Enhanced High Rate Clarification

Actiflo® Turbo
Actiflo® Turbo Clarification

A water and wastewater high rate clarification process combining microsand enhanced flocculation and settling.

Actiflo® Turbo is a compact high rate clarification process that utilises microsand as a seed for floc formation. The microsand provides surface area that enhances flocculation and also acts as a ballast or weight.

The microsand ballasted flocs display unique settling characteristics, which allow clarifier designs with very high overflow rates and short retention times. These designs result in footprints that are 10 times smaller than classic lamella clarifier or Dissolved Air Flotation (DAF) and up to 50 times smaller than conventional clarifier systems, with a short start up time of less than 10 minutes.

The Actiflo® Turbo process is ideally suited for the treatment of industrial process water, wastewater, storm water, surface and ground water.

Savings
- Lower CAPEX compared to conventional clarification processes
- Lower operational costs through reduced chemical consumption

Key Characteristics
- High efficiency treatment (turbidity removal exceeding 99%)
- Very small footprint process solution (reduces construction costs)
- Flexible (reacts quickly to changing raw water quality), provides consistently high quality effluent
- Suited to restricted spaces and easy retrofit of existing plants
- Very short start-up time (less than 10 minutes)
- Sludge treatability: the sludge produced can be thickened and dewatered easily
- Easy to operate and to maintain (can be entirely automated and controlled remotely)
- Strong 20-year operating experience with more than 700 Actiflo® plants worldwide
- Process solutions available for every application: packaged plants (100 to approx. 40,000 kl/day) or custom engineered solutions for larger plants
Industrial Process Water Applications

The Actiflo® process is an ideal solution for recycling valuable process water, providing boiler feed, product water and cooling tower make-up water to the oil & gas, power, mining & metals and chemicals industries.

Wastewater Applications

Contaminated Water

Actiflo® is especially suitable for removing heavy metals and treating contaminated water, including arsenic, iron, manganese and for treating contaminated water for typical mine wastewater and groundwater remediation applications.

Tertiary Treatment

Whether it is used for suspended solids, colour or phosphorus removal, Actiflo® can meet or exceed very high water quality standards with removal rates usually in excess of 90%. The same Actiflo® unit can be used for storm flow treatment in peak flow and for tertiary treatment in dry flow conditions.

Combined Sewer Overflow (CSO)

Stormwater often upsets wastewater treatment plants as it creates peak flows, causing plants to bypass most of the incoming hydraulic surge. With Actiflo®, storm flows can now be treated as they occur. Its compactness and quick start-up make Actiflo® particularly suited to treating storm flows, which by nature are unpredictable.

Wastewater

Actiflo® can be used as a primary clarifier for treatment in most municipal and industrial applications. Actiflo® is particularly efficient for algae removal.

Drinking Water Applications

The Actiflo® process can be applied to both groundwater and surface waters where either better performance or cost reduction is desired. It is ideally suited to treat difficult waters, such as rapidly fluctuating sources or extreme conditions.

Actiflo® consistently displays efficient removal of turbidity (high and low), colour, TOC, algae, particle counts, pathogens, cryptosporidium, iron, manganese, arsenic and other typical undesirable water contaminants.

The Actiflo® process is currently in operation worldwide in small communities as well as large metropolitan areas to provide high quality drinking water: Queenstown (Tasmania), Quebec City (Canada), Kuala Lumpur (Malaysia), Paris (France), Beijing / Shanghai (China), etc.

Actiflo® Pilot Unit & Actiflo® Jar Tests

To demonstrate the effectiveness of the Actiflo® clarification process, Veolia Water Solutions & Technologies can provide the service of an Actiflo® mobile pilot unit (capacity: up to 10 m³/hour). This standalone unit can be easily delivered by road to site and be operational within days.

Actiflo® Jar Tests can easily be organised at your site, or if we receive water samples, to simulate the Actiflo® operational conditions and help quickly ascertain whether Actiflo® is suitable for your application.
The following upflow velocities are consistently being achieved in the following applications:

- **Surface or bore water for drinking water**: 40 - 80 m/h
- **Highly loaded industrial or municipal raw wastewater**: 80 m/h
- **Primary wastewater or stormflows**: 120 m/h - 150 m/h

### The Actiflo® Turbo process

Actiflo® Turbo is equipped with:

- a coagulation tank
- a flocculation tank with **Turbomix™**
- a hydraulically optimized settling tank with lamella
- a hydrocyclone for microsand recovery (alternatively VWS MA hydrocyclone with integrated microsand washing facility)

### The Turbomix™, a major improvement in flocculation

At the heart of the Actiflo® Turbo system, the Turbomix™ was designed to enhance the flocculation efficiency by introducing the following features:

- High level of homogeneous mixing of the coagulated water with the microsand and polymer
- Reduced retention times
- Reduced energy consumption
**Actiflo® Turbo with High Concentration Sludge (HCS) Option**

For applications requiring minimum sludge production, the High Concentration Sludge (HCS) option is an Actiflo® Turbo equipped with an additional sludge recirculation loop.

The design of the loop allows for the volume of sludge produced to be reduced by 80 to 90%, and increases sludge concentration in the reject by a factor of 8 to 10 times (up to 3% solids depending on the nature of the sludge). HCS also reduces sand loss through waste.

The HCS option is a benefit for producers who wish to minimise sludge volumes and can mean:

- **Lower capital and operating costs** (smaller sludge treatment plant, reduced maintenance and pumping costs)
- **Smaller** evaporating ponds
- **Shorter** batch process duration (e.g. plate/frame filtration)

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**Actidisk™ Process (Actiflo® + Hydrotech® Discfilters)**

To achieve clarification and filtration of high suspended solids water, or phosphorous removal, the Actiflo® process followed by Discfilters is recommended. This compact and efficient process is called Actidisk™.

*Case Studies: 70 MLD Goro Nickel Effluent Polishing Plant (Vale Inco New Caledonia) to remove suspended solids from the acidic wastewater neutralisation plant and the conventional clarifiers to produce high quality treated water suitable for discharge into the sensitive marine environment.*

*Actidisk™ is also used at the Stratford Peaker Power Project (Origin Energy) in New Zealand to treat river water and produce 140 kilolitres/hour of clarified and filtered water for the Stratford Peaker Power Station to use as cooling water, and after further treatment for injection into gas turbines.*

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**Comparative footprints and rise rates**

- **Flat-bottom clarifier**: 0.5 - 1.5 m/h
- **DAF or lamella clarifier**: 10 - 15 m/h
- **Actiflo® Turbo**: 80 m/h
- **Actiflo® Classic**: >40 m/h
- **Sludge blanket clarifier**: 4 m/h
**Actiflo® Carb**

Powdered Activated Carbon (PAC) has a micro porous structure that physically adsorbs water pollutants. Those compounds to be eliminated are trapped in the PAC micro-pores which offer a very large specific adsorption surface area. The Actiflo® Carb process ensures a high elimination efficiency of pollutants, hence contributing significantly to the improvement of water quality.

**Applications**

- **Drinking water**, for enhanced removal of Natural Organic Matters (NOM), pesticides, emerging micro-pollutants, micro-algae, as well as taste and odour
- **Process water**, for NOM treatment and water polishing
- **Wastewater**, for the removal of compounds that cannot be eliminated by biological treatment
- **Reuse**, for tertiary treatment and effluent polishing

**Option**

- **Actiflo® Twin Carb**, a two-stage process where two treatment units operate in series to maximize NOM removal while reducing the installation footprint.

**Advantages**

- **Advanced treatment** based on PAC use
- **Maximum NOM removal**
- **Polishing** of treated water
- **Compatibility** with other upstream clarification processes: Actiflo®, Actiflo® Turbo, Multiflo™, other clarifiers, DAF
- **High rise rate**: ≥ 30m/h
- **Very small footprint**
- **Easy start-up**: within a few minutes
- **Easy refurbishment** of existing installations
- **Can reduce the Total Organic Carbon** (TOC) content in water from 15 mg/l to 2 mg/l or less

**Actiflo® Softening**

Actiflo® Softening combines in a single compact treatment unit both clarification and softening operations to remove constituents such as calcium, silica, heavy metals, fluorides, suspended solids, while improving properties such as alkalinity, hardness and turbidity.

**Applications**

- **Industrial applications**
  - Water pre-treatment to avoid potential scaling of membranes
  - Water production for cooling tower make-up
  - Water recycling for cooling tower side stream
- **Municipal applications**
  - Surface and ground water softening for drinking water production

**Advantages**

- **Very small footprint**: Actiflo® Softening is up to 10 times smaller than conventional softening processes
- **High rise rate**: up to 120 m/h
- **Minimises coagulant demand** due to solids precipitation with calcium carbonates
- **Sludge characteristics**: up to 8% dry solids; can be easily thickened and dewatered
Case Study: Warkworth Treatment Plant, Rodney District Council, New Zealand

Supply & commissioning of an Actiflo® Clarification packaged plant to upgrade an existing wastewater treatment plant

› Capacity: 7.5 ML/day
› Process: Actiflo® clarification packaged plant
› Application: treat peak storm flows to reduce the TSS & Phosphorous to meet discharge consent limits for safe discharge into river

Case Study: Queenstown Water Treatment Plant, Cradle Coast Water, TAS

Design, Supply, Commissioning and Operator Training of an Actiflo®, the main component of the potable water treatment plant process

› Capacity: 2.5 ML/day
› Process: Actiflo® unit (combination of Actiflo® clarification and a high rate mixed media filter)
› Application: treat river water to meet Australian Drinking Water Guidelines to provide high quality drinking water to the community

Case Study: New Moon Water Treatment Plant, Bendigo Mining, VIC

Treatment of underground mine water at the New Moon gold mine site, to remove heavy metals, arsenic and other contaminants

› Capacity: 7 ML/day
› Process: Actiflo® for pre-treatment of feedwater, manganese greensand filters, reverse osmosis
› Application: irrigate town’s parks, gardens and sporting facilities and supplement environmental flows in a local river

Case Study: Stanwell Raw Water Pre-Treatment Plant, Stanwell Corporation Ltd, QLD

Turnkey design, engineering & supply of plant and equipment for a Raw Water Pre-Treatment Plant, taking water from a dam

› Capacity: 80 ML/day
› Process: 3 Actiflo® units
› Application: cooling tower feed water with total suspended solids of less than 8 mg/l to Stanwell Power Station

Case Study: Bayswater Water Treatment Plants, Macquarie Generation, NSW

Upgrade and refurbish the 4 existing water treatment plants at Bayswater Power Station as well as a 5-year operation and maintenance contract

› Capacity: 120 ML/day
› Process: lime softening, pre-treatment using 8 Actiflo® units for clarification process, ion exchange, filtration, reverse osmosis, brine concentration and crystallisation
› Application: reduce the salinity of Lake Liddell through an increased salt removal capacity to provide cooling water whilst maintaining Bayswater as a Zero Liquid Discharge power station

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Veolia Water Solutions & Technologies is a world leader in Design & Build of water and wastewater treatment plants, focusing on reuse & desalination.

We provide Design & Build capabilities, custom & standard skid systems and packaged plants, Equipment Supply, Mobile Plants, Hydrex® Specialty Water Chemicals, as well as AQUAservice™ agreements for optimum plant performance.

We offer advanced technologies and processes, including Membrane Filtration, Reverse Osmosis, Actiflo® Clarification, Discifilters, Neosep® Membrane Bioreactors, and Moving Bed Biofilm Reactors.

We create water solutions for drinking water, process water and wastewater aimed at municipal, commercial & industrial customers.