SUPERIOR
FILTRATION

PRODUCT SHEET

AGF AUTONOMOUS GRAVITY SAND FILTER

SUPERIOR FILTRATION

Our AGF Autonomous Gravity Sand Filter is a mechanical rapid gravity sand filter. It is a polishing filter used for the removal of fine suspended solids from water. It requires no external control system or electrical supply. The backwash cycle initiation occurs autonomously and is driven entirely by built-in hydraulic design features. Operator intervention is limited to periodic maintenance inspections.

Applications

Operators install the AGF as a polishing filter to remove unsettled flocculant and suspended solids. Its applications include:

- Polishing filter on potable water treatment plants where mixing, flocculation, and sedimentation stages typically precede the AGF installation
- Removal of precipitate in iron and manganese removal processes
- Side-stream filters on cooling systems.

Industries

AGFs are used extensively in industries where polishing of process water is required. These include:

- **Industrial Process Water**
  - Agricultural and Horticultural
  - Automotive
  - Brewing & Distilling
  - Food & Agri Processing
  - Nuclear
  - Pulp & Paper
  - Power Generation
  - Quarrying
  - Rubber Processing
  - Textiles
- **Mining**
- **Mineral Processing**
  - Steel Processing
- **Potable Water and Sewage Wastewater**
- **Petrochemicals**
  - Refining
  - Pharmaceutical
  - Plastics
- **Oil and Gas**

Please contact us for more information

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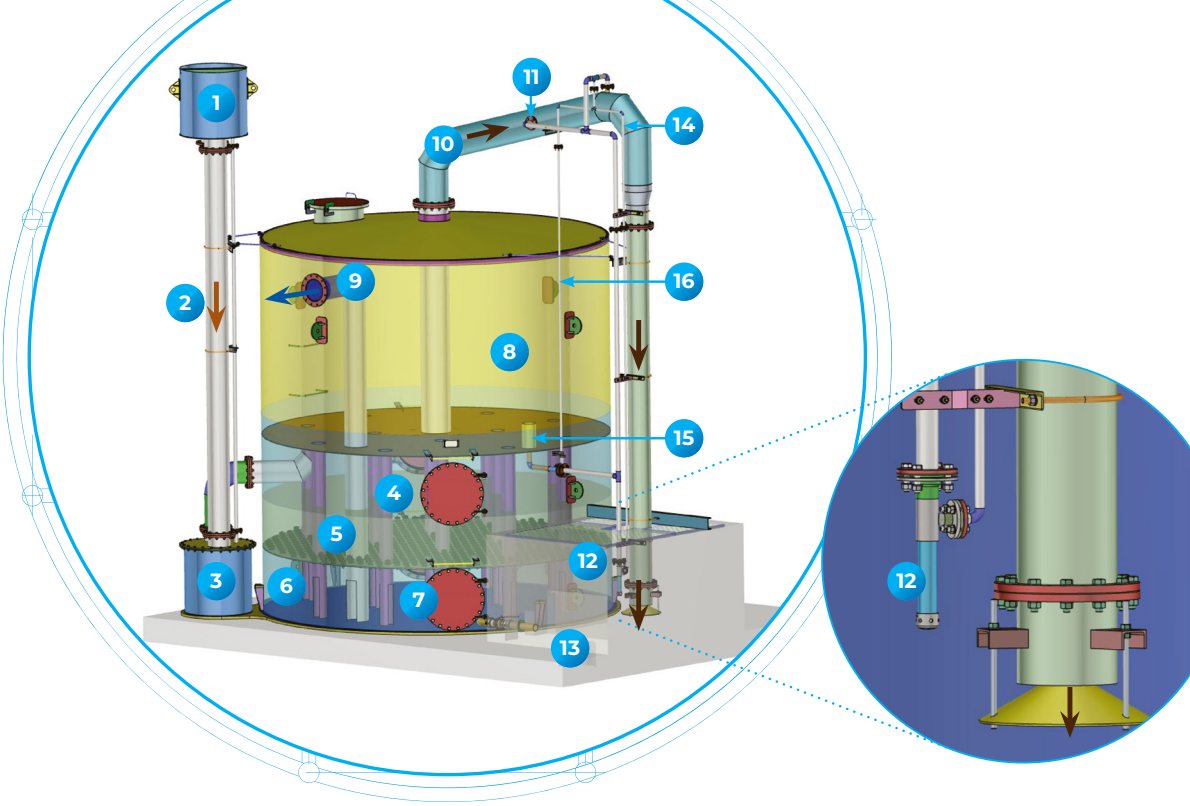

How it Works

The AGF operates autonomously for extended periods, minimising maintenance and operational costs. It requires only that the water supply:

- must be regulated so as not to exceed the prescribed flow rate
- must be supplied at the prescribed head.

Gravity or low-lift pumps provide the head. Once the above two requirements are with no further energy input, control, or interventions required, the system is stable.

Dirty water is supplied to the header tank 1 by gravity feed or by low-lift pumps. The water flows down the feed pipe 2, passes through the loop tank 3, and enters the central filtration compartment 4 above the media bed 5.

The loop tank serves to vent air and to deflect the force of the water. The water flows under gravity through the media bed and through the nozzles to the bottom filtrate collector compartment 6. The media bed retains suspended solids.

The filtrate then flows upwards through a series of transfer pipes 7, transferring it to the top backwash storage compartment. When the backwash storage compartment 8 is full, service flow commences via the filtrate outlet 9. Accumulation of dirt in the media bed causes a gradual drop in the filter head, resulting in a rise in the water level in both the backwash pipe 10 and the feed pipe 2.

Water rises in the backwash pipe until it reaches the built-in maximum level 11, then diverts to the eductor feed line. As the water passes the eductor 12, air is evacuated from the backwash pipe via the air evacuation line 14 and vented into the backwash sump 13. The system establishes a siphon that initiates the backwash process.

The designers size the backwash pipe 10 so that the siphon draws several times more water than the filter receives from the feed. This immediately reduces the static pressure above the media bed in the filtration compartment 4 to below the pressure in the backwash storage compartment 8.

In the resultant reversal of flow, water from the backwash storage compartment 8 is drawn down the transfer pipes 7 and back up through the nozzles in the central filtration compartment 4. The media bed is expanded and thoroughly agitated. Loosened dirt is carried away via the backwash pipe 10 and discharged into the backwash sump 13.

Backwash continues until the water level in the backwash storage compartment 8 clears the orifice of the siphon breaker pot 15. The siphon breaker line 16 introduces air into the backwash pipe 10. This terminates the siphon.

The filter then reverts to filtering mode. The first filtrate (rinse water) refills the filtrate storage compartment, and the system restores service flow through the filtrate outlet 9. This cycle continues without the need for external controls or human intervention.

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SUPERIOR FILTRATION

CASE STUDY

AGF: AUTONOMOUS GRAVITY SAND FILTER

THEMBISILE HANI LOCAL MUNICIPALITY – BUNDU WATER TREATMENT WORKS (WTW)

Client: Thembisile Hani Local Municipality – Bundu Water Treatment Works (WTW)
Industry: Municipal Potable Water
Region: Mpumalanga, South Africa
Product: 4 x AGF48SA – Autonomous Gravity Sand Filter – ±10 MLD
Installation: 2017

Challenge

- Thembisile Hani Local Municipality (THLM) historically had little or no own potable water source and relied mainly on Rand Water and other Water Service Authorities
- The Bundu 10 ML/d potable water treatment works addressed this risk and gave THLM its first own WTW. It strengthens supply to eastern settlements, creates a backbone for extensions, and sits alongside larger regional bulk schemes
- During the design phase, process engineers sought rapid gravity filters that would ensure compliance with potable water standards for Turbidity and TSS.
- They required:
  – easy installation
  – effective filtration
  – efficient filters
    - low maintenance and operating costs
    - zero electrical energy consumption
    - easy maintenance and operating functions
    - reliability over decades.

Application

- Final Filtration – Rapid Gravity Filters (polishing filters) at Potable Water Treatment Plant.

Solution

The process engineers (Ceenex) had seen AGF filters in operation at the Alice WTP (a plant that has been operating since 2003). After consultations with Superior Filtration, Ceenex revised the Bundu plant design to incorporate autonomous rapid gravity filters (AGF)

The inherent simplicity of the autonomous rapid gravity filters (AGF) addressed constraints posed by the rural location and easily met the requirements set by the design engineers.

- **Easy Installation**
  – Minimum civil works on site:
    - Filters are manufactured off-site under ISO-certified quality management systems
    - Filters are transported to site and installed in place with limited mechanical assembly.
- **Effective filtration**
  – Autonomous hydraulic backwashing maintains optimum filter bed condition
  – This ensures consistently high suspended solids removal and filtrate quality that meets the required acceptance standard.
- **Efficient filters**
  – Low Maintenance- and Operating Costs
    - No peripheral equipment (backwash pumps, controllers, compressors or blowers) required
    - Zero Electrical Energy Consumption
      • Gravity flow through the filters
      • Complete Autonomous Function.
    - Easy Maintenance and Operating Functions
      • Maintaining the integrity of the mechanical structure and periodic replacement of nozzles and media
      • Human Intervention is limited to periodic maintenance inspections.
- **Reliability**
  – No moving or rotating components
  – No peripheral components
  – 35+ year track record of installed continuously operating units.
- 4 x AGF48SA autonomous rapid gravity filters were installed.

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CASE STUDY

AGF: AUTONOMOUS GRAVITY SAND FILTER

THEMBISILE HANI LOCAL MUNICIPALITY – BUNDU WATER TREATMENT WORKS (WTW)

Results

- Easy and rapid installation and commissioning
- The filters were fully installed over a 2-day period. Commissioning took place in December 2018
- For the initial 12-month period, the filters operated under direct filtration whilst the pre-treatment section of the plant was constructed
- Since commissioning, the AGF filters consistently deliver filtrate in compliance with the acceptance standard (SANS 241, Drinking Water)
- In 2023, the Bundu water-treatment works (WTW) received the second-highest score for the performance of WTWs in Mpumalanga in the Blue Drop report, at 88%
- The report describes the plant as being "in secure and excellent condition".

Client experience

"Based on the reduction in construction time required and thus capital cost, as well as maintenance and operational cost, we revised the design of the Rapid gravity filter block to a battery of four AGFs for the Bundu WTW. The decision delivered on all accounts, and the filters' performance has been more than satisfactory since their commissioning in December of 2018."

- Sarel Holtzhausen - Ceenex CEO

Performance review

Turbidity (Average Values) Performance Review				
Year	**Inlet NTU**	**Outlet NTU**	**Removal efficiency**	**Performance requirement**
2019 (Direct filtration)	6,49	0,33	94,9%	> 85
2021	3,18	0,31	90,3%	> 85
2025*	3,19	0,42	86,8%	> 85
* Performance review at end of 2025 triggers client decision to replace media for the 1st time – after 7 years				

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CASE STUDY

AGF: AUTONOMOUS GRAVITY SAND FILTER

SIDE STREAM FILTRATION COOLING WATER, COEGA

Client: Air Products South Africa
Industry: Oil & Gas
Region: Eastern Cape, South Africa
Product: AGF21S, 35m³/h @ 10m/h
Installation Date: 2014

Challenge

- Air Products South Africa manufactures a wide variety of industrial and specialty gas products for the Southern African region
- Large, industrial cooling water units form part of their manufacturing plants
- Atmospheric pollutants and other solids contaminate the cooling water leading to substantial losses in efficiency
- Overcoming the inefficiencies requires increased energy inputs and chemicals consumption.

Application

- Final Filtration / **Side Stream filtration of cooling water.**

Solution

- The inherent simplicity, high efficiency and low operating costs of the Autonomous Gravity Sand Filters (AGF) makes it the ideal filter to install on side-stream filtration applications. Removal of the suspended solids with a side stream filter brings immediate and lasting economic benefits (reduction in energy consumption and chemicals usage)
- **Easy Installation:**
  - Minimum civil works on site
  - Fabrication under tightly controlled factory conditions.
- **High efficiency:**
  - AGF filters cycle autonomously between filtration and backwash cycles resulting in regular, thorough cleaning of the filter bed
  - Low Maintenance Costs:
  - No peripheral equipment (backwash pumps, controllers, compressors) required
  - Manpower limited to period oversight functions.
- **Easy Maintenance:**
  - Maintaining the integrity of the mechanical structure and periodic replacement of nozzles and sand.
- **Low Energy Consumption:**
  - Complete Autonomous Function.
- **High reliability:**
  - No moving or rotating components
  - No peripheral components.
- 1 x **AGF21S Autonomous Gravity Sand Filter** was installed, processing 35m3/h at an average filtration velocity of 10m/h.

Results

- Since commissioning in 2014 the AGF filter has provided efficient filtration at Coega, reducing the suspended solids load in the cooling water which in turn resulted in lower energy costs and lower chemicals costs
- Maintenance costs have been kept to a minimum.

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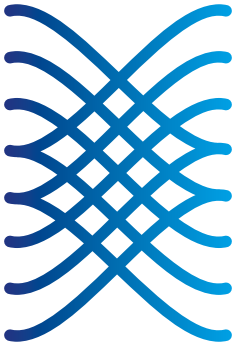

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