

ACTIFLO®



The ultimate  
clarifier

**WATER TECHNOLOGIES**

Coagulation / ballasted flocculation and settling for the production of drinking water, process water and the treatment and reuse of wastewater.

## A universal process, always at the forefront of innovation

Actiflo is a compact process for high rate clarification, developed and patented by Veolia Water Technologies.

The specificity of Actiflo resides in the use of microsand, which acts as a ballast for flocculated matter and accelerates its settling.

Actiflo benefits from constant improvements and innovations in order to respond to new environmental requirements from public authorities and industry.

25 years of operational experience and more than 1,000 references around the world make Actiflo the most universal and the highest performing clarification process.

## Major advantages

- Exceptional treatment performance, regardless of the field of application.
- Operational stability: no impact on treatment efficiency during sudden flow or raw water quality fluctuations.
- Quick response to treatment adjustments.
- Operational flexibility: possibility of frequent shutdowns and restarts without affecting treated water quality.
- Reduction in construction costs thanks to the compactness of the process.
- Reduced chemical consumption: savings up to 50% compared to conventional clarifiers.
- Process can be adapted and integrated into all treatment schemes that require a clarification step.
- Full automation and remote monitoring possible.



## Compact and ultra-rapid

Actiflo is characterized by:

- Very high settling rates:
  - > Drinking water: 60-85 m/h  
(25-35 gpm/sf)
  - > Municipal wastewater and stormwater: 60-150 m/h  
(25-60 gpm/sf)
  - > Industrial process water and wastewater: 60-200 m/h  
(25-80 gpm/sf)
- Increased compactness: Actiflo is the ideal response where there are space restrictions for rehabilitating existing installations or building new ones. Its footprint is 4 to 8 times smaller than lamella or dissolved air flotation (DAF) clarifiers and up to 50 times smaller than conventional clarification systems.
- Very short residence times resulting in great reactivity and user-friendly operation.

### Conventional clarifiers

0.5-1.5 m/h  
(0.2-0.6 gpm/sf)

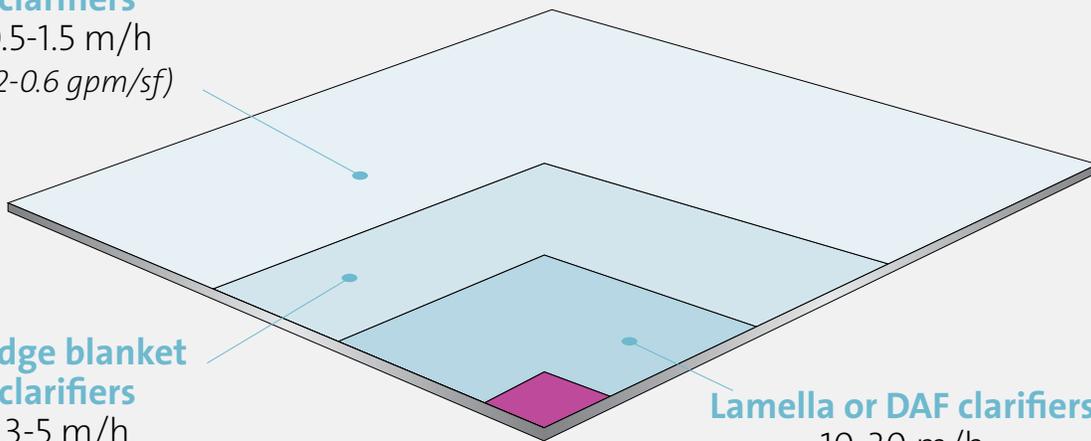
### Sludge blanket clarifiers

3-5 m/h  
(1-2 gpm/sf)

### Lamella or DAF clarifiers

10-30 m/h  
(4-12 gpm/sf)

**Actiflo**  
60-200 m/h  
(25-80 gpm/sf)





## A very wide range of applications

Available in standardized modular solutions (100 to 60,000 m<sup>3</sup>/day) or custom designed, Actiflo covers all municipal and industrial treatment applications.

### **Drinking water and process water**

For the production of drinking water and process water, Actiflo treats surface water, ground water, sea water and brackish water. It is particularly effective in eliminating turbidity, natural organic matter, color and algae.

For the specific needs of industry, Actiflo is also suitable for the treatment of cooling tower make-up water and boiler feed pre-treatment.

### **Municipal and industrial wastewater**

Actiflo can be implemented at all stages of the treatment of municipal effluents: primary and secondary clarification, tertiary polishing, and reuse of wastewater.

Real-time treatment of wet weather flows.

Phosphorus removal: compliant with the strictest standards, with reductions exceeding 95%.

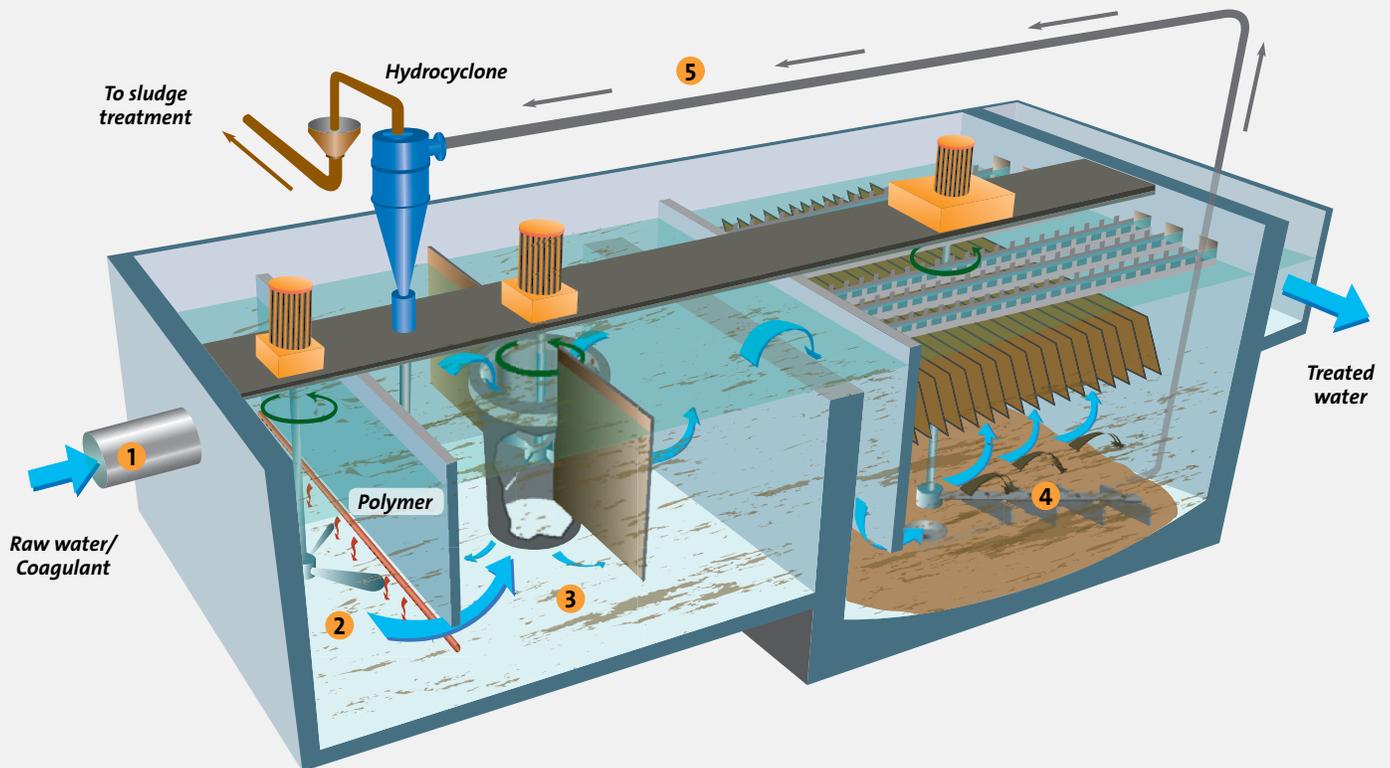
Actiflo can be used for the treatment of most industrial effluents. It is suitable, for example, for the treatment and recycling of cooling towers blowdowns.

It is also particularly suited for eliminating heavy metals, ash and coal fines in power plants or steel mills effluents.

***“Actiflo covers all municipal and industrial treatment applications”***



## State-of-the-art equipment



**1 Chemicals:** a coagulant, such as an iron or aluminium salt, is added to the raw water.

**2 Coagulation:** hydroxide flocs are formed during the coagulation phase.

**3 Turbomix™ flocculation:** the flocs formed during the coagulation phase are ballasted with microsand with the help of polymer.

**4 Clarification:** the ballasted flocs settle quickly thanks to the specific weight of the microsand.

**5 Recirculation:** the sludge and microsand slurry is pumped to a hydrocyclone where the sludge is separated from the microsand via centrifugal force. The clean microsand is recycled back to the flocculation tank while the sludge is continuously discharged.

# Configurations

The basic design of Actiflo allows for many configurations that meet the diversity of treatment contexts and needs:

CONFIGURATIONS	MAIN CHARACTERISTICS
<b>ACTIFLO® Duo</b>	Operational flexibility with or without microsand depending on the flow rate.
<b>ACTIFLO® Carb</b>	With Powered Activated Carbon (PAC) addition in order to eliminate non-flocculable organic matter, pesticides and emerging micropollutants.
<b>ACTIFLO® Softening</b>	With lime and/or soda addition for water softening.
<b>ACTIFLO® HCS</b>	For the reduction of the sludge volume and the associated water losses.
<b>BioACTIFLO®</b>	For the online stormwater treatment and the reduction of the soluble BOD.
<b>ACTIFLO® Rad</b>	For the removal of radioactive elements from contaminated water at nuclear sites.
<b>ACTIDISK®</b>	Actiflo followed by Hydrotech discfilters for decarbonatation and treated water polishing.
<b>ACTIFLO® Pack</b>	Standardized units for the treatment of any flow rate up to 2,500 m <sup>3</sup> /h (11,000 gpm).

## **ACTIFLO® Green: Actiflo configurations with use of biosourced products**

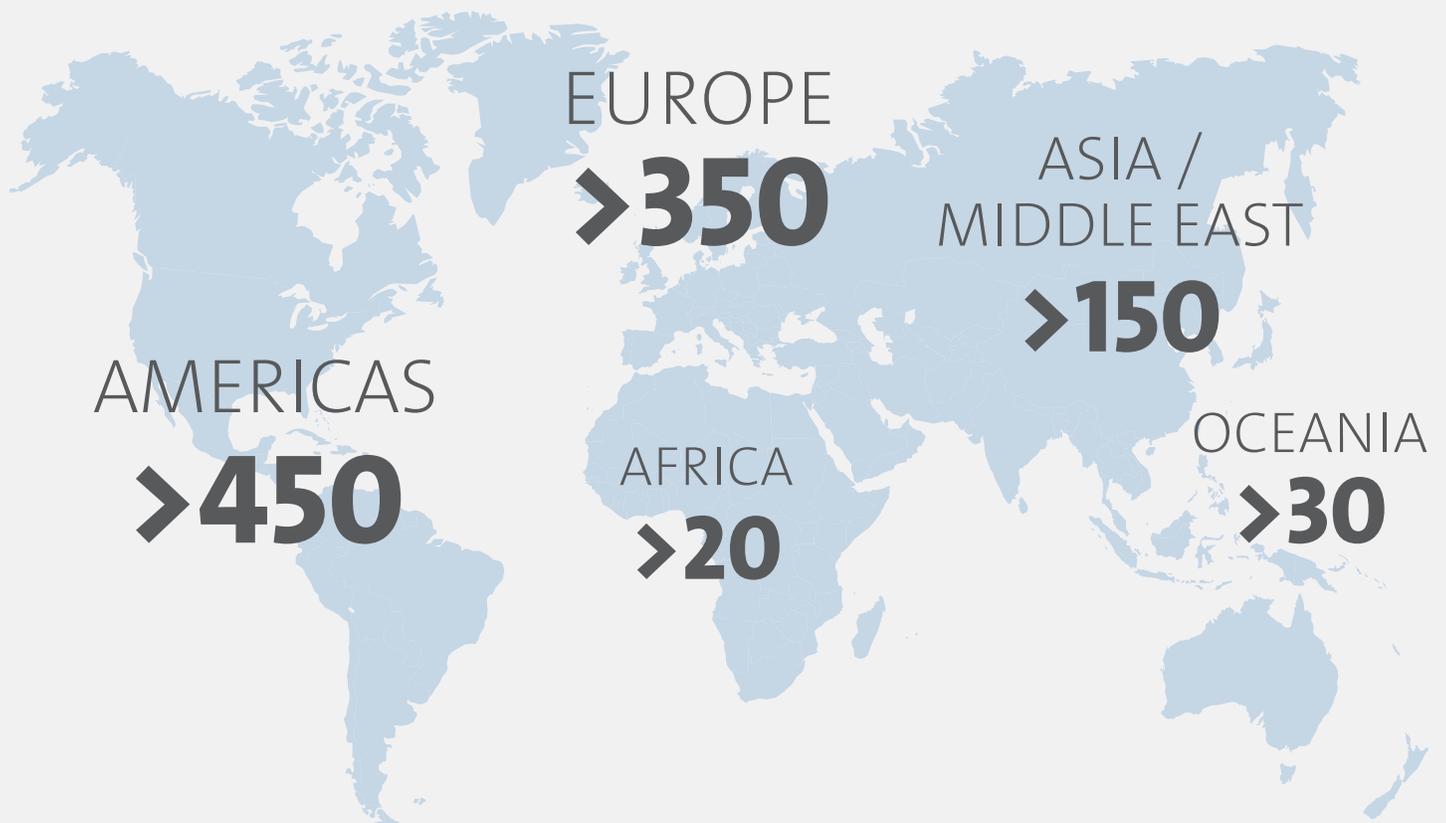
Veolia has developed, through its Hydrex™ water treatment additives brand, a product line based on renewable resources, such as activated starch, to replace traditional polyacrylamide flocculants, as a response to increasing demand from local authorities and industry in this area.

This range of biosourced products is perfectly suited for optimal Actiflo operation and its various configurations.

# Actiflo, the ultimate clarifier

## References

25 years of operational experience and more than 1,000 references around the world. Actiflo treats more than 50 million m<sup>3</sup> (13 billion gallons) of water every day.



# ACTIFLO® PACK

Standardized high-performance clarification units

Ideal for treating all types of drinking water, process water, sewage and reuse applications, Actiflo Pack standardized units are designed to be extremely compact.

Actiflo Pack units offer an economical solution, with minimal requirements for civil engineering and very short delivery and commissioning times.

## The Actiflo Pack range

The operating characteristics of Actiflo Pack are identical to those of Actiflo – coagulation/flocculation and ballasted sedimentation – giving it the advantages of fast, high-performance treatment and great operational flexibility.

The Actiflo Pack range offers a wide choice of configurations with unit treatment capacity of 2 to 2,500 m<sup>3</sup>/h depending on the application.

The systems are supplied with all equipment and accessories, from process reagent preparation to instrumentation and supervision tools.

The Actiflo Pack range is also available as a mobile unit for emergency solutions requiring temporary water treatment in the event of an unplanned downtime or to cover occasional additional water needs. Loaded onto trailers or in containers, they are available in a range of flow rates up to 350 m<sup>3</sup>/h. They can be started very quickly to guarantee continuity of production for clients.



## Advantages

- Performance: constant production of high-quality water
- Flexible operation: possibility of fast and frequent stops and starts
- Very compact with small footprint: between 2 m<sup>2</sup> and 55 m<sup>2</sup> per unit
- Economical solution, pre-fabricated in our workshops
- Choice of construction materials
- Delivery on a chassis with very short lead times

## Associated services

Our after-sales services and local technical support teams offer preventive and corrective maintenance programs that guarantee the effective commissioning and long-term operation of the installation.

## Applications

The standardized Actiflo Pack unit covers all municipal and industrial water treatment applications (drinking water, sewage, process water, reuse).

A varied range

- Actiflo Pack Mini: up to 15 m<sup>3</sup>/h
- Actiflo Pack: up to 2,500 m<sup>3</sup>/h

Actiflo Pack is the ideal response to situations that require a low-cost solution with fast set-up.

For even greater performance and safety, Actiflo Pack can be offered with the Hydrex™ range of additives, coagulants and polymers and with Actisand™ micro-sand developed by Veolia.

## REFERENCES

### Process water

- > DeBeers Diamond Mine, Snap Lake, NT, Canada - 420 m<sup>3</sup>/h (2014)
- > New Boliden, Skelleftehamn, Sweden - 15 m<sup>3</sup>/h (2014)
- > BP, Qarmat Ali, Basrah, Iraq - 8,750 m<sup>3</sup>/h (2012)
- > Coca-Cola, FEMSA, Acapulco, Mexico - 2,400 m<sup>3</sup>/day (2009)
- > Clariant (chemicals), France - 250 m<sup>3</sup>/h (2001)

### Drinking water

- > Maraba, Saudi Arabia - 2,500 m<sup>3</sup>/h (2014)
- > Kikuxi, Luanda, Angola - 1,200 m<sup>3</sup>/h (2013)
- > Sapporo, Japan - 20 m<sup>3</sup>/h (2012)
- > Iserlohn, Germany - 480 m<sup>3</sup>/h (2006)

### Municipal sewage

- > Gibson Island (Western Corridor), Brisbane, Australia - 5,500 m<sup>3</sup>/h (2008)
- > Copenhagen, Lake Emdrup, Denmark (lake water treatment - 250 m<sup>3</sup>/h - 1999)

### Reuse

- > Disney Land River, Shanghai Pudong - 1,200 m<sup>3</sup>/h (2014)
- > Samsung Semiconductor, Suzhou, China (industrial reuse - 80 m<sup>3</sup>/h - 2008)
- > Burj Khalifa, Dubai, United Arab Emirates - 2,600 m<sup>3</sup>/h (2008)
- > Lago Casa de Campo, Madrid, Spain - 1,000 m<sup>3</sup>/h (2004)

# ACTIFLO<sup>®</sup> CARB

Optimum treatment for natural organic matter and micropollutants/Water purification and refinement

## Highly effective treatment

Designed to treat and refine water, Actiflo Carb combines the fast flocculation and sedimentation performance of Actiflo with the adsorption capacity of Powdered Activated Carbon (PAC) to eliminate substances resistant to the clarification process.

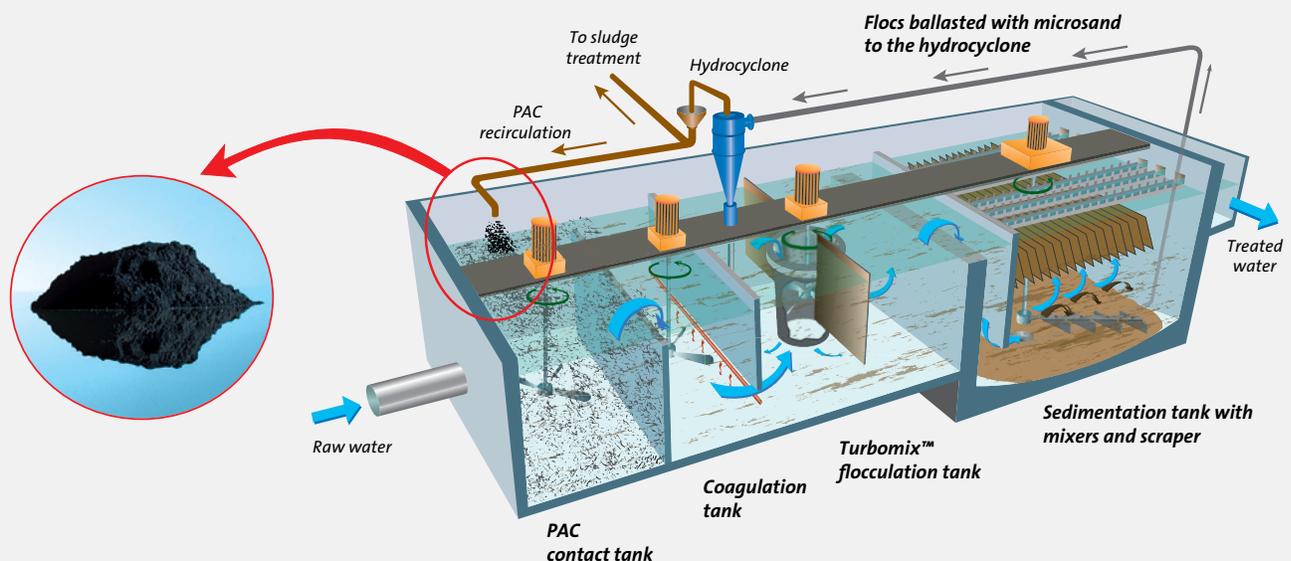
The adsorbent properties of PAC offer an effective solution for the elimination of non-flocculable Natural Organic Matter (NOM), micro-algae, flavors and odors, pesticides, endocrine disruptors and other emerging micropollutants in the water to be treated.

The unparalleled performance of Actiflo Carb produces water of very high quality.

## The Actiflo Carb process

The operating characteristics of Actiflo Carb are identical to those of Actiflo, giving it the advantages of fast, high-performance treatment. Upstream of the coagulation, flocculation and sedimentation basins, Actiflo Carb has a PAC contact tank to adsorb pollutants resistant to chemical clarification.

A recirculation circuit with a specific hydrocyclone recovers clean microsand, returns the PAC to the contact tank and purges excess sludge from the process.



## Advantages

- Advanced PAC treatment
- Maximum elimination of NOM and emerging micropollutants
- Refinement of the treated water
- Compatible with other clarification processes upstream: Actiflo, Multiflo™, Spidflow® and other sedimentation flotation tanks
- High sedimentation speed:  $\geq 30$  m/h
- Small footprint
- Simple to commission: start-up in a few minutes
- Easy, low-cost upgrading of existing installations

## Applications

Actiflo Carb is recommended for:

- Drinking water: for the treatment of NOM resistant to clarification, pesticides, emerging micropollutants, micro-algae, flavors and odors
- Process water: for refining and treating resistant NOM
- Sewage: to eliminate hard Chemical Oxygen Demand (COD) and other compounds resistant to chemical or biological treatment systems
- “Reuse”: for the advanced tertiary treatment and refinement of treated sewage

## Actiflo Twin Carb, a dual-stage treatment

Depending on the quality of the water to be treated and the performance to be achieved, the Actiflo Carb process is also available in an Actiflo Twin Carb version. This unique configuration consists of a dual-stage treatment in series, amplifying the elimination of NOM and reducing the footprint.

This dual-stage treatment involves an Actiflo clarification stage followed by an Actiflo Carb refinement stage. Particularly well-suited to treating water with a high pollutant content, Actiflo Twin Carb can reduce a Total Organic Carbon (TOC) level of more than 15 mg/L in the raw water to less than 2 mg/L in the treated water.

## REFERENCES

### ACTIFLO® Carb

- > Harpeth Valley UD, Nashville, TN, USA - 90,000 m<sup>3</sup>/day (2015)
- > DSM Nutritional Products, Village-Neuf, France - 2,400 m<sup>3</sup>/day (2014)
- > Raffineria di Milazzo, Italy - 7,200 m<sup>3</sup>/day (2014)
- > La Chesnaie, France - 12,000 m<sup>3</sup>/day (2013)
- > Fuyang, Zhejiang, China - 250,000 m<sup>3</sup>/day (2012)
- > Medias, Romania - 16,000 m<sup>3</sup>/day (2012)
- > TW Moses, Indianapolis, IN, USA - 91,000 m<sup>3</sup>/day (2011)
- > Montry, France - 11,000 m<sup>3</sup>/day (2010)
- > Huntsman, Qingdao, China - 1,000 m<sup>3</sup>/day (2009)

### ACTIFLO® Twin Carb

- > Nantes La Roche, France - 160,000 m<sup>3</sup>/day (2016)
- > Parker WSD, CO, USA - 38,000 m<sup>3</sup>/day (2015)
- > Vitré La Grange, France - 14,000 m<sup>3</sup>/day (2014)
- > Cholet, France - 34,000 m<sup>3</sup>/day (2014)
- > Mervent, France - 24,000 m<sup>3</sup>/day (2013)
- > Pont-Scorff, France - 6,000 m<sup>3</sup>/day (2012)
- > Durtal, France - 4,800 m<sup>3</sup>/day (2011)
- > Aire-sur-la-Lys, France - 109,000 m<sup>3</sup>/day (2010)
- > Perros-Guirec, France - 10,000 m<sup>3</sup>/day (2009)
- > Lucien Grand, La Rochelle, France - 72,000 m<sup>3</sup>/day (2009)

# ACTIFLO® SOFTENING

High-speed decarbonation and/or softening solution

Designed to improve the quality of hard water, Actiflo Softening combines the operations of clarification and decarbonation/softening in a single compact unit to reduce the alkalinity and hardness of water. At the same time, the process also eliminates other undesirable components such as silica, heavy metals, fluorides and phosphates together with suspended solids and organic matter.

Fast and effective, Actiflo Softening produces very high-quality water for industrial and municipal applications.

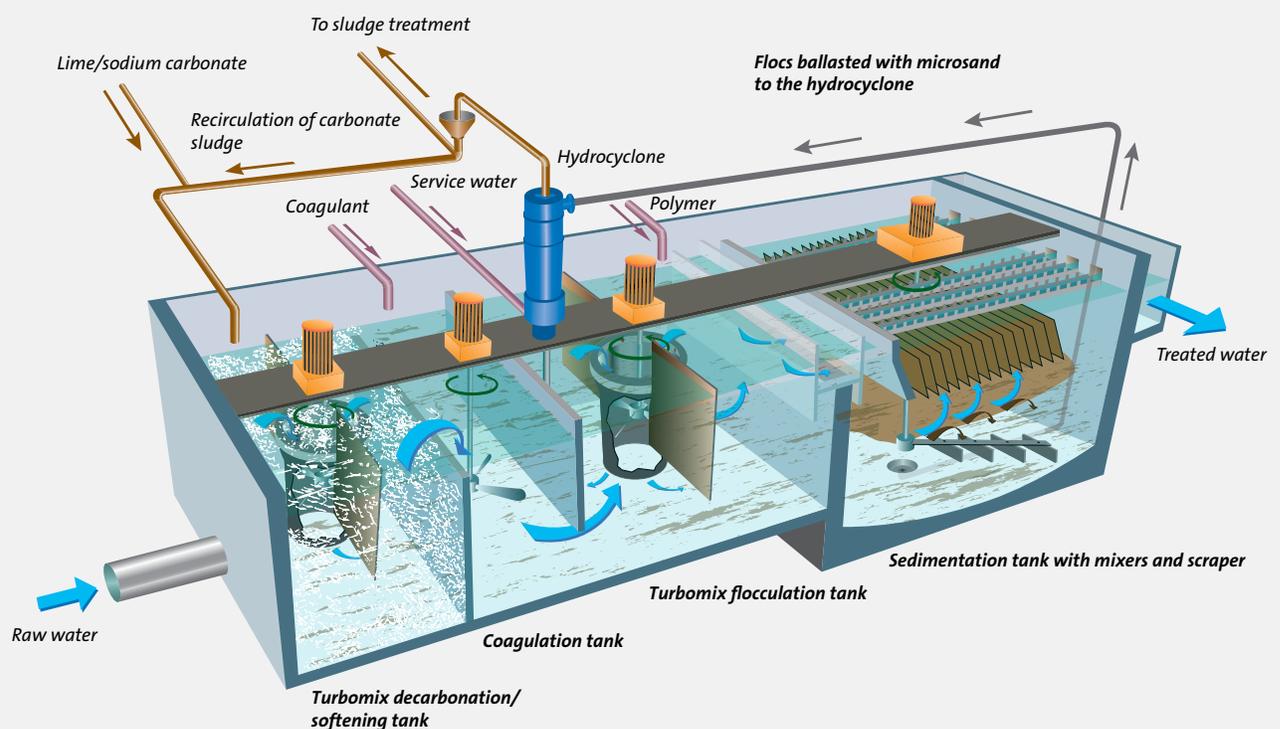
## The Actiflo Softening process

The operating characteristics of Actiflo Softening are identical to those of Actiflo, giving it the advantages of fast, high-performance treatment.

Upstream of the coagulation, flocculation and sedimentation basins, Actiflo Softening has a Turbomix™ reaction tank

into which chemical products are injected to form insoluble compounds.

A recirculation circuit with a specific hydrocyclone recovers clean microsand, returns the decarbonation and softening sludge to the reactor and purges excess sludge from the process.



## Advantages

- Small footprint: up to 10 times more compact than conventional decarbonation or softening processes
- High upward flow rate: up to 120 m/h
- Easy installation in existing tanks
- Improved mixture and accelerated chemical precipitation reaction thanks to the Turbomix tank
- Reduced coagulant consumption due to the recycling of carbonate sludge in the Turbomix tank
- Sludge characteristics: up to 8% dry matter; can be easily thickened and dried
- Easy to commission: start-up in a few minutes
- Can be fully automated and deployed in existing plants at reduced cost

## Applications

Actiflo Softening, an ideal solution for:

### Industrial applications

- Pre-treating water to avoid membrane fouling
- Production of make-up water for cooling towers and water recycling
- Treating water used in oil and gas production
- Treating SAGD (Steam Assisted Gravity Drainage) water in condensate circuits
- Treating wastewater from combustion gas desulfurization and acidic mining effluents
- Reusing wastewater in iron, steel and other metal industries
- Phosphorus co-precipitation

### Municipal applications

- Decarbonation and softening of surface or borehole water to produce drinking water

## REFERENCES

- > Chelyabinsk Power Plant, Chelyabinsk, Russia - 9,000 m<sup>3</sup>/day (2015)
- > Athy, Kildare, Ireland - 29,000 m<sup>3</sup>/day (2014)
- > EDF Bouchain, France - 26,000 m<sup>3</sup>/day (2014)
- > ENEL, Porto Tolle, Italy - 27,000 m<sup>3</sup>/day (2014)
- > Grande Raffinerie Oranaise de Sucre (GROS), Oran, Algeria - 1,000 m<sup>3</sup>/day (2014)
- > Vale, Long Harbour Processing Plant, NL, Canada - 29,000 m<sup>3</sup>/day (2013)
- > Abengoa Solana, Gila Bend, AZ, USA - 23,000 m<sup>3</sup>/day (2013)
- > JIFCO sulfuric and phosphoric acid plant, Eshidiya, Jordan - 13,000 m<sup>3</sup>/day (2013)
- > Kerry Ingredients & Flavors, Listowel, Ireland - 3,600 m<sup>3</sup>/day (2013)
- > Laurier Station, QC, Canada - 2,000 m<sup>3</sup>/day (2013)
- > Gahard, France - 2,000 m<sup>3</sup>/day (2011)
- > Coca-Cola, FEMSA, Acapulco, Mexico - 2,400 m<sup>3</sup>/day (2009)

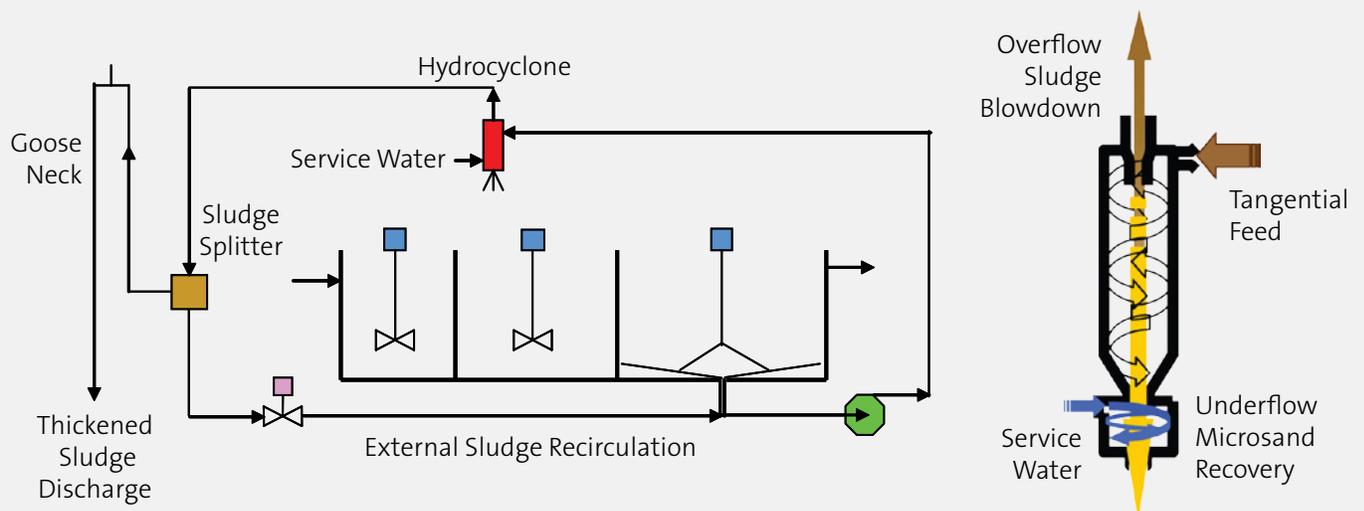
# ACTIFLO® HCS

High-speed decarbonation and/or softening solution

## Advancements to Reduce the Volume of Sludge Produced

To reduce the volume of sludge produced by any ACTIFLO® process train (existing or new) a hydrocyclone concentration system (HCS) can be installed or retrofitted.

The HCS system is a simple sludge recirculation loop, which reduces sludge production by 50 – 80%.



## The HCS System Process

The ballasted material in the settling tank is pumped to the hydrocyclone and the overflow of the hydrocyclone is sent into the recirculation loop.

The hydrocyclone overflow enters the repartition device and a portion of it is maintained within the recirculation loop and a portion is discharged to waste.

The portion being recirculated does not re-enter the ACTIFLO® settling tank, it stays within the sand recirculation circuit.

The control of the proportions of recirculated flow versus discharged flow is maintained by a flow meter and/or a TSS probe and a modulating valve.

The hydrocyclone is specifically designed for the HCS system and incorporates a small amount of flush water to enhance the sludge recovery rate.

## An unrivalled track-record of references

The ACTIFLO® process is currently in operation worldwide in small communities and large metropolitan areas, as well as in various installations for the treatment of industrial water and effluents. Highlighted are some Canadian installations.

**TROIS-RIVIÈRES, Québec**



**QUÉBEC, Québec**



**BERTHIERVILLE, Québec**



**ST-LAMBERT, Québec**



**LONGUEIL, Québec**



**RED DEER, AB**



**PORTAGE LA PRAIRIE, MB**



**BOISBRIAND, Québec**



**FLEISCHMAN, QC**



**CALGARY BEARSPAW, AB**



**SEYMOUR CAPILANO, BC**



**BURLINGTON, ON**



# Resourcing the world

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