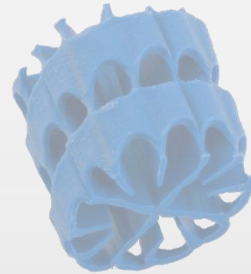
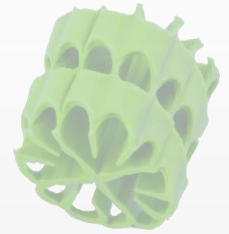




Advanced Water and Wastewater Treatment Solutions



Aqwise Presentation
September, 2020



Global Water Market Trends

↑ UPWARD TRENDS



Environment
Awareness

Policy &
Regulation

Energy
Costs

Disposal
Costs

Fresh Water
Prices

↓ DOWNWARD TRENDS



Accessible
Fresh Water

Land
Availability

Infrastructure
Quality

Common Technologies for Wastewater Treatment

Extensive

Oxidation Ponds



Low O&M cost
Simple to operate

Lower quality effluent
Operational problems – odors
Large space / land requirements

Intensive

Attached Growth



Simple to operate
Resistant to shock loads
(Industrial wastes)
Small footprint
Lower quality effluent
Operational problems
(odors, clogging)

Suspended Growth



Good treatment capabilities
Larger footprint
More complex to operate
Less resistant to shocks

Innovation That Works

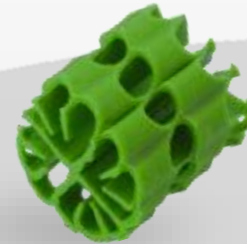
Aqwise Biomass Carriers protect biofilm against abrasion and ensure mass transfer efficiency

Recycled, high-density
polyethylene

Highly open
external design

High effective
surface area
of $650 \text{ m}^2/\text{m}^3$

Optimal oxygen and
nutrients transfer



Aqwise Biomass Carriers – per stage in MBBR reactor



Stage 1



Stage 2



Company Highlights

About Aqwise

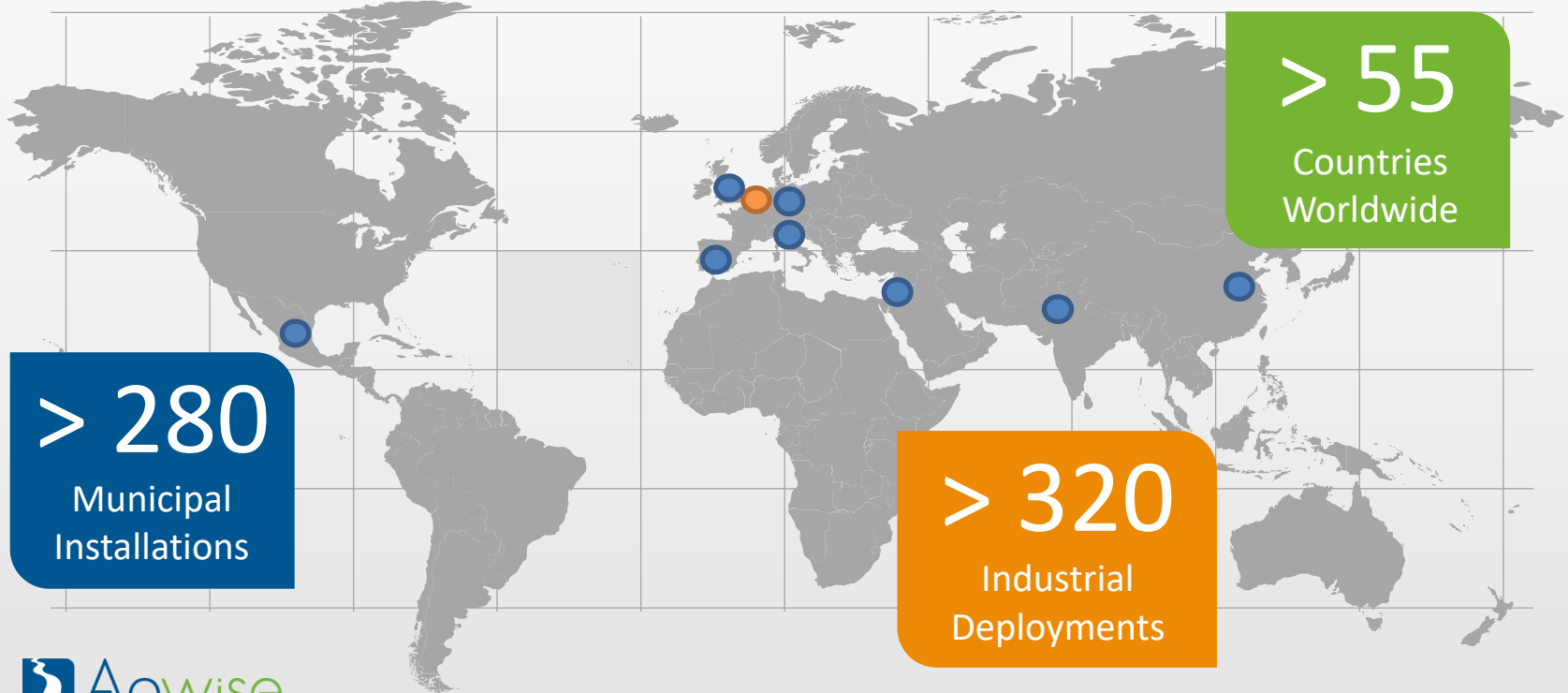
Aqwise is an industry leader in advanced bio-film based wastewater and water treatment technologies



- **Expertise**
 - Strong biological process know-how
 - Multi-disciplinary expert staff
 - Engineering knowhow to execute Turnkey projects, around the globe
- **Global Reach, Local Presence**
 - Over 600 installations in 55+ countries
 - World-wide regional offices, sales representatives and partners

Global Solution Provider

Aqwise is a trusted solution provider for municipal and industrial customers

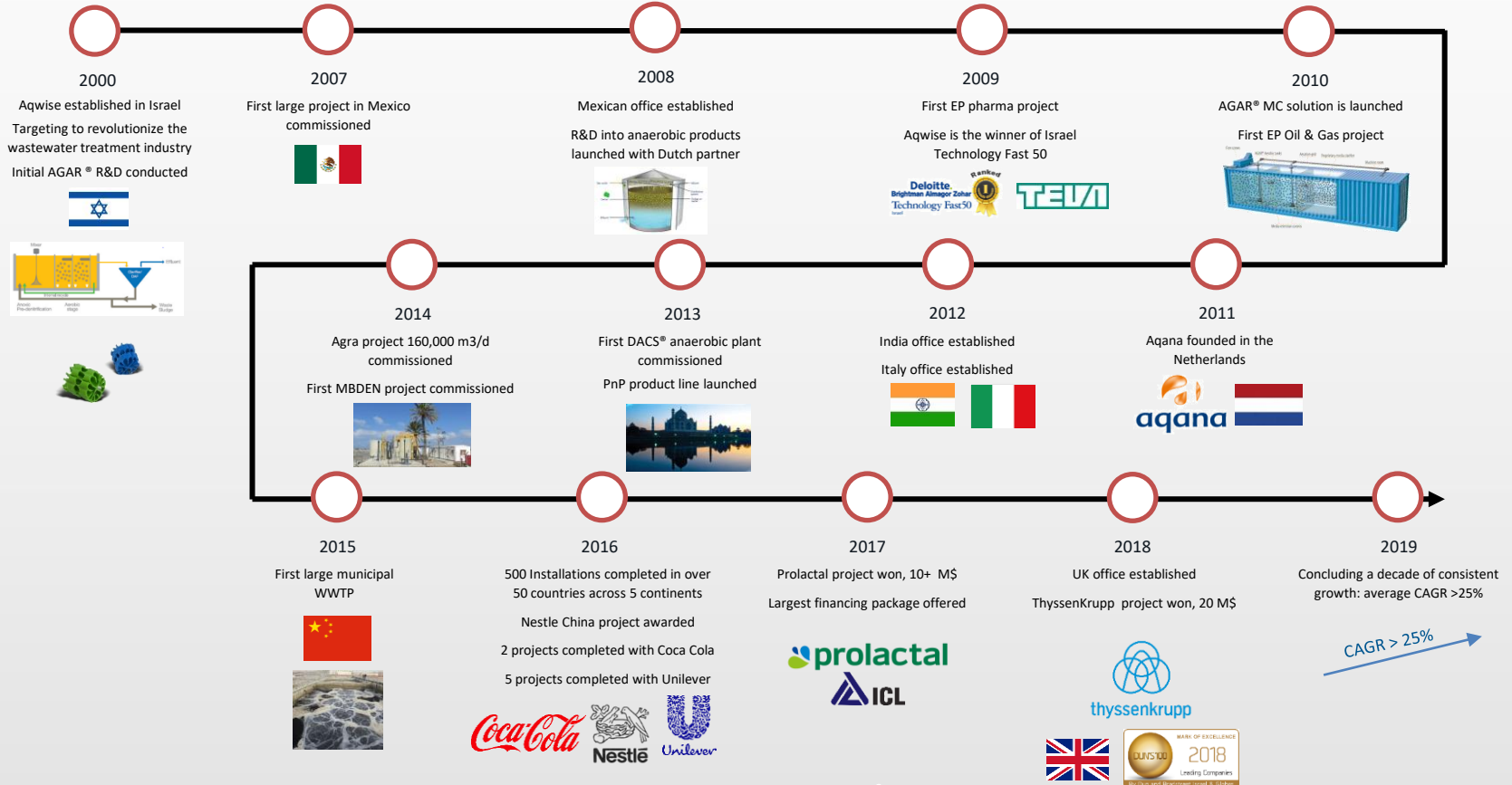


> 280
Municipal
Installations

> 55
Countries
Worldwide

> 320
Industrial
Deployments

Company Development



Aqwise - Leading MBBR Solution Provider



- **Strengths**
 - In-house design of MBBR for over 20 years, with self-developed design software
 - Experience in wide range of applications
 - Proprietary Biomass Carrier, with unique geometry and characteristics
- **Market Position**
 - Second only to Veolia (Kaldness) in number of installations
 - Global reach, serving Tier 1 clients
 - Largest MBBR @ 163 MLD

Global Impact

LA FORMA DELL'ACQUA

Qualcosa cambia e comincia ad essere più facile e sicuro bere acqua pulita. Grazie ad una nuova tecnologia di filtrazione, la forma dell'acqua cambia e comincia ad essere più facile e sicuro bere acqua pulita.

ראיון עם אלעד פרנקל - יו"ר כנס הוולק 2017

האירוע יתקיים ב-15 בנובמבר במלון סטריט סטארט באזור תל אביב. פרנקל ידבר על התקדמותי פרויקט הוולק ופיתוחי טכנולוגיית ה-Aqwise.



15 अक्टूबर • 07 सुबह 2017 हिन्दुस्तान 1978 में सोलोमन द्वीप द्वि

आगरा में यमुना जल पीने लायक बना रहा इजरायल

दिल्ली-आगरा जल

आगरा में यमुना जल पीने लायक बनाने के लिए इजरायल की मदद ली जा रही है।

इजरायली-आगरा की स्वच्छता

आगरा में यमुना जल पीने लायक बनाने के लिए इजरायल की मदद ली जा रही है।

2016 में आगरा उपखण्ड पर इजरायल के एग्रीकल्चरल डेवलपमेंट प्रोग्राम (एडीएड) के अंतर्गत एक प्रयोग करवाया गया था।




इजरायली एग्रीकल्चरल डेवलपमेंट प्रोग्राम (एडीएड) के अंतर्गत एक प्रयोग करवाया गया था।







Proven Track Record of Success

 Over 600 installations worldwide

 Municipal:

-  New plants
-  Upgrade
-  Expansion

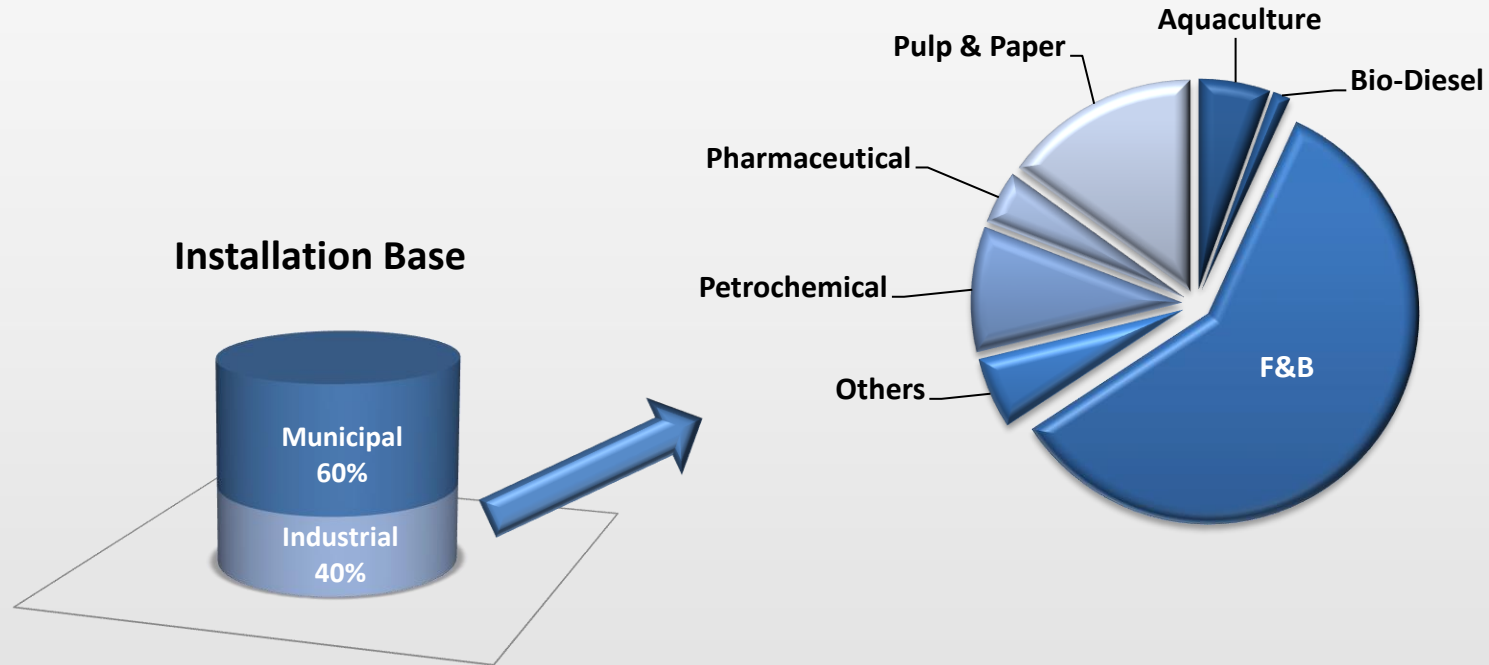
 Industrial:

-  Food & Beverage
-  Pulp & Paper
-  Pharmaceutical
-  Oil & Gas



Proven Track Record of Success

Over 600 diverse installations worldwide



Aqwise Solution Portfolio

Aqwise supplies adaptable technology and tailor-made solutions for the global markets



DRINKING WATER

- Surface water treatment
- Ground water treatment
- Environmentally-friendly approach to treatment of a variety of pollutants



MUNICIPAL / INDUSTRIAL

- New and upgrade installations
- High strength wastestreams
- Wide range of industries
- Full water reuse – irrigation / industry



AQUACULTURE

- New and upgrade systems
- Large or small scale facilities
- Closed water cycle

Large Scale Municipal Solutions

Aqwise solutions include implementation of new plants and upgrade of existing facilities



- Small reactor footprint
- Minimal civil works
- Retrofit of existing plants
- Simple Operation & Maintenance
- Expansion of flow capacity

Industrial Solutions

Aqwise has a proven track record in a wide range of industrial sectors



Pharmaceuticals and Chemicals



Pulp and Paper



Oil and Gas



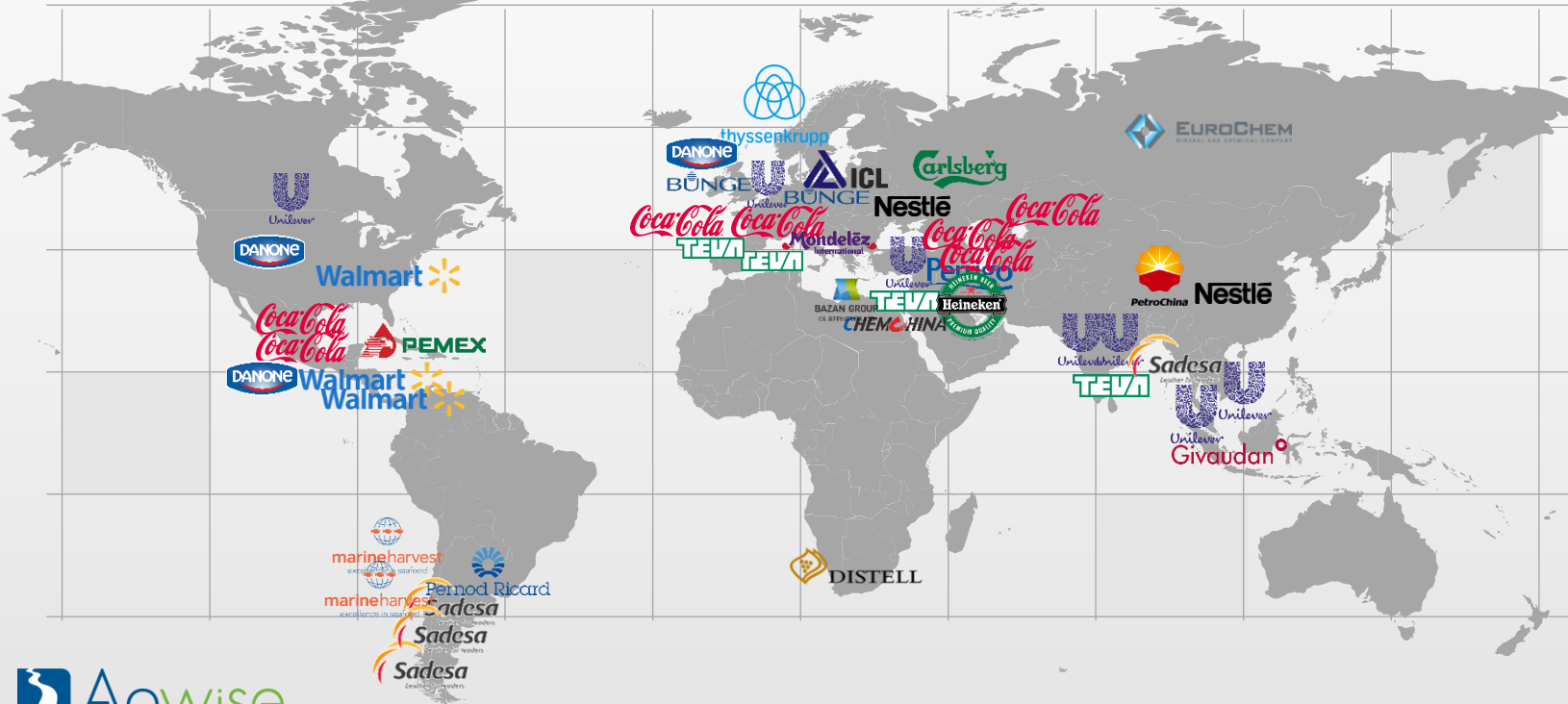
Food and Beverage



Aquaculture

Aqwise
Clear and Simple

Serving Global Tier-One Clients



Customer Benefits



SMALL FOOTPRINT

Suitable for both new applications and existing plant upgrades



DURABLE & STABLE

Highly resistant to hydraulic shock loads with short recovery time after toxic loads



COST EFFICIENT

Requires minimal civil works, short project life cycle and low CAPEX/OPEX



LOW MAINTENANCE

Simple process control
Low maintenance & operational costs



SCALABLE & FLEXIBLE

Smooth upgrade or gradual expansion based on just-in-time investment



ECO FRIENDLY

Carriers manufactured from recycled HDPE, minimal land usage, reduced sludge generation

Business Models

Aqwise offers a wide range of business models to fit customer needs



Turn-Key Project

Full project management and implementation



Package Plant

Compact containerized and pre-fabricated solutions



Process Package

Technological process design services, carrier and equipment supply



Financing

Tailor-made financial models to meet customer budget requirements



Professional Services

Pilot Services, process supervision up to full Operation & Maintenance

Project Management

Aqwise implements recognized industry standard project management methodologies



Research & Development

Aqwise is actively involved in the development of new and innovative biological solutions



Aqwise Laboratories



Field Test Facilities

- **Research Facilities**

- Advanced Research & Development center located in Israel
- Biological process excellence center

- **Wastewater Treatment**

- Development of new biological processes for treatment and compliance to new standards

- **Drinking Water**

- Focus on efficient treatment of various pollutants



Technological Solutions

Technology Highlights

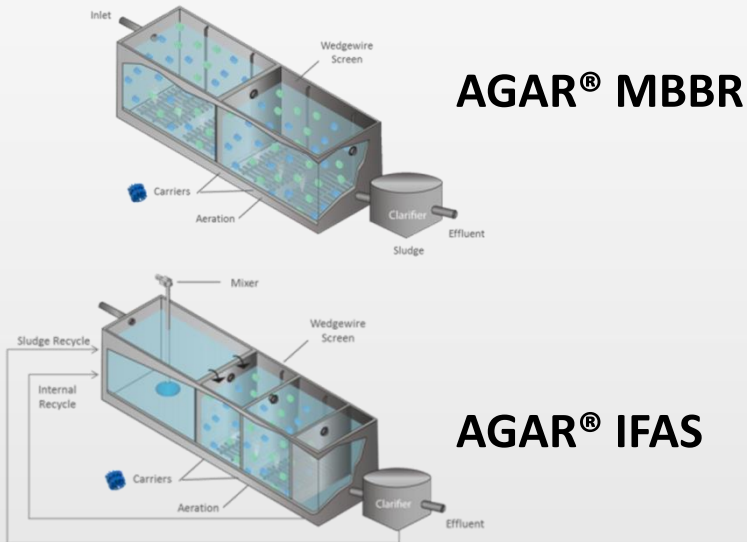
Aqwise technology is the result of over a decade of multidisciplinary research and development



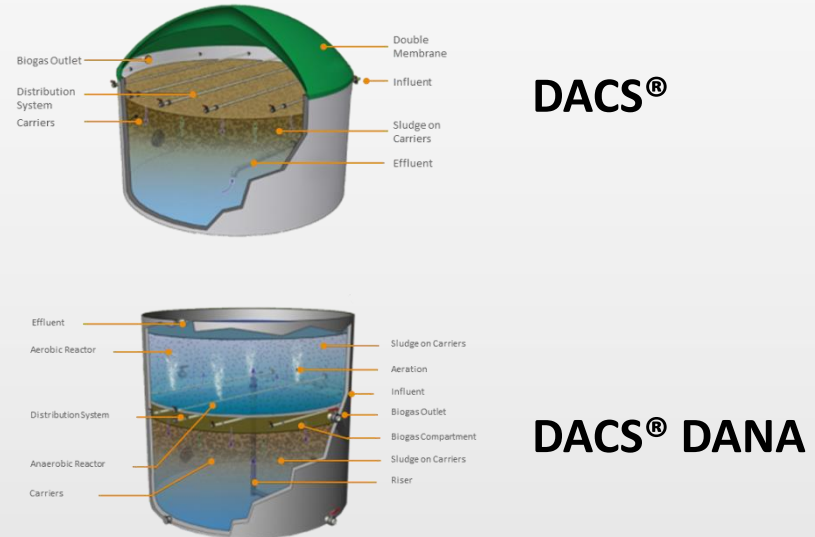
- Innovative biofilm-based technologies
- Strong IP portfolio
- Unique proprietary know-how
- Cost efficient, scalable, and eco-friendly
- Field-proven in diverse applications
- Ongoing R&D and piloting for new applications

Diverse Biological Processes

AGAR[®] Aerobic Processes

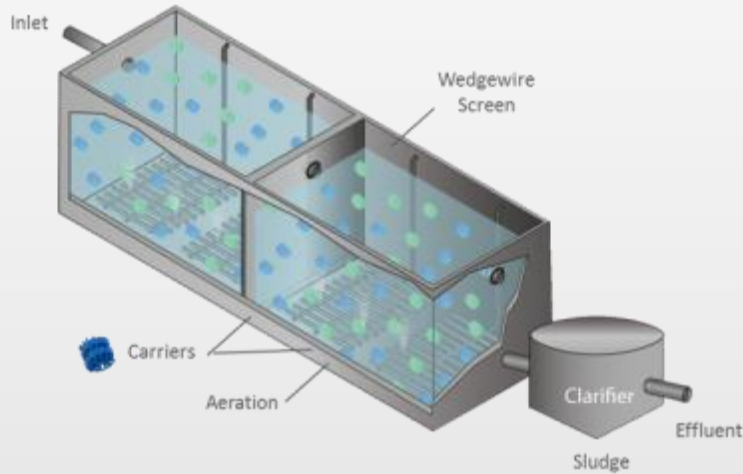


DACS[®] Anaerobic Processes



Aerobic Technology

Moving Bed Biological Reactor



AGAR® MBBR Solutions

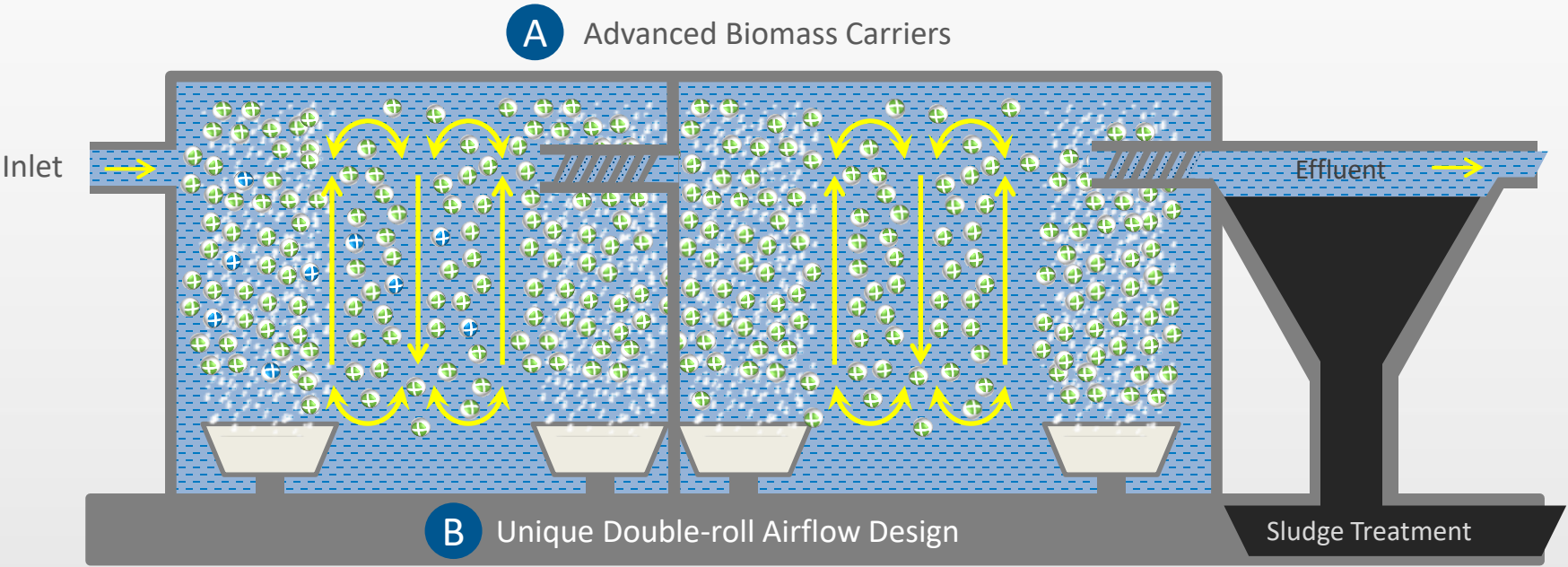
- Simple, single-pass process
- Reduces soluble organic pollutants with minimal process complexity
- Requires a significantly smaller footprint in comparison to suspended growth technologies (SBR, ASP)

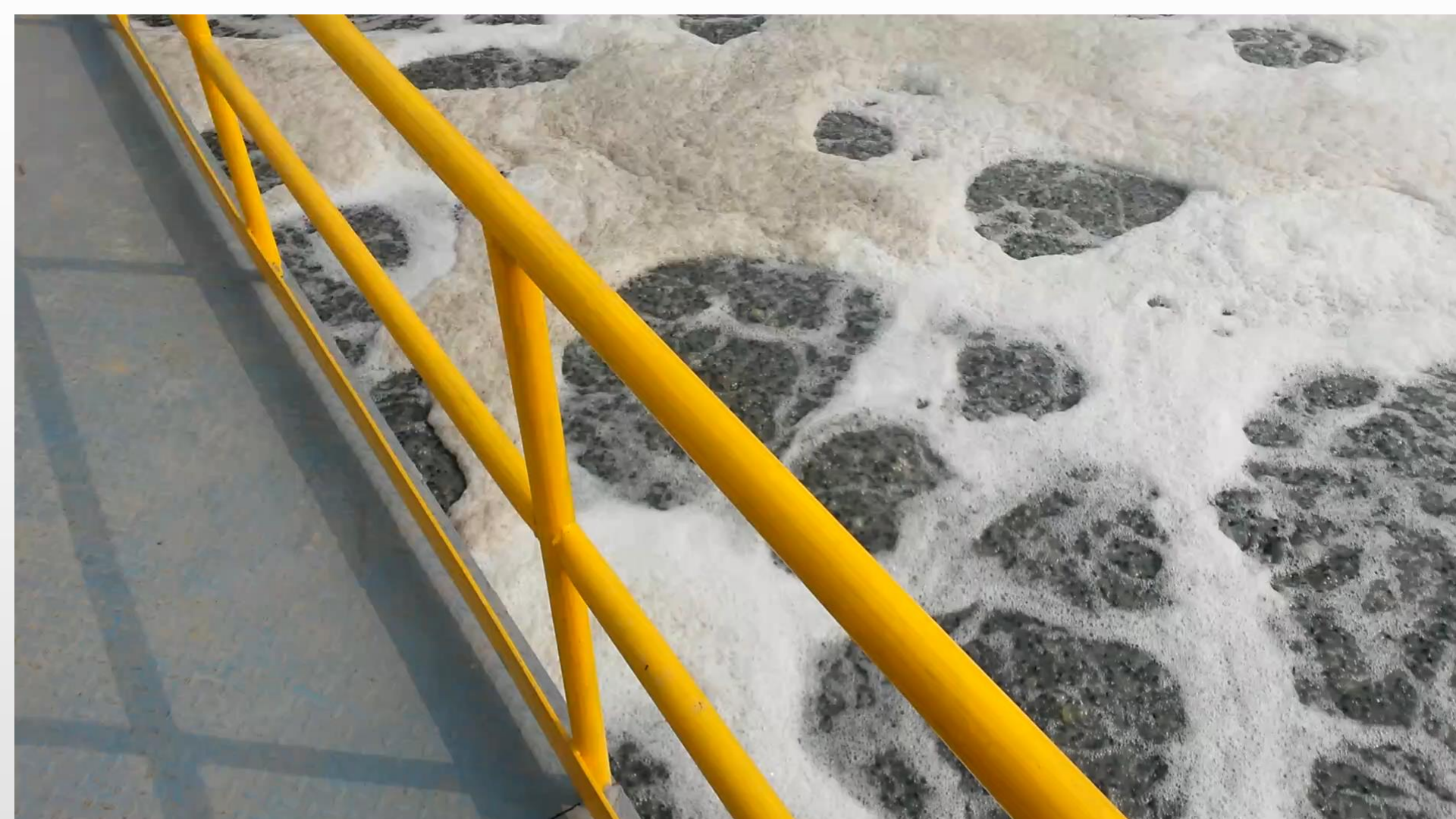
Aqwise Biomass Carriers - ABC



- High effective surface area for biofilm growth : $650 \text{ m}^2/\text{m}^3$
- Openings in outer circumference create **turbulent flow within the carrier**, and minimize distance to biofilm from to 0 - 3 mm across the entire media.
- 10 year guarantee for mechanical integrity of the carrier, from **HDPE**

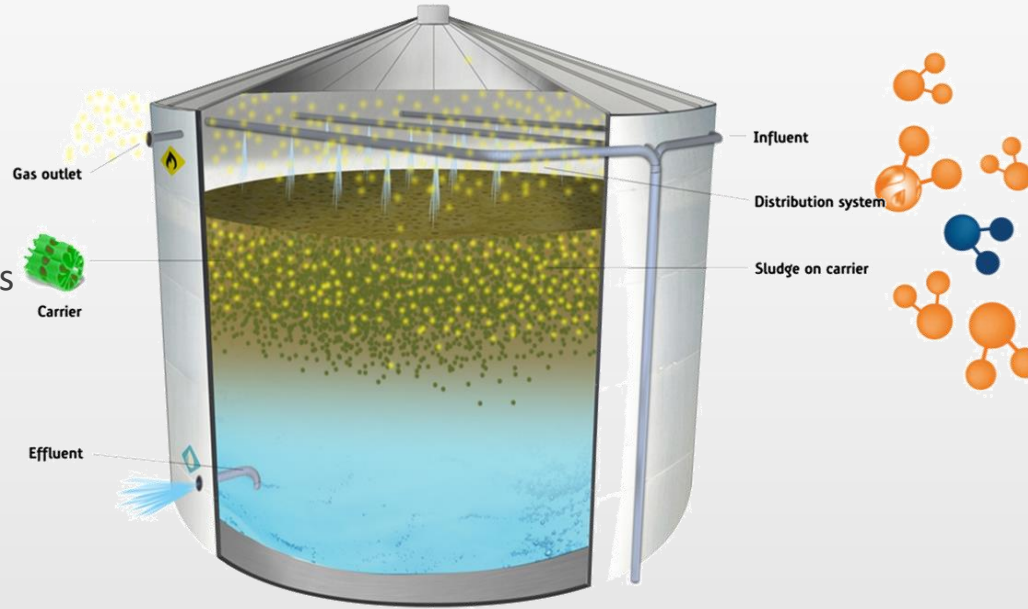
AGAR[®] Technology Overview





DACS[®] Downflow Anaerobic Carrier System

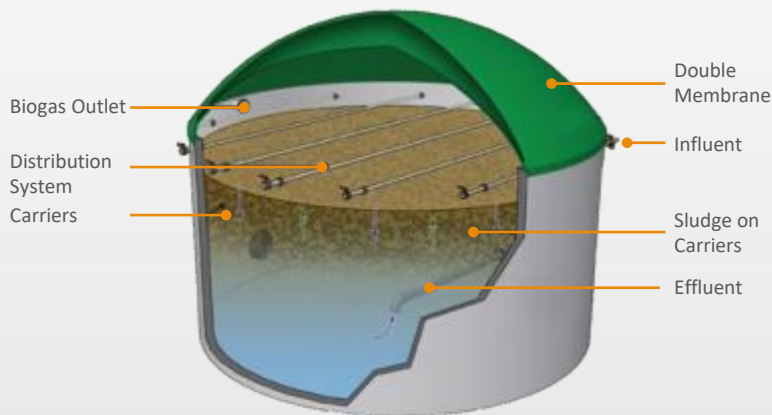
- high rate anaerobic process
- simple + robust design
- **Downflow carrier bed – NO granular sludge required!**
- High methane concentrations in biogas through reduced CO₂ stripping
- Strongly reduced risk of scaling
- None to low caustic consumption



SHARING WASTEWATER SOLUTIONS

Anaerobic Technology

Downflow Anaerobic Carrier System



DACS[®] Solutions

- Suitable for heavily loaded industrial applications
- Downflow distribution of wastewater on to layer of biomass carriers
- Very fast Return On Investment through energy generation and savings on energy and sludge disposal costs



Selected Case Studies – Municipal MBBR

Case Study: Shaya WWTP – MBBR-BNR @ 20 MLD



Shaya, Xinjiang Province, People's Republic of China



HIGHLIGHTS

- Customer: Elof Hanssen
- Location: Shaya County, Xinjiang Province, PRC
- Capacity: 20,000 m³/d



REQUIREMENTS

- Expansion of existing treatment plant serving Shaya County – addition of new line with capacity of 20 MLD.



SOLUTION

- Construction of new WWTP – MBBR-BNR.
- 2 lines in parallel configuration – 10 MLD each.
- Aqwise supply included biomass carriers, MBBR screens, mechanical mixers for anoxic zones, clarifier scraper mechanisms, sludge conveyors

Case Study: Municipal WWTP Upgrade



HIGHLIGHTS

- Customer: Severn Trent Services
- Location: Robecco Sul Naviglio, Milano, Italy
- Capacity: 140,000 m³/d



REQUIREMENTS

- Need to expand WWTP capacity (from 96,000 m³/d)
- Upgrade for the removal of nitrogen and phosphorus in addition to improved reduction of BOD5, COD and TSS



SOLUTION

- ASP converted to MBBR, 2 parallel lines
- Successfully commissioned : July, 2015



Severn Trent Italia S.p.A.
Sede Legale e Operativa
Via Ticino, 9
25015 Desenzano del Garda (BS)
Italia

T: +(39) 030.999.0553
F: +(39) 030.999.0563

TO WHOMSOEVER IT MAY CONCERN www.severntrentitalia.it

We hereby confirm the followings with reference installed by us for ROBECCO SUL NAVIGLIO (MI) ITALY, waste water treatment plant upgrade project:

MBBR supplied by: AQWISE WISE WATER TECHNOLOGY Ltd.

Installation: ROBECCO SUL NAVIGLIO (MI) ITALY.

Water utility: CAP HOLDING.

Plant capacity: 140,000 mc/day.

People Equivalent: 320,000.

Configuration : MBBR (Moving Bed Biofilm Reactor). Plant has two identical line. Each MBBR line has introduced ABC5 Bio Carrier(Aqwise Biomass Carrier type5).

Plant commissioning: successfully commissioned in June – July 2015.

Sincerely,

(Alessandro Colombo, C.E.O.)

Case Study: Common Effluent Treatment Plant Upgrade



HIGHLIGHTS

- Customer: SK UEM
- Location: Haridwar Industrial Estate
- Capacity: 4,500 m³/d



REQUIREMENTS

- Upgrade of existing plant to accommodate fluctuating inlet parameters



SOLUTION

- New MBBR Tank, between existing primary clarifier and activated sludge reactor
- Industry reuse water quality



Case Study: Municipal Plant Upgrade



HIGHLIGHTS

- Customer: Monclova Municipality
- Location: Mexico
- Capacity: 58,000 m³/d



REQUIREMENTS

- Upgrade of existing plant from 30,000 m³/d to 58,000 m³/d



SOLUTION

- Conversion of existing ASP to AGAR[®] IFAS configuration
- No reactor expansion
- High quality effluent for industrial reuse in local steel plant



Monclova, Mexico

Case Study: Treatment Plant Expansion



Gambolo WWTP, Italy



HIGHLIGHTS

- Customer: City of Gambolo
- Location: Italy
- Capacity: 12,000 m³/d



REQUIREMENTS

- Expansion of existing treatment plant from 6,000 m³/d to 12,000 m³/d, and improve quality to achieve TN < 15 mg/l



SOLUTION

- Conversion of ASP reactor to AGAR[®] IFAS configuration, in single reactor
- No reactor expansion
- Second DAF added after existing clarifier - to accommodate increased flow and provide better quality effluent

Case Study: Treatment Plant Expansion



Pinthong Industrial Estate, Thailand



HIGHLIGHTS

- Customer: Pinthong Industrial Estate
- Location: Thailand
- Capacity: 4,000 m³/d



REQUIREMENTS

- Expansion of existing treatment plant from 2,000 m³/d to 4,000 m³/d



SOLUTION

- Conversion of 4 x ASP reactors (in parallel) to AGAR® MBBR in 1 reactor, followed by 3 x ASP in parallel
- No reactor expansion
- Second clarifier added to accommodate increased flow



Selected Case Studies – MBBR for Water Treatment

Case Study: Surface Water Treatment



HIGHLIGHTS

- Customer: Triveni Engineering & Industries
- Location: Agra, – treating Yamuna River water
- Capacity: 163,000 m³/d (MBBR)



REQUIREMENTS

- Modernization of existing drinking water plant, serving population of 2 million people



SOLUTION

- Cost-efficient surface water treatment
- AGAR® MBBR and UF membrane polishing
- Efficient COD reduction and BNR
- Adaptive to variable loads
- Minimized chlorine dosing



Drinking Water Treatment Plant - Agra, India

Case Study: Ground Water Treatment



Ground Water Treatment - Sdot Yam, Israel



HIGHLIGHTS

- Customer: : Kibbutz Sdot Yam
- Location: Israel
- Capacity: 1,300 m³/d



REQUIREMENTS

- Reduce nitrate levels in well water to meet drinking water regulations



SOLUTION

- De-nitrification AGAR[®] MBBR , UF polishing
- Minimal footprint
- No residual brine

Case Study: Greenfield Aquaculture



HIGHLIGHTS

- Customer: APT
- Location: Angola
- Capacity: 340,000 kg fish/year
- Density: 50 kg fish/m³ pond
- Fish Type: Tilapia (*O. Niloticus*)



SOLUTION

- AGAR[®] MBBR biological treatment
- Compact design
- Meeting requirements in variable influent conditions



Dondo Pitom, Angola



Selected Case Studies – Industrial MBBR

ThyssenKrupp MOL WWTP



Polyol production, Erection

- Greenfield WWTP for a new Polyol MOL complex – under construction
- 100 Ton COD/day
- Stringent discharge standards
- Anaerobic, Aerobic & tertiary stages
- Biological process based on unique advantages of proprietary DACS[®] & AGAR[®] technologies

Case Study: Ben & Jerry's, Vermont, USA



Ben & Jerry's (Unilever), USA, 2017



HIGHLIGHTS

- Customer: Unilever – Ben & Jerry's
- Location: St. Albans, VT, USA
- Capacity: 97 m³/d



REQUIREMENTS

- Phase I of plant expansion : pH adjustment only (future Phase II : secondary treatment)



SOLUTION

- Continuous and automatic semi-batch mode pH adjustment system, to meet local limits for discharge to the municipal sewer.

Case Study: Pharmaceuticals



TEVA API Plant, Malanpur, India



HIGHLIGHTS

- Customer: TEVA API, Malanpur, M.P.
- Location: India
- Capacity: 450 m³/d



REQUIREMENTS

- Retrofit of an existing activated sludge reactor process to MBBR to enable ETP capacity expansion.



SOLUTION

- AGAR[®] MBBR (3-stage) – clarifier - DAF configuration for industrial use
- No additional tanks / footprint required

Case Study: Unilever, India



HUL Ice cream, India, 2015



HIGHLIGHTS

- Customer: Unilever
- Location: Nalagarh, Himachal Pradesh, India
- Capacity: Pilot plant before full scale during 2016



REQUIREMENTS

- Demonstrate the feasibility of AGAR® technology
Pilot plant period > 5 months



SOLUTION

- AGAR® MBBR-Clarifier configuration
- Effluent requirement: Discharge to sewage, at > 95% COD removal;
Influent COD = 4,500 mg/l;
Effluent COD = 250 mg/l
- Pilot completed successfully



Case Study: Dannon, USA



HIGHLIGHTS

- Customer: Dannon, Yogurt dairy
- Location: USA
- Capacity: 2,700 m³/d



REQUIREMENTS

- Treatment plant with a simple future upgrade for influent growth
- Environmentally friendly biological system



SOLUTION

- Design by World Water Works, MBBR Media (ABC) supplied by Aqwise
- DAF - MBBR - DAF configuration
- Effluent requirement: Discharge to municipal sewage, over 50% TSS removal



Yogurt Factory, USA, 2010

Case Study: Coca Cola



Coca Cola Factory Poland, 2014



HIGHLIGHTS

- Customer: Coca Cola
- Location: Poland
- Capacity: 1,200 m³/d



REQUIREMENTS

- Replace existing submerged bio-beds, before activated sludge process (improve performance)
- Very limited footprint



SOLUTION

- New AGAR[®] MBBR tanks, on same footprint as existing bio-bed vessels
- Effluent requirement: COD / BOD / TSS < 125 / 20 / 30 mg/l, respectively

Case Study: Coca Cola, Azerbaijan



Coca Cola Bottlers, Azerbaijan, 2015



HIGHLIGHTS

- Customer: Coca Cola Bottler
- Location: Baku, Azerbaijan
- Capacity: 700 m³/d Industrial; 50 m³/d Municipal



REQUIREMENTS

- Green field Turn Key ETP construction



SOLUTION

- AGAR[®] MBBR + Aqwise Media Clarifier configuration.
- Effluent requirement: Discharge to municipal sewage under Coca-Cola cooperate effluent standard .

Case Study: Mondelez, Poland



Mondelez, Poland, 2015



HIGHLIGHTS

- Customer: Mondelez
- Location: Poland
- Capacity: 400 - 500 m³/d



REQUIREMENTS

- Increase WW treatment capacity
- Minimum footprint expansion due to limited area



SOLUTION

- AGAR[®] MBBR 1 stage configuration before existing WWTP - using existing tank
- Increasing treatment capacity by 25%
- Effluent requirement: discharge to sewage

Case Study: Food & Beverage



HIGHLIGHTS

- Customer: TAB Koncentraty
- Location: Poland
- Capacity: 1,000 m³/d



REQUIREMENTS

- Treatment of wastewater with high BOD levels – from apple concentrate factory



SOLUTION

- Two DACS[®] reactors followed by a two-stage AGAR[®] MBBR
- Treating high loads in minimal footprint
- Bio-gas generation for utilization for steam generation at the factory



Case Study: Dairy (Netherlands)



Dairy Factory, The Netherlands, 2009



HIGHLIGHTS

- Customer: Friesland Campina, dairy products
- Location: The Netherlands
- Capacity: 1,440 m³/d



REQUIREMENTS

- Fluctuation in wastewater composition
- Very limited footprint



SOLUTION

- AGAR[®] MBBR-DAF configuration by using an existing tank.
- Effluent requirement: Discharge to sewage, at 70% COD removal



Case Study: Lowicz



HIGHLIGHTS

- Customer: Lowicz
- Location: Poland
- Capacity: 4,000 m³/d



REQUIREMENTS

- Upgrade of an existing treatment plant (Trickling Filters) to treat higher capacity and improved effluent



SOLUTION

- AGAR® MBBR – AGAR® IFAS configuration



Dairy Factory, Poland, 2015

Case Study: Pulp & Paper



HIGHLIGHTS

- Customer: Europaper
- Location: Italy
- Capacity: 2,000 m³/d



REQUIREMENTS

- Addition of production lines led to increase of wastewater capacity and BOD loads



SOLUTION

- AGAR® MBBR installed upfront of existing effluent treatment plant (RBC + clarifier)



Paper Factory, Italy

Case Study: Pulp & Paper Mill, Chile



HIGHLIGHTS

- Customer: Valdivia CPMC
- Location: Chile
- Capacity: 8,500 m³/d



REQUIREMENTS

- Upgrade an existing plant – flow increase from 4,500 to 8,500 m³/d, within limited footprint



SOLUTION

- Primary DAF - AGAR® MBBR – Secondary DAF
- Successful upgrade with low HRT



Pulp & Paper Mill, Chile

Case Study: Tannery Factory, Argentina



Tannery Factory Argentina, 2015



HIGHLIGHTS

- Customer: Tannery Factory
- Location: Argentina
- Capacity: 4,000 m³/d



REQUIREMENTS

- New treatment plant for effluent from a tanning plant



SOLUTION

- New AGAR® IFAS configuration
- Effluent requirement: Discharge to a river



Selected Case Studies - DACS

Case Study: Zuvamesa, Spain



HIGHLIGHTS

- Customer: SUEZ/AQUALOGY – ZUMOS food
- Location: Spain
- Capacity: 3000 mc/day, max 40 ton COD/d



REQUIREMENTS

- CODin 60.0000 mg/l orange concentrate
- TSS < 2000 mg/l
- COD conversion 85-90%



SOLUTION

- One DACS® reactor, biogas production up to 8000 mc/day
- Treating seasonally BOD loads most economical way



ZUVAMESA orange food Factory, Spain

Project in Progress: Turk Tuborg, Izmir

Expected completion : Q1 2020



HIGHLIGHTS

- Customer: Turk Tuborg
- Location: Izmir, Turkey
- Capacity: Expansion from 5,500 to 9,000 m³/day



REQUIREMENTS

- Expand WWTP capacity
- Upgrade WWTP to meet new – more strict – discharge limits (COD < 800 mg/l)



SOLUTION

- Addition of new DACS reactor, parallel to existing EGSB (15 years old)
- Addition of primary clarifiers, serving BOTH anaerobic reactors
- Addition of new 1-stage MBBR reactor, serving BOTH anaerobic reactors, to achieve final discharge limit

Case Study: ENGEL food, Germany



HIGHLIGHTS

- Customer: ENGEL food
- Location: Germany
- Capacity: 2200 mc/day, max 6 ton COD/d



REQUIREMENTS

- Treatment of variable COD levels
- 4000-8500 mg/l
- TSS 3000-5200mg/l



SOLUTION

- Four DANA® reactors / each reactor equipped with bottom DACS® & top stage AGAR® MBBR
- Treating variable loads in minimal footprint



ENGEL potato food Factory, Germany

Case Study: Distell Group SA (Apple Cider)



HIGHLIGHTS

- Customer: Distell
- Location: Springs South Africa
- Capacity: 12 Tons COD/day



REQUIREMENTS

- High fluctuations in COD up to 20.000mg/l.
- High fluctuations in flow
- Caustic savings



SOLUTION

- DACS + MBBR + TSS removal + UF/RO + CHP
- Effluent requirement: discharge to the environment



Started up June 2018

Case Study: Coca Cola, Italy *Global Beverage*



HIGHLIGHTS

- Customer: Global Bev. Italy
- Location: Oricola, Italy
- Capacity: 1,75 Tons COD/day



REQUIREMENTS

- Fluctuating COD. pH levels
- No Hardness



SOLUTION

- AGAR® DACS +CHP configuration



Global Bev. bottling plant, Italy

Case Study: Hall & Woodhouse, UK



HIGHLIGHTS

- Customer: Hall & Woodhouse (600.000 hl/a)
- Location: UK
- Capacity: 360-530 m³/d
1-1,5 ton COD/day



REQUIREMENTS

- New green WWTP
- Small footprint system which enables enclosing in designated building



SOLUTION

- New DACS® + MBBR WWTP
- Buffer + Calamity + Pre-acid + DACS + MBBR + CHP unit



Hall & Woodhouse Brewery, UK

Aqwise – Clear and Simple



- Technology Leadership
- Global Reach, Local Presence
- Proven Track Record
- Measurable Return on Investment
 - Wastewater reuse
 - Energy recovery
 - Retrofit capabilities

Contact Information

Contact us for further information about Aqwise solutions



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