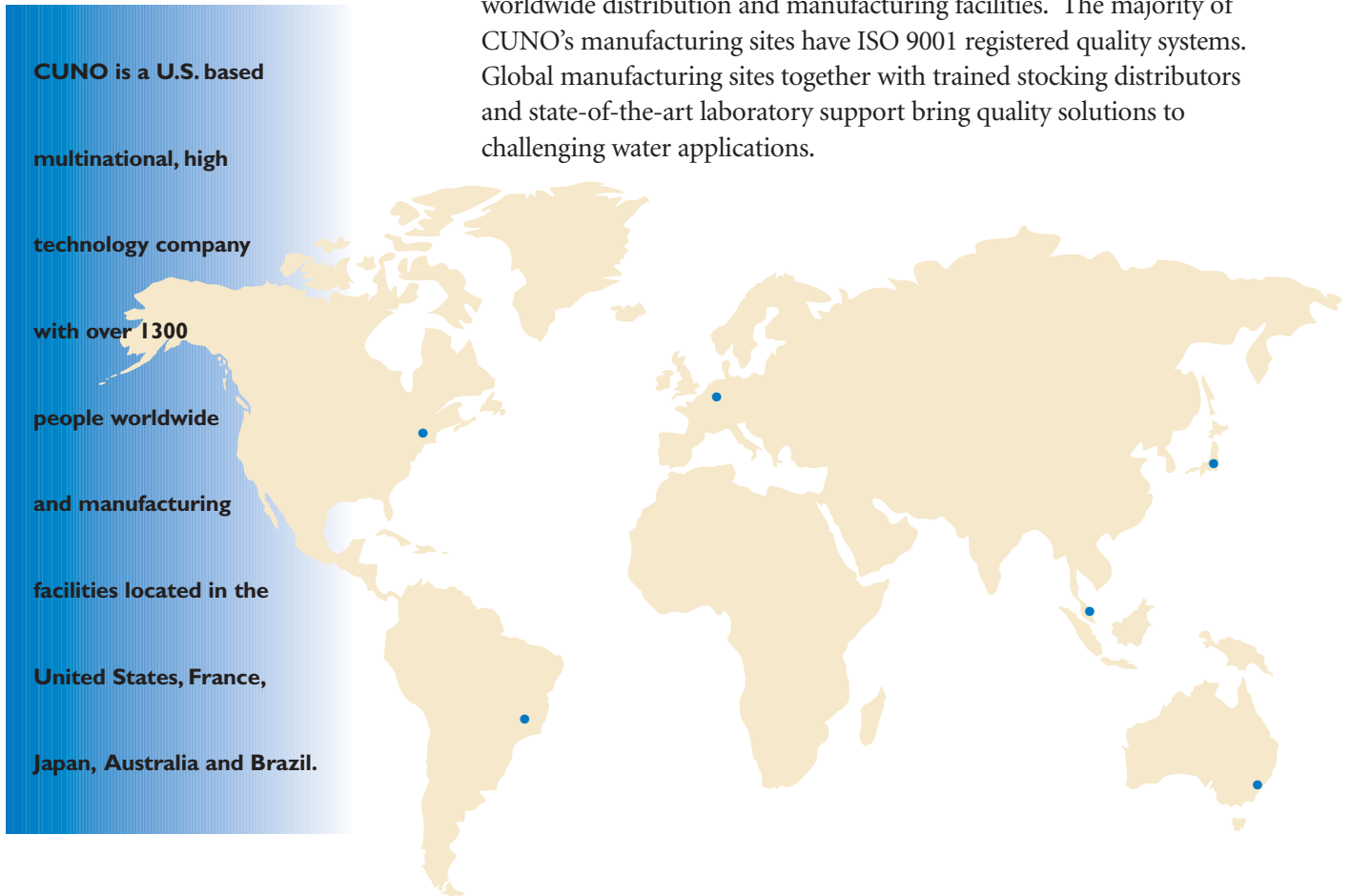
For more information please ask for CUNO literature number [LITZRH106](#)

Table 15
ZWB & ZWC Selection Guide

Model	Material/Closure	Cartridge Style	Number of Filters	Cartridge Length	Maximum Flow Rate
ZWB	316L SS, Bolt	226 O-Ring	4, 8, 11, or 21	10" to 40"	360 GPM (1363 LPM)
ZWC	316L SS, Clamp	226 O-Ring	4, 8, 11, or 21	10" to 40"	360 GPM (1363 LPM)

CUNO ... A World Leader In Fluid Purification

CUNO is a U.S. based multinational, high technology company with worldwide distribution and manufacturing facilities. The majority of CUNO's manufacturing sites have ISO 9001 registered quality systems. Global manufacturing sites together with trained stocking distributors and state-of-the-art laboratory support bring quality solutions to challenging water applications.



CUNO Engineered Filtration Solutions

CUNO is a world class manufacturer of innovative filtration products with engineers, scientists, and filtration specialists serving customers' needs worldwide. A dedicated staff of market specialists provides engineered filtration solutions to accommodate a wide range of contamination control problems.

CUNO is renowned for its technical expertise and continues to invest aggressively in research and development, expand laboratory facilities, and develop pilot plant capabilities. Pursuit of innovation has yielded advances in filtration technology and resulted in a multitude of engineered contamination control solutions for a variety of applications.

Such innovation is responsible for the development of many filtration products for wide range of applications. These products dramatically improve process fluid purity, enabling customers to achieve increased process efficiency, process protection, and reduced manufacturing costs.

CUNO Incorporated - Over 90 Years of Solutions

When looking for bottled water processing filtration solutions, the industry has turned to CUNO for performance. CUNO has achieved a leadership position by striving to be the best supplier of high quality products designed to provide cost effective solutions.

Some filter manufacturers offer a limited range or a single filter option. CUNO, however, understands that each application is unique and there is always an alternative. CUNO has both the experience and the breadth of products to provide quality improvements and dramatic cost savings for the customer.

Scientific Applications Support Services (SASS)



The cornerstone of CUNO's philosophy is service to customers, not only in product quality and prompt delivery, but also in validation, application support and in the sharing of scientific information.

CUNO's Scientific Applications Support Services works closely with customers to solve difficult filtration challenges and to recommend the most efficient, economical filter systems. SASS specialists can perform on-site testing and utilize filtration applications expertise to partner with customers.

CUNO resolves filtration problems promptly and efficiently in a cost-effective, confidential manner with a commercial support group consisting of CUNO's in-house customer service staff, application specialists, and engineering services. CUNO's broad distributor base and sales offices provide worldwide customer service, local inventory, and field support in virtually every major center of manufacturing.

Quality Management & ISO Standards



CUNO has maintained its leadership in fluid filtration and purification by continually providing superior products and technical support. CUNO filtration systems are designed and manufactured to the most stringent industry standards to assure the reliability of CUNO systems that our customers have come to expect.

CUNO has established a global quality management program which encompasses all facets of its operations. An essential part of the CUNO program is the creation of multi-function teams whose combined expertise is devoted to continuous improvement of processes, procedures, and quality systems. In addition, the CUNO system ensures the active support and participation of senior management. CUNO is fully committed to the tenets of the quality management program and provides a support system for the quality process. The majority of CUNO manufacturing plants have ISO 9001 registered quality systems. At CUNO, Quality is defined by the never-ending pursuit for continuous improvement in products, services, and personnel.



■ **Performance**
High Performance Filter
Systems Provide Optimal
Process Economies

■ **Convenience**
Easy-to-Use Systems
Deliver Low Labor Costs
and Minimum Downtime

■ **Quality**
Worldwide, State-of-the-Art,
Manufacturing Facilities
Ensure Consistent Quality
Filter Products

Fluid Purification

Service Worldwide

CUNO Incorporated

400 Research Parkway
Meriden, CT 06450, U.S.A.
203/237-5541
800/243-6894
Fax 203/238-8977 & 203/238-8716

CUNO Pacific Pty., Ltd.
140 Sunnholt Road
Blacktown, N.S.W. 2148 Australia

**CUNO Filtration
Asia Pte. Ltd.**
18 Tuas Link I (3rd Floor)
Singapore 638597

CUNO K.K.
Hodogaya Station Building 6F
1 - 7 Iwai-cho, Hodogaya-Ku
Yokohama 240 Japan

CUNO Latina Ltda
Rua Amf do Brasil 251
18120 Mairinque - Sp
Brazil

CUNO Limited
21 Woking Business Park
Albert Drive
Woking Surrey
GU21 5JY
United Kingdom

Visit us @ www.cuno.com

Your Local CUNO Distributor: