



BILFINGER

**WATER
TECHNOLOGIES**



BILFINGER WATER TECHNOLOGIES

SCREENING TECHNOLOGY FOR WATER INTAKES

GLOBAL BUSINESS UNIT WATER INTAKE – TRADEMARKS OF RELIABLE TECHNOLOGY:
GEIGER® – JOHNSON SCREENS® – PASSAVANT®

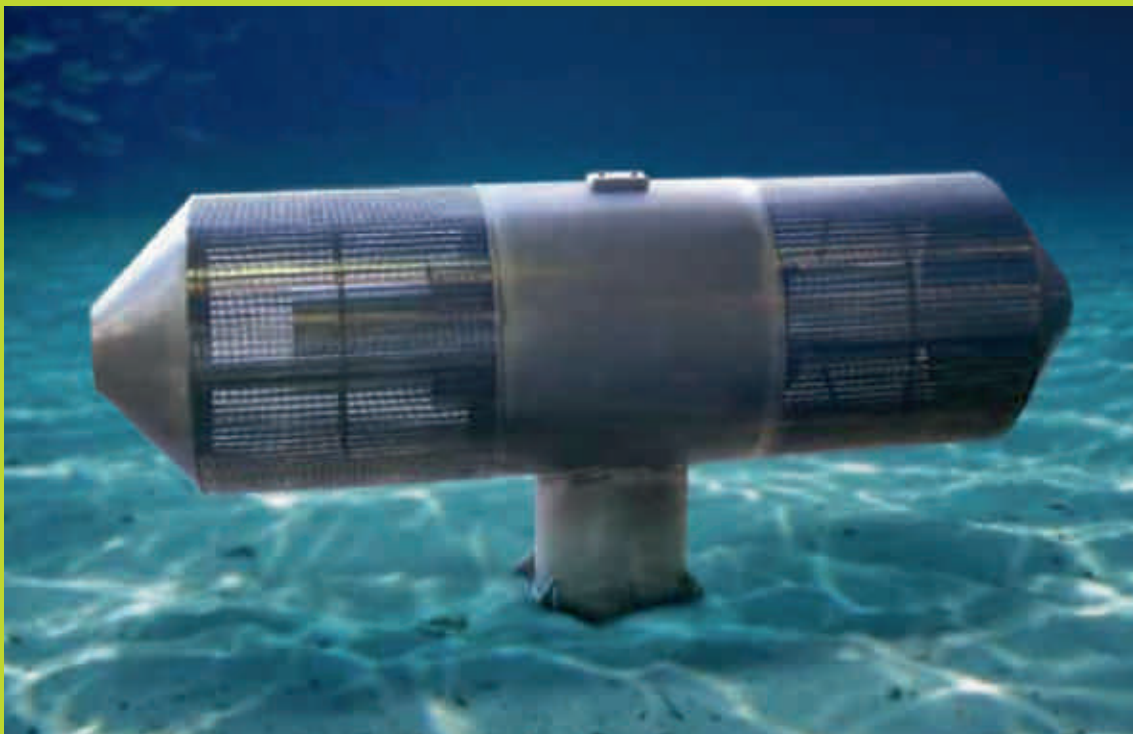
Open Water Intake

Patented MultiDisc® Technology: Unique and compact zero carry-over design.



Passive Water Intake

Patented internal flow modifier: High efficiency and low costs.



Water Intake Technologies by GEIGER[®], JOHNSON SCREENS[®] and PASSAVANT[®]

Bilfinger Water Technologies provide our customers with best practice solutions to enhance their water intake systems. Our custom-designed equipment will optimise your plants' lifecycle costs and minimise the effects on aquatic life.

In most cases, process or cooling water must be cleaned before use. Cleaning systems have to fulfill specific requirements, depending on their source (i.e. rivers, lakes or the sea) and the type of industrial plant in which they will be used. Furthermore, each plant's facilities vary in their requirements. Bilfinger Water Technologies meet these challenges thanks to a variety of flexible solutions and the implementation of the latest manufacturing technology.

Our environmentally-friendly solutions are used in both open surface water and submerged passive water intakes to deliver debris-free water; for example, cooling water at power plants, process water at industrial sites, raw water at potable water plants, desalination plants and irrigation plants.

The combined experience of GEIGER[®], JOHNSON SCREENS[®] and PASSAVANT[®] is unsurpassed, with each brand existing for more than 100 years. Together we have supplied more than 15,000 intake screens worldwide. From small municipal drinking water plants to next generation nuclear plants, we support our customers in all project phases including conceptual design, assistance with regulatory requirements, computational modelling (if required), equipment supply, commissioning and follow-up service.

We offer custom-made solutions for open and passive water intake that include comprehensive consulting services and the optimal coordination of system technology and structures. Furthermore, we custom-design and build sophisticated constructions to suit the particular application area. Our state-of-the-art production methods ensure that our machines meet the highest quality standards.

Our premium bar and mesh screening machines find their best application when high-grade power units such as condensers and pumps need to be protected from damage by debris and other foreign bodies. Our JOHNSON SCREENS[®] high capacity passive intake screens provide a low and even slot velocity whilst operating continuously without any downtime for cleaning or routine maintenance.

In detail, our product range can be divided up into the following:

- Bar Screening Machines Page 4
- Mesh Screening Machines Page 6
- Passive Screens Technology Page 8
- Special Components Page 10

Bar Screening Machines

Bilfinger Water Technologies supplies a complete range of bar screening machines for both coarse and fine screening in the context of open water intake.

We differentiate between coarse and fine screening, depending on the width of the bar spacing and the type of debris. Coarse screening is the first stage of cleaning for the removal of large or bulky debris using robust bar screens with bar spacing of 30–100 mm. Bar screens can also be used for fine screening (as a 2nd stage) with narrower bar spacing of 2–30mm.

Bar screen cleaning:

- Is a fully automatic cleaning process
- Has a customised design and manufacturing depending on the flow conditions, debris type and material requirements
- Has a design operating life of a minimum of 35 years

GEIGER® bar screening machines are highly reliable, low maintenance and highly durable. The machines undergo constant technical updates and re-design procedures, standards that are maintained thanks to our continuous research and development. Bilfinger Water Technologies has its finger on the pulse when it comes to using state-of-the-art technology, and is always aware of innovative ideas for products and processes, helping to provide the best solutions for the customer.

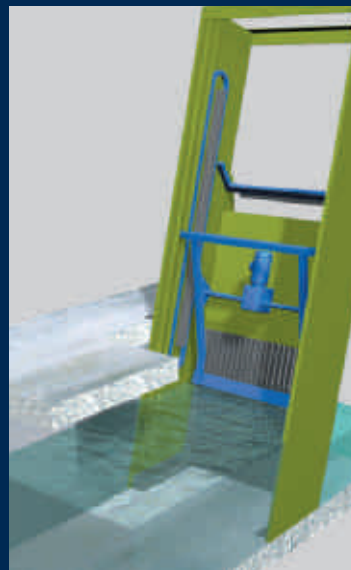
We offer the following bar screening machines, adapted to meet the customer's specific requirements:

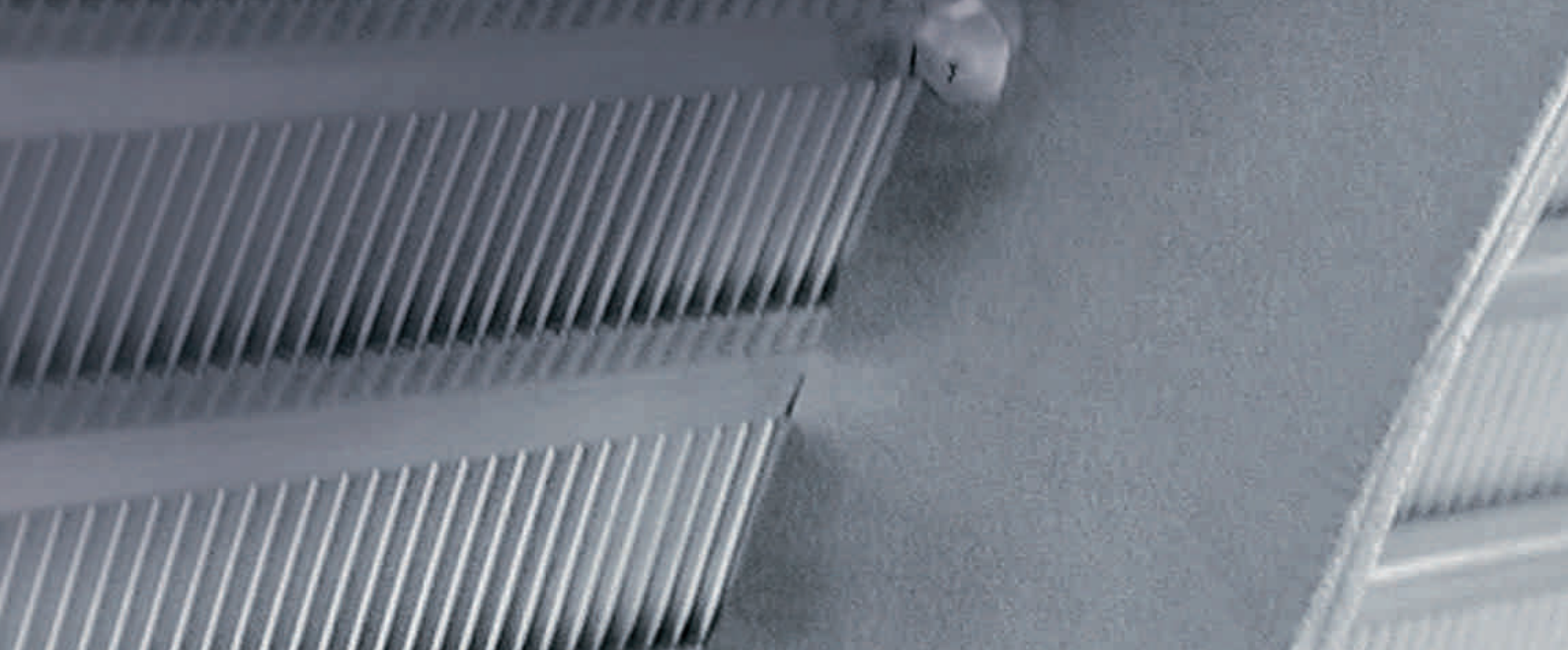
Revolving Chain Screens, Lifttable Bar Screens, Cable-Operated Grab Cleaners – Stationary and Traversing, Claw Screens and Climber Screens.

GEIGER® Claw Screen

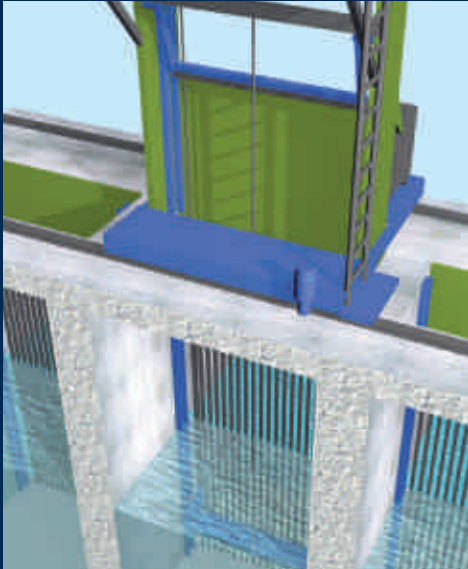


GEIGER® Climber Screen

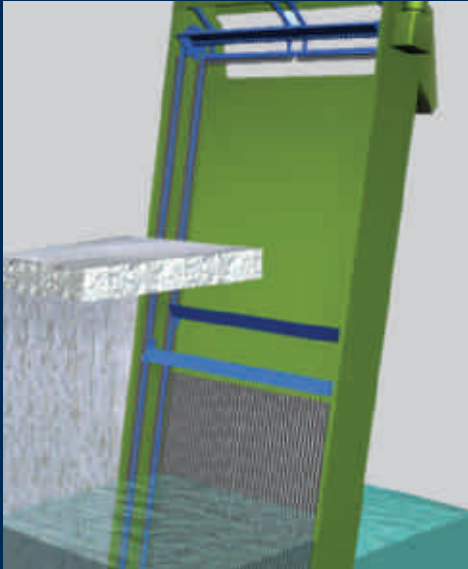




GEIGER® Cable-Operated Grab Cleaner



GEIGER® Revolving Chain Screen



Mesh Screening Machines

As the last cleaning stage in the water intake process, efficient fine screening using mesh screening machines is essential to protect pumps, condenser tubes and other critical equipment.

For decades, GEIGER® mesh screening machines have been successfully implemented on a global scale in the water intake structures of power plants, petro-chemical, desalination, LNG, pulp & paper and other processing plants. One of the main features is the high throughput capacity with a compact machine size.

Looking for a completely new concept and in view of the present requirements GEIGER® developed the prize-winning MultiDisc® Screen.

The advantages of the MultiDisc® are:

- Its compact design allowing significant cost reductions in civil structure volume
- Its fast and simple plug-in installation
- Its low operating costs:
 - a) Only one maintenance-free side bar chain
 - b) Easy maintenance; mesh panels can be changed at floor level (no need for channel dewatering)
- Lower head loss: water only passes through the screen once
- Intensive and efficient cleaning of the mesh panels
- Zero carryover of debris to the clean water side

Executed projects have shown that the MultiDisc® can be retrofitted into existing water intake structures within 24 hours, including removal of the old screen, installation of the MultiDisc® and getting it up and running. The MultiDisc® and our Travelling Band Screens are available with either plastic or stainless steel mesh ranging from 0.2 – 10 mm. In addition to this, we offer micro drum screens with a mesh size down to 15 microns.

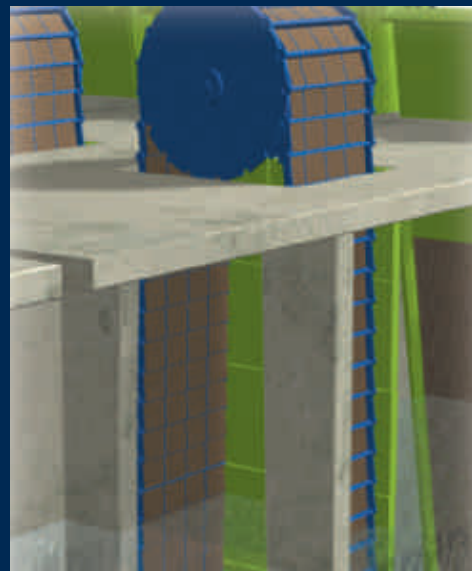
GEIGER MultiDisc® Screen



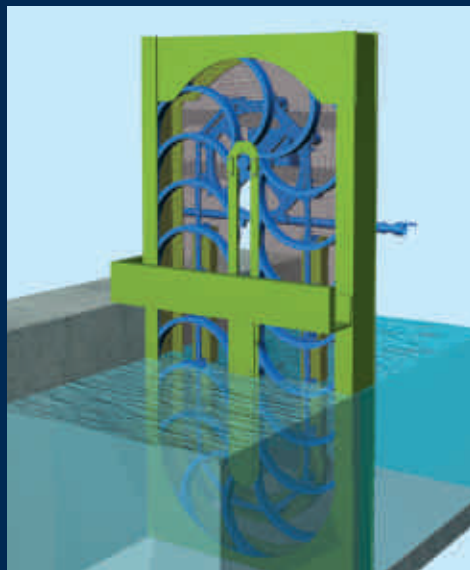
We offer the following mesh screening machines, adapted to meet the customer's specific requirements:

Centre-Flow Travelling Band Screens (in-to-out flow pattern), Dual-Flow Travelling Band Screen (out-to-in flow pattern), MultiDisc® Screen (through-flow pattern), and MicroScreen MTSM.

GEIGER® Travelling Band Screen



GEIGER MultiDisc® Screen Through-Flow Pattern



PASSAVANT® MicroScreen MTSM



Passive Screens Technology

JOHNSON SCREENS® high capacity passive intake screens provide uninterrupted water withdrawal from lakes, rivers and oceans.

The JOHNSON SCREENS® high capacity passive intake screens are constructed using non-plugging Vee-Wire® with a patented internal flow modifier that creates a nearly uniform low velocity flow through the entire screen surface. This significantly reduces impingement and entrainment of debris while protecting aquatic life. Passive screens are designed to meet regulatory requirements for a maximum slot velocity of 0.15 m/s which is the maximum velocity at which a juvenile fish can turn around, swim away and not be impinged onto a passive screen. This, combined with a typical slot width range of 1 – 10 mm (3 mm is the most common) will determine the screen sizing. The large open area and low velocities result in a very low headloss.

Key Features:

- Passive device – low capital costs and no moving parts, no power consumption, and low maintenance needs.
- Environmentally-friendly – this approach meets the EPA's 316b regulations for fish protection.
- No waste stream – there is no debris brought to the surface to be handled or disposed of.
- Easy cleaning – with a periodic blast of compressed air using our Hydroburst™ system.
- Three standard configurations – drum, tee and half screens.
- Selection of materials – 304 stainless steel for fresh water and Z-Alloy (CuNi) for repelling zebra mussel attachment and anti-bio fouling.
- Seawater applications – higher corrosion-resistant materials such as 316L, and duplex or super duplex, along with cathodic corrosion protection are available for seawater intakes.
- Double flow modifier – provides low and even slot velocity (CFD modelling is available on demand).

Hydroburst™ Backwash System

Over time, general debris will gather on the outer screen surface and will need periodic cleaning to keep the screen functioning properly. The Hydroburst™ system offers an efficient method of regular cleaning without having to send divers in to clean the screens.

The Hydroburst™ system is designed to deliver three screen volumes of air in 3 – 5 seconds time – a real solid blast of air that has proven to work in all types of applications and conditions. This volume of air comes out from the bottom of the screen, and as it rises and expands, grabs and carries away impinged debris from the screen surface, returning the screen to a clean operating condition. Our application engineers evaluate screen size, depth and distance away in order to deliver the correct amount of air. Systems can be as basic as operating a manual valve, a programmable timer system or to a PLC system that communicates to a central data control system/SCADA system for control.

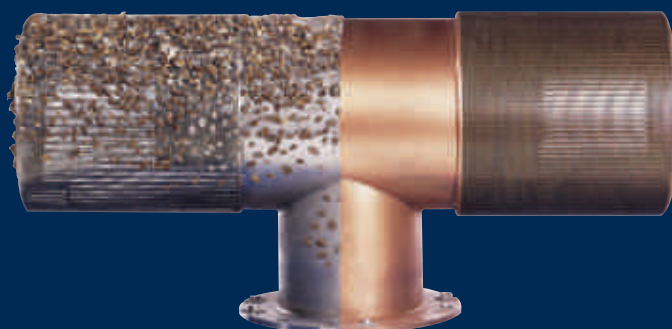
Half Intake Screens

As water demands expand for cities, towns and industry, shallow water resources previously hard to withdraw from due to their lack of depth, have now become a more viable option. The patented half screen has all the same attributes (low slot velocity, Hydroburst™ option, Vee Wire® etc.) as the standard passive intake screens but can operate in a much lower depth of water. The standard screen requires a half diameter clearance around the screen. The half screen sits flat on the bottom and only needs the top clearance.

JOHNSON SCREENS® Passive Intake Screen



JOHNSON SCREENS® Passive Intake Screen Z-Alloy



JOHNSON SCREENS® Half Intake Screen



Hydroburst™ with Surface Blast



Special Components

Fish protection is a key issue in the planning and operation of cooling water intake structures at rivers, seas and oceans, for hydropower plants and river pumping stations.



The EU flora-fauna-habitat guidelines are the foundation for establishing the necessary protection measures. GEIGER® and JOHNSON SCREENS® fish protection concepts are the result of the latest developments in mechanical and electrical engineering combined with decades of experience.

Our fish protection concept covers the following aspects:

- Electrical fish-repelling systems as behavioural barriers
- Meets environmentally-friendly guidelines
- Automatic fish retraction systems for bar and mesh screening machines
- Immobilisation of fish
- GEIGER MultiDisc® is particularly environmentally-friendly with specially shaped fish buckets

Shut Off Devices

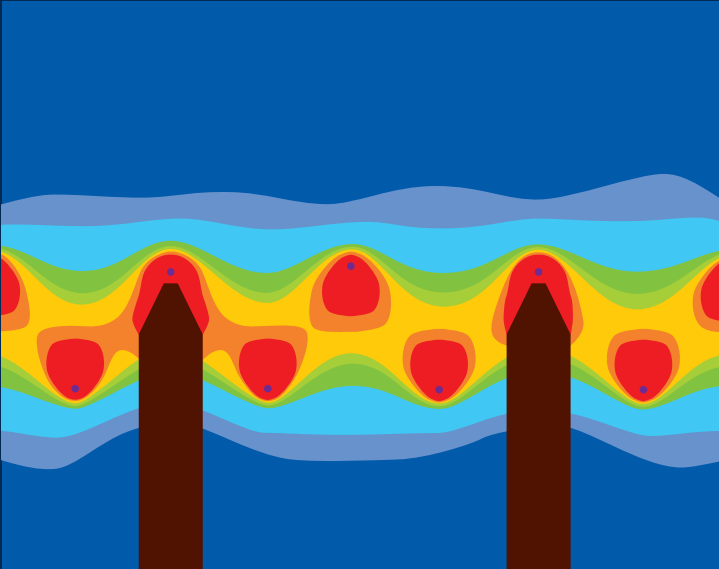
In water intake, Bilfinger Water Technologies sluice valves and stop logs are tailor-made and installed according to on-site requirements. They provide shut-off services for maintenance and revision work on the machines. Deluge valves enable pressure equalisation for easy lifting. GEIGER® stop logs are custom built to

withstand the rigours of different plants. Stop logs are of welded construction, manufactured from steel plate and feature-rolled steel sections. A pre-formed neoprene seal is fitted around the outer edge of the gate to ensure reliable sealing. The stop logs are equipped with valves through which the isolated chambers are flooded. Hence, the pressure is balanced and the stop logs can be withdrawn easily. Operators recommend our lifting beams as the valves are operated automatically, meaning there is no need for additional equipment such as spindles.

Cathodic Corrosion Protection

Cost-effectiveness in the design of mechanical equipment for water intakes not only depends on the right choice of machines. To ensure continuous reliable operation and value preservation, it is highly recommended to supplement careful and regular maintenance with a special plant protection system, particularly when the equipment is installed in aggressive environments. Cathodic corrosion protection is the most efficient method to protect steel equipment from natural corrosion in aggressive environments such as seawater. Bilfinger Water Technologies has decades of expertise in this field and holds patents for the protection of machines in saltwater to secure the machines' long-term economic value. These systems preferably use impressed current. They have been installed in 100s of desalination and power plants.

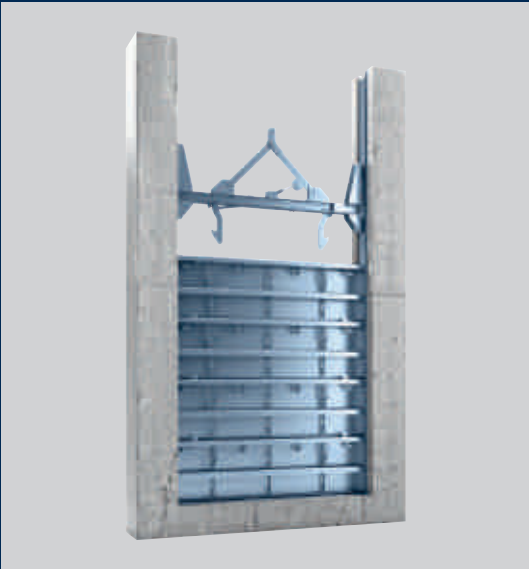
GEIGER® Fish Repelling System



PASSAVANT® Slide Gate



GEIGER® Stop Log with Lifting Beam



Systematic Quality Control



Services



A Team of Specialists for Individual Tasks

Bilfinger Water Technologies provide a wide range of services for the whole service life of a plant. These include manufacturing and supplying spare parts, fulfilling maintenance contracts and making plant revisions, as well as adapting equipment to meet modified site conditions. We also modernize plants, for example, by supplying lubrication-free chains and modern materials, as well as modifying existing guideways with wear ledges.

Dedicated and highly specialised teams of project engineers ensure that the customers' benefits are maximised, so that they profit from the know-how we have gained during decades of experience. We endeavor to solve even the most complex challenges with professional engineering – for both passive and open water intake, complemented by a variety of special features.

Systematic Quality Control

The systematic approach of the project teams ensures that each project is a success from start to finish. Expert advice, the choice of the appropriate technology, the adaptation of the systems to harmonise with the civil structures, and the machines' design and manufacturing are subject to stringent controls performed in accordance with the highest quality standards (for example, KTA 1401 and SCC**). Complete and detailed documentation and the spare parts service including their design and manufacture according to the latest technologies, ensure a long service-life and trouble-free operation.

Services

Our strong commitment to providing high-quality products and professional customer service is reflected in long-term partnerships with customers all over the world. Bilfinger Water Technologies offers a qualified service upon delivery on-site. The installation team is made up of committed and internationally experienced specialists, dedicated to providing installation of equipment, commissioning and training of operating personnel. The after-sales support team assists the customers by giving competent advice with regard to operation and maintenance work. Bilfinger Water Technologies product range is well-known for its high quality and long service life. Our mission is to provide a fast and effective response to all our customers.

JOHNSON SCREENS® Passive Intake Installation: Drinking Water Plant, in South Carolina, USA



GEIGER® Travelling Band Screens, Water Works Shanghai, China



GEIGER® Claw Screen, Power Plant Hemweg, Netherlands



References

Power Plant Moorburg, Germany

12 MultiDisc® Screens, 6 Cable-Operated Grab Cleaners,
Stop Logs, Fish Protection Technology

Nuclear Power Plant DC Cook, USA

15 MultiDisc® Screens, operating + control systems

RO-Desalination Plant Al Taweelah, UAE

24 x T54 316L Passive Intake Screens

Power Plant Al Taweelah "A", UAE

12 Cable-Operated Grab Cleaners,
12 Travelling Band Screens, operating + control systems,
Stop Logs, Cathodic Corrosion Protection System, accessories

RO-Desalination Plant Tampa Bay FL, USA

4 x T84 316L Passive Intake Screens, Hydroburst™ System

Desalination Plant: Tuaspring, Singapore

3 Stop Logs, 3 Travelling Band Screens, 3 Cable-Operated
Grab Cleaners, Cathodic Corrosion Protection System

Industrial Intake Office Chiller System, Hudson River, USA

2 x T Passive Intake Screens, Hydroburst™ System

WaterWorks Shanghai, China

12 Travelling Band Screens, operating + control systems,
2 Traversing Trash Raking Machines

Power Plant Qurayyah, Kingdom of Saudi Arabia

36 Revolving Chain Screens, specially designed equipment
for the removal of jellyfish

Desalination Plant Mirfa, UAE

2 Revolving Chain Screens, Stop Logs, 2 Travelling Band Screens,
Cathodic Corrosion Protection System

Power Plant Youssifiyah, Iraq

3 Cable-Operated Grab Cleaners, 3 Travelling Band Screens,
6 Stop Logs, operating + control systems, accessories

Nuclear Power Plant Brokdorf, Germany

8 Cable-Operated Grab Cleaners,
8 Revolving Chain Screens,
Cathodic Corrosion Protection System

Power Plant Atacama, Chile

4 Cable-Operated Grab Cleaners, Stop Logs,
4 Travelling Band Screens, Cathodic Corrosion Protection System

Power Plant Sousse, Tunisia

2 Cable-Operated Grab Cleaners, operating + control systems,
2 Travelling Band Screens, Cathodic Corrosion Protection System

Mining Plant, Sumbawa, Indonesia

4 MultiDisc® Screens, Cathodic Corrosion Protection System

Power Plant VC Summer, USA

6 MultiDisc® Screens,
2 Cable-Operated Grab Cleaners, Stop Logs

Power Plant Öresundsverket, Sweden

1 Traversing Cable-Operated Grab Cleaner, 3 Revolving Chain
Screens, 3 MultiDisc® Screens, Fish Repelling Device,
Cathodic Corrosion Protection System

Power Plant Zawia, Libya

4 Cable-Operated Grab Cleaners, 4 Travelling Band Screens,
2 sand removal units, Cathodic Corrosion Protection System

CCGT Power Plant Irsching, Germany

Fish Repelling System

Water Treatment Plant Solombala, Russia

Raking System with Climber Screen,
Belt Conveyor and Screenings Screw Press

RO-Desalination Plant Magtaa, Algeria

4 Travelling Band Screens, 4 Revolving Chain Screens,
Stop Logs, Cathodic Corrosion Protection System

Power Plant Guayaquil, Ecuador

2 Travelling Band Screens, operating + control systems

RO-Desalination Plant Torrevieja, Spain

5 x T60 Super Duplex Passive Intake Screens

Municipal Intake Clinton TN, USA

Half T-Intake Screen on guide rail, Hydroburst™ System

Power Plant, Diemen, Netherlands

2 Travelling Band Screens, Fish Protection System,
Cable-Operated Grab Cleaner, 2 Pen Stocks

Power Plant Milwaukee WI, USA

24 x T96 Z-Alloy Passive Intake Screens,
Hydroburst™ System

