



# Advanced Water & Wastewater Treatment Solutions

Extending Nature's Capacity

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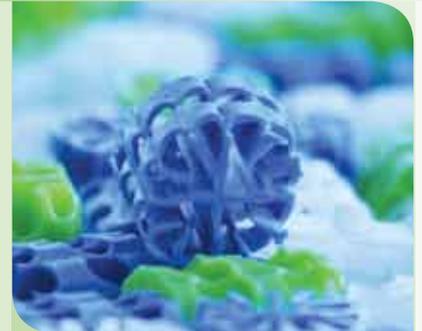
**A**qwise is a global industry leader in the development and implementation of innovative water and wastewater treatment solutions. Aqwise's innovative, field-proven technology reduces BOD levels and increases nutrient removal capabilities. Aqwise offers both aerobic and anaerobic solutions for a diverse range of industrial and municipal needs and delivers integrated, tailor-made solutions for both new and existing plants – from small scale compact units to large scale facilities. With hundreds of water and wastewater treatment plants successfully implemented worldwide, Aqwise project deployment methodology and wide range of services are designed to meet global clients' priorities and operational needs.



## The Technology

Aqwise solutions are based on a wide range of innovative biofilm-based processes. Aqwise's technology, a product of over a decade of multidisciplinary theoretical and practical research and development, positioned the company as a world leader in its field. Aqwise's solutions include:

- **AGAR® (Attached Growth Airlift Reactor)** aerobic solutions include AGAR® MBBR and AGAR® IFAS to enable efficient BOD removal and intensive nutrient removal for both municipal and industrial clients.
- **DACS® (Downflow Anaerobic Carrier System)** anaerobic solutions include the DACS® high-rate anaerobic process and the DACS® DANA process, to enable simple and effective removal of COD and energy recovery for various industrial sectors.



## Key Customer Benefits

### Municipal

- Keep pace with evolving regulation
- Upgrade aging infrastructure and retrofit existing facilities
- Reduce operation and maintenance costs
- Scale operations to cope with growing population
- Restore contaminated ground and surface water sources

### Industry

- Comply with industry regulatory requirements for wastewater discharge
- Handle variable inflow, seasonal peaks and high organic loads
- Simplify daily operation and treatment process
- Increase of water reuse up to zero liquid discharge (ZLD)
- Reduction of energy costs and energy recovery



## Professional Services

Aqwise offers its global clients and partners a wide range of professional services through versatile business models.

- Site survey and field-piloting
- Start-up and commissioning
- Operators training
- Ongoing technical support
- Process design and optimization
- Turn key projects
- Operation and management
- Project financing



# Municipal Solutions

Aqwise solutions enable municipalities to keep pace with urban population growth, increasing regulatory requirements, and the need to reduce daily operation and maintenance expenses and overhead. Aqwise delivers cost-effective technology which helps municipalities to increase treatment capacity, and improve effluent quality with minimal civil works, while adding little or no treatment volume.

## Large Scale Solutions and Retrofits

Aqwise solutions, based upon highly advanced biological processes, enable municipal clients to deal with a variety of challenges, such as strict nutrient removal standards as well as space limitations, and produce high-quality effluent for discharge or reuse. The solutions may be implemented within an existing wastewater treatment plant, or designed and constructed as greenfield plants in a number of configurations, depending on local conditions and requirements.

## Small & Medium Scale Solutions

Aqwise offers innovative, compact, easy to deploy and simple to operate package plants. The package plants may be offered as pre-assembled or containerized units, which are designed to take advantage of the simplicity and small footprint of the AGAR® technology. Aqwise package plants provide a perfect solution for clients in remote or isolated locations who require to treat and dispose of wastewater with minimal operator attention.

The containerized units are available in 20 ft. and 40 ft. configurations treating up to 200 m<sup>3</sup>/d with nutrient removal.

- Small or remote communities
- Industrial and touristic parks
- Hotels and resorts
- Gas stations and rest areas
- Marine Oil & Gas platforms
- Mining and construction sites



**Municipal, Upgrade – Mexico** (58,300 m<sup>3</sup>/d)

- Doubling plant capacity
- No expansion of reactor volume
- Achieving industry reuse water quality



**Municipal, Greenfield – Israel** (5,000 m<sup>3</sup>/d)

- AGAR® IFAS configuration
- Intensive nutrient removal
- Scalability for future upgrades



**Package Plant – Israel** (100 m<sup>3</sup>/d)

- Containerized plug-and-play solution
- AGAR® MBBR configuration
- Proprietary Aqwise Media Clarifier

## Value Proposition

- 🔧 **Ideal retrofit solution with minimal civil works**
- 💡 **Simplicity of operation**
- 🔬 **High Biological Nutrient Removal (BNR) capabilities**

# Industrial Solutions



**Paper mill, Greenfield–Portugal (1,200 m<sup>3</sup>/d)**

- Small footprint
- DAF-MBBR-DAF configuration
- Scalable and flexible design



**Beverage plant, Greenfield–Spain (600 m<sup>3</sup>/d)**

- Process stability for seasonal peaks
- Treatment of high organic loads
- Meeting space limitations



**Pharmaceutical plant, Upgrade–Italy (350 m<sup>3</sup>/d)**

- Minimal plant downtime
- Adapting to variable production processes
- Resistant to toxic shocks

Water and wastewater treatment for the industrial sector requires an in-depth understanding of industry-specific production processes, compliance with applicable local regulations, integration with physical and chemical processes, and high-level of expertise to ensure maximum quality effluent for discharge and reuse up to Zero Liquid Discharge (ZLD).

Aqwise's solution portfolio is suitable for deployment in a variety of industries, demonstrating process stability in harsh and variable conditions, adapting to ever-changing production needs.

**Pulp & Paper** is an industry which is renowned for its high water consumption. It is required to meet high levels of wastewater treatment to allow safe discharge and reuse in the production. Aqwise can provide anaerobic, aerobic and hybrid solutions to meet these needs and effectively utilize water and energy resources.

**Food & Beverage** is a highly diverse industry, and is characterized by variable production processes generating highly loaded wastewater streams and seasonal peak loads. Aqwise offers unique anaerobic and aerobic solutions, which allow plants to meet stringent discharge limits, while ensuring year-round process stability.

**Chemicals & Pharmaceuticals** are industries which consist of complex production processes, and harsh wastewater composition including inhibiting compounds and high salinity. Aqwise expertise in non-standard aerobic technologies offering high resistance to toxic and organic shocks, provide clients with simple and reliable plant operation.

**Oil & Gas** is an industry which is characterized by high concentrations of fat, oil and grease, as well as soluble organic material such as phenols and aromatic compounds. Aqwise offers and integrated solution for refineries and oil processing, combining intensive solids separation followed by aerobic treatment. This enables scalable facilities anticipating future growth needs.

**Aquaculture** is a rapidly developing industry. Intensive fish ponds and hatcheries are challenged to achieve high levels of water reuse, requiring unique and efficient treatment for ammonia, COD and solids separation. Aqwise offers tailor-made biological processes and clarification solutions allowing this industry to meet these challenges at a sustainable manner.

## Value Proposition



**Process stability in variable conditions**



**Resistance to toxic and organic shocks**



**Water reuse and energy recovery**

# Drinking Water Solutions

Potable water is becoming scarce worldwide due to increased demand, population growth and a decline in the availability and quality of water sources due to contamination and over-production. The clean water shortage drives water utility companies and consumers to search for new, efficient and sustainable ways to utilize existing water resources.

Biological treatment is fast becoming an industry standard for treatment of drinking water. Most other treatment methods including Reverse Osmosis, Electrodialysis and Ion Exchange separate and transfer the pollution into a concentrate stream, while biological treatment actually solves the problem.

## Surface Water

Rivers, lakes and ponds are a major and highly accessible sources of fresh water for small and large communities. Over the years various contaminations polluted these valuable sources and may pose a public health hazard. Aqwise solutions effectively treat such water sources, contaminated with ammonia and low load BOD.

Aqwise AGAR® technology is implemented in a large-scale project in India, providing clean potable water from the Yamuna River for over two million inhabitants of Agra, home of the famous Taj Mahal. This project is one of the largest MBBR applications in the world.

## Ground Water

Thousands of drinking water wells worldwide have been closed due to contaminations which origin in various sources, mainly due to use of fertilizers and industrial activity. Aqwise proprietary biological solution for well remediation meets the highest global health standards (EPA, EU), while utilizing advanced on-line monitoring and control systems. A major advantage of the solution is that it produces no brine which needs to be removed, which makes the treatment sustainable and viable also in places where brine disposal is highly expensive or not possible.

Main applications:

- Nitrate-contaminated well water
- Various pollutants, such as Selenium, Perchlorates and explosives
- Nitrate-rich brine streams



**River water treatment—India** (163,000 m<sup>3</sup>/d)

- AGAR® MBBR and UF membrane polishing
- Low-load potable water application
- Adaptive to variable loads



**Well water treatment—Israel** (1,300 m<sup>3</sup>/d)

- Denitrifying AGAR® MBBR and UF polishing
- Minimal footprint
- No residual brine

## Value Proposition



**No Brine for disposal**



**Low energy costs**



**Scalable design for changing conditions and regulations**

# Aerobic Treatment

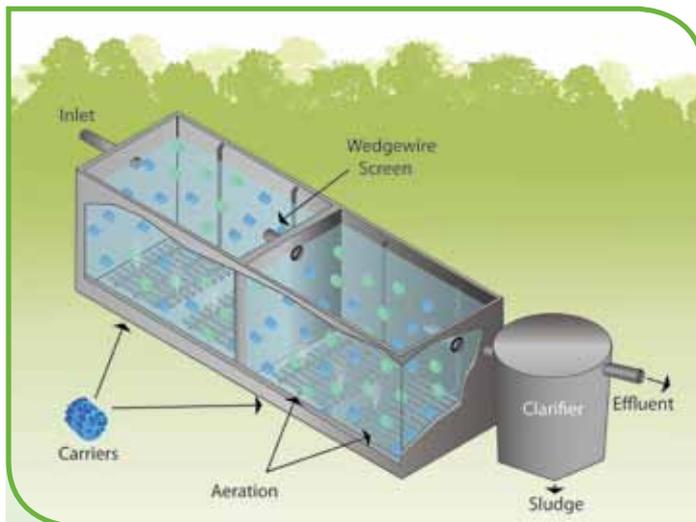
## AGAR® Solutions

Aerobic treatment for water and wastewater is highly effective and widely in use worldwide. Aqwise AGAR® (Attached Growth Airlift Reactor) technology is a proprietary process that utilizes biofilm grown on carrier media which aerobically degrade soluble organic pollutants in wastewater.

The process consists of a biological reactor, usually divided into a few stages, filled with floating biomass carriers, a screen to prevent downstream migration of the carriers and an aeration grid or a mechanical mixer.

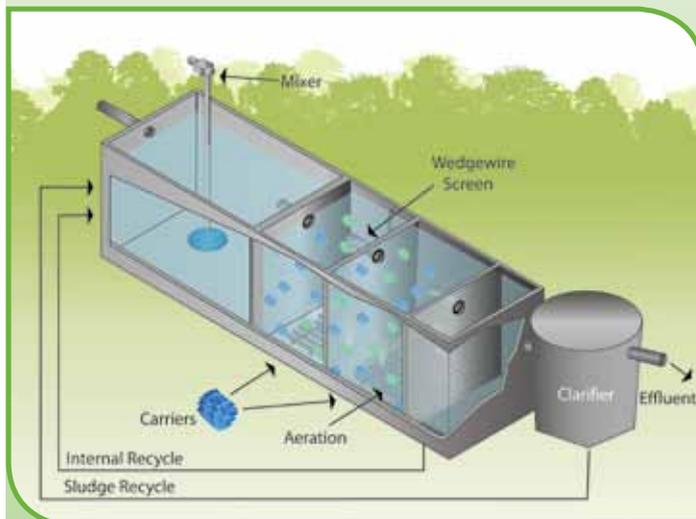


**The core elements of the process** are the proprietary design parameters, based on field-proven mathematical models, and the Aqwise Biomass Carriers.



### AGAR® MBBR

The AGAR® MBBR (Moving Bed Biological Reactor) technology is a simple, single-through process, where all biological activity takes place on the biomass carriers. This process prevents sludge recycle from a secondary clarifier. MBBR technology is robust and reduces soluble pollutants with minimal process complexity. MBBR solutions also utilize a significantly smaller physical footprint compared to conventional aerobic treatment methods. MBBR is typically used for either high load industrial applications, as stand-alone or as a buffer stage, as well as for robust simple-to-operate municipal facilities.



### AGAR® IFAS

The AGAR® IFAS (Integrated Fixed-film Activated Sludge) process combines conventional activated sludge technology and biofilm systems into a single reactor. In general an IFAS configuration is similar to an activated sludge plant, with biomass carriers utilized in specific stages of the process. This creates a synergy between two distinct biological processes: the MLSS degrades most of the organic load (BOD), and the biofilm creates a strong nitrifying population for oxidation of the nitrogenous load. IFAS is typically used to upgrade existing plants to enhance nitrogen removal, or in the design of new plants to enable extensive BOD and nitrogen removal.

# Anaerobic Treatment

## DACS® Solutions

Anaerobic biological treatment for wastewater is a very effective technology, particularly for heavily loaded large-scale industrial applications, mainly in the Food & Beverage and Pulp & Paper markets. In anaerobic conditions, wastewater is converted into biogas with low excess sludge, hence presenting a highly cost-effective treatment method. However, the process requires relatively large initial capital expense and is considered quite sensitive.

DACS® (Downflow Anaerobic Carrier System) is a truly innovative breakthrough in the field of anaerobic wastewater treatment. It is a patented high rate anaerobic process utilizing Aqwise Biomass Carriers at a unique hydraulic pattern, resulting in a highly flexible design and stable performance.

- Very large surface area for enhanced biological activity ( $650 \text{ m}^2/\text{m}^3$  effective area)
- Highly open external design for optimal mass transfer of substrates
- Applicable for various biological processes – aerobic (BOD, nitrification), anoxic (denitrification) and anaerobic (high load COD)

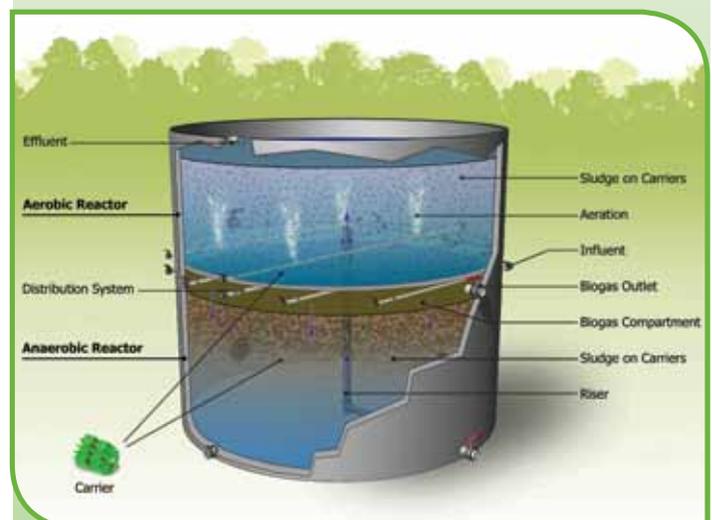
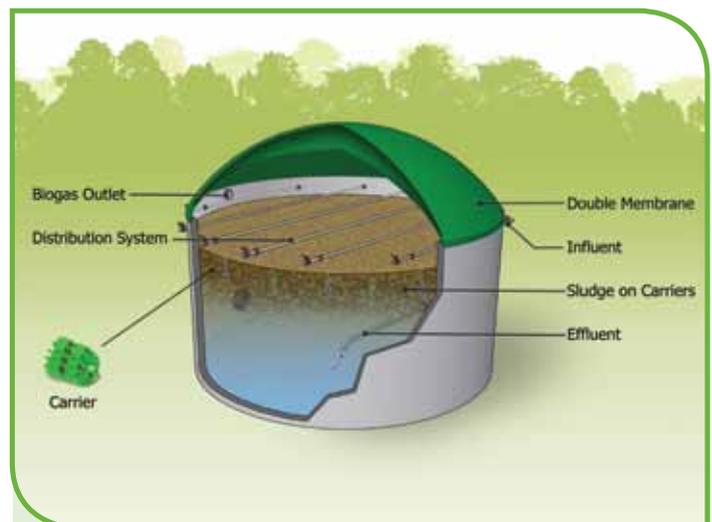
## DACS®

The main advantage of this technology stems from the use of a down flow distribution method of the wastewater on to Aqwise Biomass Carriers as media for anaerobic bacterial attachment. The end result is a smaller footprint, more robust process with superior performance when compared to conventional anaerobic systems. Moreover, this approach enables industrial clients to use ready-available tanks, in various forms, shapes and structure materials, as well as the ability to retrofit existing reactors into an anaerobic process. The return on investment for these clients significantly improves. DACS® is therefore expanding the anaerobic market and providing also small to medium industrial plants, with an access to this technology.

## DACS® DANA

The DACS® DANA (Dynamic Anaerobic Aerobic) hybrid process provides an end-to-end solution for clients with high- load wastewater that are required to meet stringent discharge or reuse limits. In this configuration the anaerobic DACS® reactor is followed by an aerobic polish of an AGAR® MBBR reactor. The flexibility of the DACS® reactor geometry allows putting the aerobic reactor on top of the anaerobic one, thus significantly reducing overall system footprint, a significant advantage for industrial facilities with limited space.

Moreover, streamlining the two processes supplied by a single vendor provides the client with a “one-stop-shop” approach and full integration of biological processes.





## Aqwise Eco-Friendly Approach

Aqwise solutions enable retrofit, reuse and recycling of existing equipment, materials and resources. The company's entire range of processes and products is designed to generate a minimal physical footprint and ensure a non-intrusive impact on the environment. Aqwise's technology provides clients with cost effective and environmentally-friendly solutions.

[info@aqwise.com](mailto:info@aqwise.com) | [www.aqwise.com](http://www.aqwise.com)

## Technology Advantages

- 💰 Cost efficient
- 👣 Small footprint
- 🕒 Fast deployment
- 📄 Scalable & simple operation
- 💡 Flexible & innovative technology
- ⚡ Durable & stable
- 🌱 Intensive nitrification
- ☁️ Environmentally friendly

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Clear and Simple