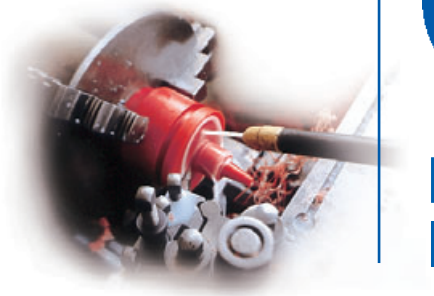


Culligan®

FILTRATION FOR INDUSTRIAL APPLICATION

CULLIGAN: WORLD LEADER IN THE WATER TREATMENT

CE *Equipment according to CE Directives in force*

Culligan: a specific water, from the experts

Filtration Process

Filtration is the process of removing **turbidity** from water, both coarse as well as colloidal, adsorbing undesired odours, taste and colours and organic pollutant (antiparasitics, solvents, cyanotoxins), eliminating **Iron**, **Manganese, Arsenic** and other heavy metals (such as Chromium, Aluminium, Nichel, etc.) or neutralising the water acidity.
All these results can be achieved with a proper filtration treatment that in many cases is preceded by a pre-oxidation and chemical conditioning equipment. Filtration makes possible to remove **Ammonia** by means of nitrification.
Simple in appearance, filtration is in reality a sophisticated water treatment process available. It does not always correlated to precise chemical reactions but, in many instances, it is connected to mechanical and biological reactions, not always easily explainable.

A few examples of turbidity expressed as Nephelometric Turbidity Units. The Filtr-Cleer process of filtration makes possible the reduction of the water turbidity to below 4 NTU (0.4 NTU for OFSY).

CULLIGAN FILTERS

Our industrial filters are entirely manufactured in our Culligan plants. They are made of steel and are protected by **anti-corrosion coatings**, a heavy layer of food-grade epoxy resin on the inside, and synthetic paint on the outside.
The smaller Hi-Flo 22 Filters are manufactured in FRP fiberglass, with internal protection achieved with a non-toxic polyethylene liner.
On the industrial filters, the **automatic cycles** of service and backwash are regulated by a group of diaphragm hydraulic valves driven by an hydraulic pilot that, in turn, is controlled by an electronic logic programmer. Hi-Flo 22 Filters are controlled by a hydraulic piston valve. Starting time, duration and frequency of backwashes can be programmed on the logic programmer. The flow rate control of all the service and backwash phases is performed by **automatic flow rate controllers**, which prevent leakage of the minerals during the backwash and optimise filter efficiency during service.

→ Models: Hi-Flo 22, Hi-Flo 6 and Hi-Flo 9.

The filters of the Hi-Flo 6 and Hi-Flo 9 series can be combined in modules achieving filtration systems of greater capacity (see later “Twin System” or “ Four-leaf Clover System”); they can also be combined as double filtration in series, making Culligan’s exclusive “Omnifiltration” system.

FILTERING MINERALS

A **complete range of filtering minerals** can be selected for all types of Culligan filter, achieving the best solution for each problem. The more common **versions** are:

• FILTR-CLEER, a multi-layer filter whose typical application is the elimination of **turbidity,** suspended solids and of small quantities of **heavy metals** (particularly Iron and Manganese). The minerals utilised in the filter bed are Cullcite, a granular anthracite with a low density that makes the upper layer, and Cullsan, an ultra-pure silica sand with no carbonates, chemically inert and with a unlimited life.

• CULLAR typical applications are removal of undesired **odours** and **tastes** and excess **Chlorine** and its derivatives. Cullar is a granular form of activated carbon with high degree of porosity, giving it an extraordinary adsorbing capacity.

• CULLNEU typical applications are **remineralisation** of water with low mineral content and **neutralisation** of acid water, inhibiting water aggressiveness toward metal piping. Cullneu is a granular Calcium Carbonate mineral that dissolves in proportion to the amount of neutralised acidity and must therefore be refilled periodically.

• SUPER IRON, a multi-layer filter using a selective mineral for **Iron** and **Manganese** removal. Super Iron can be activated with many oxidising agents.

• G.A.C., granular activated carbon, a specific adsorbent for organohalogenated compounds, antiparasitics, heavy metals and other substances harmful to health.

• BIOFILTER, a special filter for removing Ammonia, where the main function of the quartz filter media is to support the nitrification biomass, consisting in two strains of aerobic bacteria. Nitrosomonas converts ammoniacal Nitrogen to nitrous Nitrogen, while the nitrobacter completes the oxidation to nitric, transforming Ammonia ultimately into Nitrate. The biofilter is also able to oxidise and remove appreciable concentrations of Iron and Manganese when present in the water.

MULTI-LAYER FILTRATION

Filtration made with the traditional "single layer" filters has three limitations: only the upper part of the mineral layer "works" trapping the turbidity, while the lower layers remain idle; the resistance opposed to the water flow (pressure loss) increases very rapidly, making frequent backwashes necessary. Flow rates have to be decreased in order to maintain quality.

The most recent "multi-layer" filters allow selective turbidity removal within the filtering layers. Layers have different thicknesses and are made of minerals with different mesh and specific weight.

This technology allows a higher filtration speed (if necessary) and very low usage of coagulants. **Multi-layer filtration** was developed and perfected by Culligan and its most common application is in "Filtr-Cleer" filters and in "Omnifiltration" system.

OMNIFILTRATION® SYSTEM AND OFSY FILTERING GROUPS

While "multi-layer filtration" performed by Filtr-Cleer captures very large quantity of turbidity with limited pressure losses, it does not prevent the leakage of small turbidity particles that escape from the granules before maximum adsorbing capacity of filtering beds is reached. In order to solve this problem, Culligan has developed the "Omnifiltration" system, made of two filtering sections of "Filtr-Cleer" placed in series: the first works until complete saturation of the mineral is achieved and the second buffers any turbidity leakage, guaranteeing output of constantly crystal-clear water, even if the quality of the inlet water changes.
Some of the most appreciated features of the OMNIFILTRATION system (OFSY) are:
low installation and operation costs, smaller size, high versatility, simple and quick start-up procedure, as well as excellent quality of water produced.
The OFSY system is by far superior to any other conventional filtration method. OFSY is in operation in hundreds of waterworks around the world.

Culligan equipment: a guarantee for quality and efficiency

HI-FLO 22

Fully automatic filters, controlled by a hydraulic piston valve which directs water during service and backwash phases. They are manufactured in FRP fiberglass, with internal protection achieved with a non-toxic polyethylene liner.
→ Available in different versions: see models in the Technical Specifications.

HI-FLO 6

Filters suitable for industrial applications. Differing from the Hi-Flo 9 in that they have lower filtering bed thickness (and therefore total height). They are recommended for treatment of water without specific characteristics.
→ Available in different versions: see models in the Technical Specifications.

BIOFILTER

A special filter, recommended for Ammonia removal.
→ Available in BF version, models from 48" to 120".

HI-FLO 9

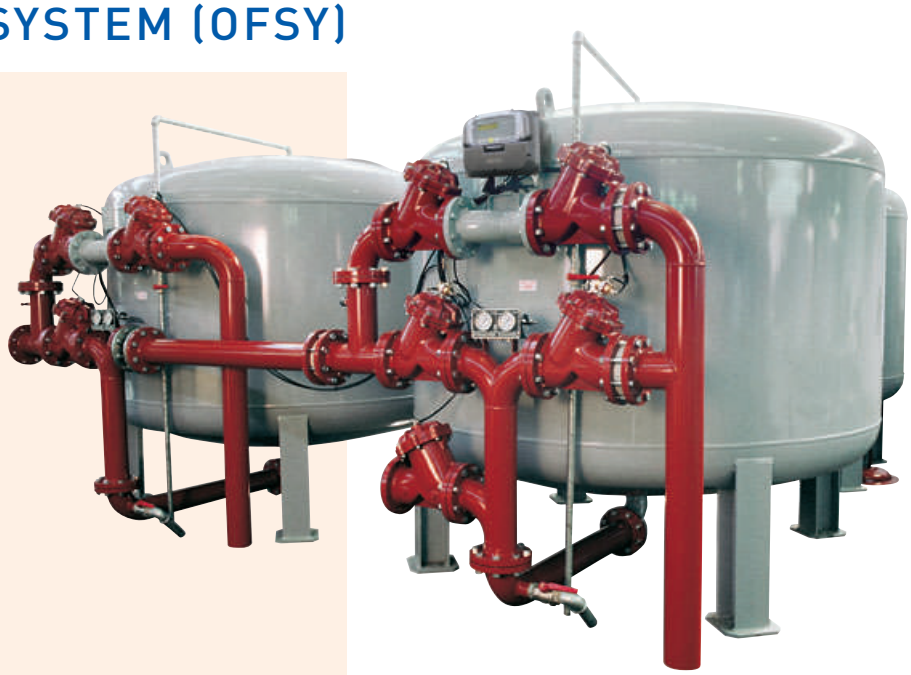
Industrial filters suitable for commercial and industrial applications. Available models from 20" to 120" (20" to 48" range features Noryl valves and non toxic piping).
The tank is protected by a layer of food-grade epoxy resin inside and by synthetic paint outside.
→ Available in different versions: see models in the Technical Specifications.

"TWIN" CONFIGURATION

The picture shows two Hi-Flo 9 filters in TWIN configuration characterised by a single group of valves that controls both filters.
The advantage of this configuration is that the flow rates for service as well for backwash are the same. Backwash occurs
in sequence one filter after the other, thus saving on plumbing and pumping costs.

OMNIFILTRATION SYSTEM (OFSY)

The versatility and adaptability of the Omnifiltration (OFSY) is certified by hundreds of systems installed in waterworks plants around the world, with a wide range of flow rates.
The Omnifiltration System has acquired a well deserved reputation thanks to its excellent performance, both from an economical and quality point of view.



"FOUR-LEAF CLOVER" CONFIGURATION

This system is made of four filters assembled in a "clover" configuration, controlled by a single centralised group of valves. The compactness of the system is clear. The modular design of the system makes it possible to be very flexible whenever capacity increases are necessary, or when stand-by equipment is mandatory.

Technical Specifications

BIOFILTER

MODEL	FLOW RATE m³/h			
	Service		Backwash	
	min.	max	with air	with water
BIOFILTER (ammonia - iron - manganese)				
BF 48	8.5	17	72	36
BF 60	13	26	108	54
BF 72	19	38	160	80
BF 84	26	52	216	108
BF 90	31	62	252	126
BF 100	36	72	288	144
BF 120	53	106	432	216

HI-FLO 9

MODEL	FLOW RATE m³/h		
	Service		Backwash
	min.	max	
HI-FLO 9 filtr-cleer (turbidity - iron - manganese)			
UF 20	2	4.7	7.9
UF 24	2.8	6.7	10.9
UF 30	4.5	11	15.9
UF 36	7	17	27.3
UF 48	11	27	40.9
UF 54	18	37	56
UF 60	17	42	61.3
UF 72	25	60	90.8
UF 84	32	80	129.4
UF 90	36	86	147.7
UF 100	49	117	174.9
UFe 100	49	117	174.9
UF 120	70	170	250
UF 400	195	470	700
UF 480	280	670	1000
HI-FLO 9 cullar (taste - odours - colours - micropollutants)			
UR 20	1.2	4.7	3.4
UR 24	2.8	6.7	4.5
UR 30	4.5	11	6.8
UR 36	7	17	10.9
UR 48	11	27	18.2
UR 54	18	37	25
UR 60	17	42	27.3
UR 72	25	60	40.9
UR 84	32	80	52.2
UR 90	36	86	61.8
UR 100	49	117	79.5
UR 120	70	170	114
UR 400	195	470	320
UR 480	280	670	480
HI-FLO 9 cullneu (acidity)			
UU 20	-	3	7.9
UU 24	-	4.5	10.9
UU 30	-	7	15.9
UU 36	-	11	27.3
UU 48	-	18	40.9
UU 54	-	25	56
HI-FLO 9 super-iron (iron - manganese - arsenic)			
UFP 20	1.5	3	7.9
UFP 24	2.2	4.5	10.9
UFP 30	3.5	7	15.9
UFP 36	5.5	11	27.3
UFP 48	9	18	40.9
UFP 54	12	25	56
UFP 60	14	28	61.3
UFP 72	20	40	90.8
UFP 84	25	52	129.4
UFP 90	29	58	147.7
UFP 100	39	79	174.9
UFPe 100	39	79	174.9
UFP 120	56	112	250

For filtration and Iron removal only
Minimum flow rate is recommended for turbid water and for the removal of high concentration of suspended solids (> 4 mg/l in total). Average flow rate is recommended for water of average turbidity and for the removal of average concentration of suspended solids (1-4 mg/l in total). Maximum flow rate is recommended for water with low turbidity and for the removal of low concentration of suspended solids (< 1 mg/l in total).
Note: Hi-Flo 9 filters from 20" to 48" have Noryl valves.

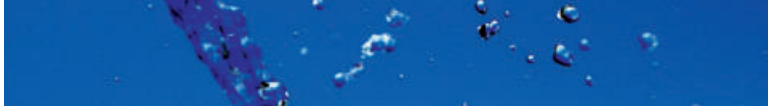
HI-FLO 22

MODEL	FLOW RATE m³/h		
	Service		Backwash
	average	max	
HI-FLO 22 filtr-cleer (turbidity - iron - manganese)			
UF 12	1.8	2.5	2.3
UF 14	2.5	2.9	3.4
UF 16	2.5	3.4	4.5
UF 21	3.2	5	6.8
HI-FLO 22 cullar (taste - odours - colours - micropollutants)			
UR 12	0.9	2.5	1.8
UR 14	1.1	2.9	2.3
UR 16	1.6	3.4	3.4
UR 21	2.5	5	5.7
HI-FLO 22 cullsorb (iron - manganese - arsenic)			
UFP 12	1.1	1.8	1.8
UFP 14	1.1	2.1	3.4
UFP 16	1.8	2.5	3.4
UFP 21	2.5	3	6.8

HI-FLO 6

MODEL	FLOW RATE m³/h		
	Service		Backwash
	min.	max	
HI-FLO 6 filtr-cleer (turbidity - iron - manganese)			
UF 60	21.7	36.2	61.3
UF 72	31.2	52	90.8
UF 84	42.2	70.4	129.4
UF 90	49	81.6	147.7
UF 100	60.7	101.2	174.9
UFe 100	60.7	101.2	174.9
UF 120	87	145	250
UF 400	242.8	404	700
UF 480	348	580	1000
HI-FLO 6 cullar (taste - odours - colours - micropollutants)			
UR 60	21.7	36.2	27.3
UR 72	31.2	52	40.9
UR 84	42.2	70.4	52.2
UR 90	49	81.6	65
UR 100	60.7	101.2	79.5
UR 120	87	145	114
UR 400	242.8	404	320
UR 480	348	580	480
HI-FLO 6 cullneu (acidity)			
UU 60	-	22.7	61.3
UU 72	-	32.7	90.8
UU 84	-	40.9	129.4
UU 90	-	47	147.7
UU 100	-	59	174.9
UUe 100	-	59	174.9
UU 120	-	80	250
HI-FLO 6 super-iron (iron - manganese - arsenic)			
UFP 60	15.9	28	61.3
UFP 72	27.3	40	90.8
UFP 84	36.3	52	129.4
UFP 90	42.3	58	147.7
UFP 100	52.2	79	174.9
UFPe 100	52.2	79	174.9
UFP 120	73.5	112	250

Hi-Flo 6 Filtr-Cleer filtration is intended to remove natural turbidity in general (for the specific removal of metals such as Iron, Manganese, etc. please refer to Hi-Flo 9). In case of colloidal substances, coagulant agents must be added. For Cullar models, the minimum flow rate is recommended for the removal of organic matter and micropollutants and for the dechlorination of water in continuous treatment (waterworks, etc.). The maximum flow rate is recommended for the removal of low contents of residual Chlorine (< 2 mg/l).



HI-FLO 6 TWIN

MODEL	FLOW RATE m³/h		
	Service		Backwash
	min.	max	
HI-FLO 6 TWIN filtr-cleer (turbidity - iron - manganese)			
UF 248	24.5	41	41
UF 260	43.4	72.4	61.8
UF 272	62.4	104	90.8
UF 284	84.4	140.8	129.4
UF 290	98	163.8	150
UF 2100	121.4	202.4	174.9
UF 2120	174	290	250
HI-FLO 6 TWIN cullar (taste - odours - colours - micropollutants)			
UR 248	24.5	41	21
UR 260	43.4	72.4	29
UR 272	62.4	104	40.9
UR 284	84.4	140.8	52.2
UR 290	98	163.2	68
UR 2100	121.4	202.4	79.5
UR 2120	174	290	114
HI-FLO 6 TWIN super-iron (iron - manganese - arsenic)			
UFP 248	20.5	36	41
UFP 260	31.6	56	61.8
UFP 272	54.6	80	90.8
UFP 284	72.6	104	129.4
UFP 290	84.6	116	150
UFP 2100	104.4	158	174.9
UFP 2120	147	224	250

Hi-Flo 6 Twin Filtr-Cleer filtration is intended to remove natural turbidity in general (for the specific removal of metals such as Iron, Manganese, etc. please refer to Hi-Flo 9 Twin).
In case of colloidal substances, coagulant agents must be added.

G.A.C.

MODEL	FLOW RATE m³/h		
	Service		Backwash
	min.	max	
G.A.C. 20	1.2	3	3.4
G.A.C. 24	1.7	4.5	4.5
G.A.C. 30	2.6	7	7
G.A.C. 36	3.8	10.8	11
G.A.C. 48	6.8	18	18
G.A.C. 60	10.5	27	28
G.A.C. 72	15.2	40	41
G.A.C. 84	20.7	54	55
G.A.C. 100	29.4	80	80
G.A.C. 120	42.5	108	113

HI-FLO 9 TWIN

MODEL	FLOW RATE m³/h		
	Service		Backwash
	min.	max	
HI-FLO 9 TWIN filtr-cleer (turbidity - iron - manganese)			
UF 260	43.4	72.4	61.9
UF 272	62.4	104	90.8
UF 284	84.4	140.8	129.4
UF 290	98	163.2	150
UF 2100	121.4	202.4	174.9
UF 2120	174	290	250
HI-FLO 9 TWIN cullar (taste - odours - colours - micropollutants)			
UR 260	43.4	72.4	29
UR 272	62.4	104	40.9
UR 284	84.4	140.8	52.2
UR 290	98	163.2	61.2
UR 2100	121.4	202.4	79.5
UR 2120	174	290	114
HI-FLO 9 TWIN super-iron (iron - manganese - arsenic)			
UFP 260	31.6	56	61.9
UFP 272	54.6	80	90.8
UFP 284	72.6	104	129.4
UFP 290	84.6	116	150
UFP 2100	104.4	158	174.9
UFP 2120	147	224	250

OFSY

MODEL	FLOW RATE m³/h	
	Service - max	Backwash
OFSY 20	4.5	7.9
OFSY 24	5.7	10.9
OFSY 30	9.1	15.9
OFSY 36	13.6	27.3
OFSY 48	21.8	40.9
OFSY 60	36.3	61.3
OFSY 72	50	90.8
OFSY 84	68.1	129.4
OFSY 100	100	174.9
OFSY 120	139	250
OFSY 400	400	700
OFSY 480	556	1000

OPERATING DATA

	HI-FLO 22	HI-FLO 6 / HI-FLO 9 / G.A.C. / TWIN / OFSY
Minimum Operating Pressure	2 bar	1.5 bar
Maximum Operating Pressure	7 bar	7 bar up to model 60" 5 bar from model 72"to 120"
Operating Temperature	4-48 °C	5-40 °C
Power Supply	24/230 V – 50-60 Hz Single-phase + earth	24/230 V – 50-60 Hz Single-phase + earth
Installed Power	10 W	10 W

Some References

(for medium/high flow rate)

		→ flow rate	
→ OIL REFINERY INDUSTRIES			
Process Water Filtration			
AGIP PETROLI SpA	Rome, Italy	320	m³/d
AL FURAT	Syria	340	m³/d
B.P. SOLAR	Spain	800	m³/d
DANIELI SpA	Yazd-Iran	50.000	m³/d
MOBIL OIL	Egypt	2.300	m³/d
→ MUNICIPALITIES			
Surface Water Filtration			
AGAC	Reggio Emilia, Italy	42.000	m³/d
VELIA CONSORTIUM, ALENTO BASIN	Salerno, Italy	100.000	m³/d
FORNOVO DI TARO WATERWORKS	Parma, Italy	1.500	m³/d
CASTELPOLE WATERWORKS	Ireland	5.400	m³/d
BOG OF THE RING	Ireland	5.000	m³/d
BUK WATERWORK	Hungary	4.000	m³/d
EGER	Hungary	18.000	m³/d
ASHGABAT WATERWORKS	Turkmenistan	350.000	m³/d
CASTEL GANDOLFO WATERWORKS	Rome, Italy	6.000	m³/d
SULMONA WATERWORKS	L'Aquila, Italy	3.600	m³/d
VALPOVO WATERWORKS	Croatia	5.200	m³/d
ROLLE WATERWORKS	Switzerland	5.100	m³/d
BYGDOSZ WATERWORKS	Poland	40.800	m³/d
ELBLAG WATERWORKS	Poland	50.000	m³/d
RAWA MAZOWIECKA WATERWORKS	Poland	12.000	m³/d
SUWALKI WATERWORKS	Poland	16.000	m³/d
RADOM WATERWORKS	Poland	23.000	m³/d
→ STEAM BOILER FEED			
FATRO FARMACEUTICI SpA	Ozzano E., Bologna, Italy	40	m³/d
TURBOTECNICA SpA	Florence, Italy	240	m³/d
DANIELI SpA	Buttrio, Udine, Italy	15.600	m³/d
BORMIOLI ROCCO CASA	Fidenza, Parma, Italy	350	m³/d
→ SPECIAL APPLICATIONS			
MUNICIPAL WATERWORKS Arsenic Removal **(see picture 3)**	Subotica, Serbia	24.000	m³/d
MUNICIPAL WATERWORKS Arsenic Removal	Canneto s/Oglio, Mantova, Italy	1.500	m³/d
MUNICIPAL WATERWORKS Chrome Removal	Lumezzane, Brescia, Italy	1.400	m³/d
MUNICIPAL WATERWORKS Iron and Manganese Removal	Quercioli, Reggio Emilia, Italy	9.000	m³/d
MUNICIPAL WATERWORKS Giardia Removal	New Zealand	3.100	m³/d
MUNICIPAL WATERWORKS High turbidity removal without chemical products	Oporto, Portogallo	150.000	m³/d
MUNICIPAL WATERWORKS Biologic filtration **(see picture 1)**	Ostrolenka, Polonia	14.500	m³/d
MUNICIPAL WATERWORKS Arsenic Removal and Ammonia Nitrification	Isola Dovarese, Cremona, Italy	2.100	m³/d
MUNICIPAL WATERWORKS Iron and Manganese Removal	Quinzano d'Oglio, Brescia, Italy	5.000	m³/d
MUNICIPAL WATERWORKS Arsenic, Vanadium and Fluorides Removal **(see picture 2)**	Velletri, Rome, Italy	3.600	m³/d

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Cat. No. BU0158/09-08 PRINTED IN ITALY - C TECNOSTUDI

QUALITY SYSTEM CERTIFIED ACCORDING TO UNI EN ISO 9001:2000 NORM

Culligan reserves the right to change any technical or design specifications for the models shown in this brochure.

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With three manufacturing plants and more than a hundred dealers, agents and representatives all over Europe, Culligan is next door wherever you are. Each and every user enjoys outstanding after-sales service. Culligan is present in every area thanks to its engineers and technicians who are ready to act for you quickly and efficiently. The Culligan organisation is represented worldwide in more than 90 countries. The logistic support it provides enables each licensee and dealer to guarantee exceptional services during and after the warranty period (one year, covering manufacturing faults and corrosion).