

#### Water is our element.

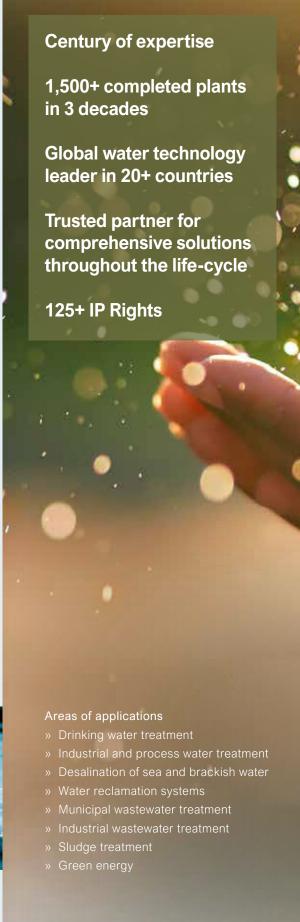
Currently, there are 2.3 billion\* people residing in countries facing water stress, with 733 million of them living in countries experiencing high or critically severe water stress. This predicament is not limited to developing nations alone; even developed countries are increasingly grappling with water scarcity as a pressing concern. The causes underlying this situation go beyond climate-related factors and encompass environmental issues and the depletion of groundwater reservoirs. Consequently, there is increasing awareness of the global importance of water treatment, wastewater purification, and the advancement of novel technologies for water reuse and recycling.

In response to these challenges, WABAG provides a comprehensive and highly advanced range of solutions for water and wastewater treatment, desalination, recycling, and resource recovery. Through our innovative technologies and services, we strive to make a significant contribution to ensuring a secure water supply and efficient wastewater treatment, both in urban and industrial settings. With a century of expertise in the water industry, we take pride in our knowledge and profound understanding of all water-related aspects. WABAG's vision aligns with the United Nations Sustainable Development Goals (UNSDGs), with a particular emphasis on SDG 6, as we ensure cleaner solutions for a greener world.

Our extensive array of services encompasses consulting, planning, financing, installation, and operational management of water treatment plants and systems. By delivering customized solutions, we aim to provide our customers with the advantages of a convenient one-stop shopping experience."









- » Planning
- » Financino
- » Design & Engineering
- » Equipment supply
- » Construction
- » Commissioning
- » Operations & Maintenance
- » Life-cycle partnership

# GOAL 6:

ENSURE ACCESS TO WATER AND SANITATION FOR ALL.



# Guaranteeing top quality drinking water.



In numerous areas, ensuring a reliable and safe supply of drinking water in the desired quantity and quality necessitates the utilization of state-of-the-art technology. The choice of specific technologies relies on factors such as the source of water and the degree of water contamination.

WABAG has positioned itself as an ideal partner in addressing this collective challenge by providing a comprehensive range of chemical, physical, and biological processes for treating both surface and groundwater. Our proficiency in advanced technology is bolstered by extensive process knowledge and a profound understanding of customer needs.

# WABAG's innovative processes for drinking water treatment:

» Clarification: OPUR-SK™

» Filtration: WABAG advanced filtration systems

» Membrane filtration: CERAMOPUR®, CERAMOZONE®

» Adsorption: CARBOPUR®, PACOPUR®

» Oxidation: ADOX®, CERAMOZONE®

» Nitrate removal: BIODEN®, ENR®

» Nitrification: fixed bed aerated biological filter





# Drinking water treatment

#### Surface water

Typically, multi-stage treatment processes are necessary to ensure that drinking water from surface sources remains consistently suitable for human consumption. These processes also address issues related to storage and distribution in the network. At WABAG, we have extensive expertise in designing and implementing these multi-barrier systems, derived from our experience gained through numerous projects. We excel in providing optimal solutions by combining conventional processes with advanced technologies like membrane filtration. This approach ensures a high level of flexibility and delivers water of the highest quality standards.

#### **Ground water**

The quality of groundwater and spring water is increasingly being affected by anthropogenic substances, agricultural pollution, and the rising presence of chlorinated hydrocarbons. To address these challenges, WABAG has developed and optimized technologies specifically designed for groundwater treatment. We provide cutting-edge processes that include biological denitrification, advanced oxidation, and membrane technologies.



## To safeguard our water.

# Municipal wastewater treatment

Municipal wastewater treatment is vital for public health and environmental preservation. Technological progress is now expanding the possibilities for environmental protection. In response, municipalities are increasingly focusing on advanced technologies and processes to achieve higher levels of purification and protect water bodies. Resource recovery and sustainable reuse of treated wastewater are emphasized, providing alternative water sources for urban and agricultural irrigation and industrial supply.

The removal of micropollutants in wastewater has gained significant importance in recent years. As a pioneer in the field, WABAG has developed suitable processes and successfully implemented additional treatment stages in many plants.

Our state-of-the-art plants offer tailored solutions for carbon and nutrient removal, micropollutant elimination, high-performance, space-saving technologies, and water reclamation and reuse.

WABAG is dedicated to delivering advanced solutions in municipal wastewater treatment, addressing emerging challenges and promoting sustainable water management.

#### WABAG's innovative processes for wastewater treatment:

- » Fine sieving: MICROPUR®
- » Biofiltration: BIOPUR®
- » MBBR, Moving bed biology: FLUOPUR®
- » Activated sludge processes: HYBRID™, MICROPUR-CAS®
- » Aerobic Granular Activated Sludge: NEREDA® (licensee)
- » Sequencing Batch Reactor (SBR): CYCLOPUR®
- » Membrane bioreactor: MARAPUR®, MICROPUR-MBR®, PACOPUR®-MBR
- » Oxidation processes: BIOZONE®
- » Sedimentation: OPUR-SK™
- » Adsorption processes: CARBOPUR®, PACOPUR®
- » Anammox Nitrogen removal: DAMOPUR®
- » Deep bed filtration in various designs







### Producing green energy.

# Energy-neutral wastewater treatment: Unleashing Anaerobic Sludge Potential

Efficient wastewater treatment is a critical aspect of WABAG's approach, and it encompasses a crucial component: sludge treatment. In particular, anaerobic stabilization of sewage sludge presents an environmentally and economically beneficial energy source through the utilization of biogas. Large wastewater treatment plants can even meet up to 100 percent of their energy requirements by adopting this approach, making it energy-neutral.

#### The Global Challenge

The escalating global demand for energy, coupled with alarming  $\mathrm{CO}_2$  emissions, presents an urgent problem that demands sustainable solutions. Neglecting the treatment of sewage sludge and allowing it to be stored untreated in landfills would further exacerbate the greenhouse effect, releasing pollutant landfill gas into the atmosphere over several decades. Of particular concern are the emissions of methane, which is 25 times more potent as a greenhouse gas compared to carbon dioxide.

# The Ecological and Economic Advantages of Anaerobic Sludge Treatment

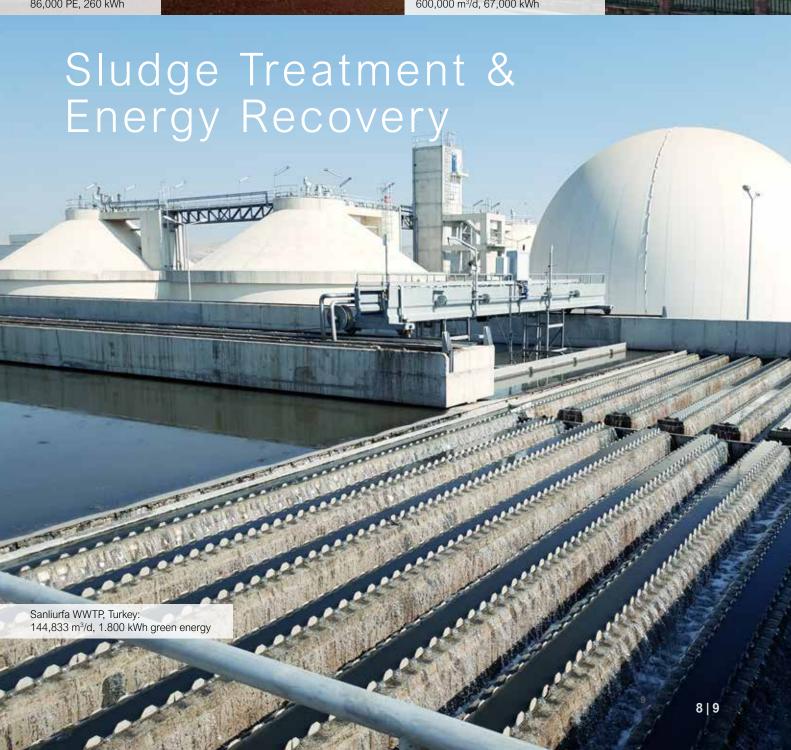
Sewage sludge should be viewed as a valuable alternative energy source, rather than mere waste. Implementing anaerobic sludge treatment and utilizing biogas allows us to address global challenges such as energy demand,  ${\rm CO_2}$  emissions, and landfill gas emissions, while simultaneously benefiting the environment and economy. Wastewater plants can sustainably fulfill their energy needs, reducing reliance on fossil fuels and operational costs.

#### **ENOPUR® = Energy-neutral wastewater treatment**

The WABAG ENOPUR®-System encompasses anaerobic sludge stabilisation and corresponding pre- and post-treatment steps as well as nutrient recovery providing advanced and sustainable sludge management solutions. WABAG has been installing and operating anaerobic sludge treatment plants since many years and have extensive know-how and experience for this specific task. With over 70 plants installed during the past 30 years, successfully generating > 35 MW of clean and renewable energy.







## Securing water as a production factor.

In industrial settings, water quality requirements vary across sectors like power generation, refineries, petrochemical plants, steel works, food & beverages, and more. Whether it is for manufacturing, processing, cooling, or cleaning, each industry has specific water quality requirements.

WABAG provides tailored water management solutions, offering a comprehensive portfolio from conventional to highperformance systems, including membrane processes. Our expertise ensures secure water supply in terms of quantity and quality, enabling sustainable economic strategies. We prioritize reliable, efficient, and cost-effective systems that meet safety standards.

#### **Cooling water**

In industrial facilities, cooling water plays a crucial role in various processes. Different cooling systems have specific water quality requirements. To meet these requirements, raw water from diverse sources such as groundwater, surface water, seawater, or reclaimed water is purified accordingly. Technologies employed include filtration, desalination, chemical treatment, and disinfection.



#### Boiler feed water and condensate treatment

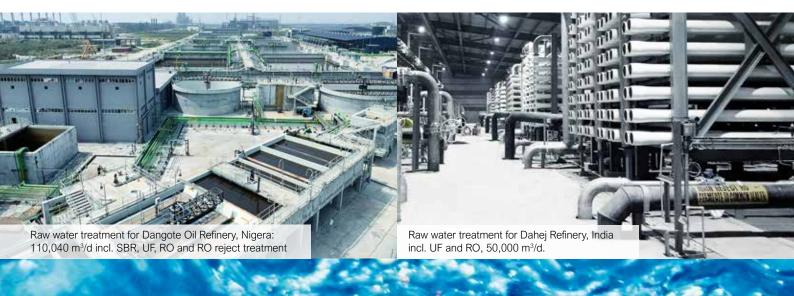
Boiler feed water is sourced from a diverse range of raw water sources. The treatment processes associated with it are customized to suit the specific composition of the raw water and the desired quality of the boiler feed water.

The key processes involved include make-up water treatment, which encompasses pre-treatment and demineralization with silica removal. Additionally, condensate polishing involves filtration, cation exchange, and mixed bed filtration. Thermal and chemical degassing are also integral steps in the treatment process.

# WABAG's innovative processes for industrial water treatment:

- » Clarification: OPUR-SK™
- » Filtration: WABAG advanced filtration systems
- » Membrane filtration: CERAMOPUR®, CERAMOZONE®
- » Adsorption: CARBOPUR®, PACOPUR®
- » Oxidation: ADOX®, CERAMOZONE®
- » Desalination: innovative MED & RO features, ENR®, ZEROPUR™





# Industrial water

#### Production of green hydrogen

The production of green hydrogen involves the use of renewable energy sources to power electrolysis, which separates water into hydrogen and oxygen. In this process, water treatment plays a crucial role in ensuring efficient and sustainable hydrogen production. Technologies such as reverse osmosis, ion exchange, and electrochemical methods are employed to purify and condition the water used for electrolysis. These processes remove impurities, control pH levels, and optimize water quality, ultimately enhancing the efficiency and longevity of electrolysis systems. Raw water sources can be any kind of water including reclaimed water.

## Meeting the highest environmental standards.

Treating industrial wastewater presents a unique challenge due to the diverse range of impurities it contains. Moreover, there is a continuous tightening of effluent standards. As a result, effectively treating industrial wastewater requires extensive knowledge of process technologies and their economical.

With our professional experience gained over the years, we possess the expertise to meet both customer requirements and mandatory regulations with utmost precision. Our goal is to achieve an optimal balance between efficiency and cost-effectiveness. This encompasses not only minimizing initial investment expenditure but also reducing operational costs throughout the lifespan of the treatment plant.

# Customized solutions tailored to your unique requirement.

With our wide range of technologies, we specialize in designing individually tailored multi-stage processes based on the specific characteristics of the wastewater. We utilize aerobic and anaerobic biological processes, as well as chemical-physical processes.

For example, we employ activated sludge processes, our MBBR - FLUOPUR® process or efficient biofiltration system (BIOPUR®) to treat less contaminated water.

For applications requiring the highest level of treatment, such as water recycling, we employ advanced membrane processes. If required, we integrate additional cleaning phases like reverse osmosis and ion exchange to achieve even more advanced level of treatment.

Our team has extensive experience in designing, building, and operating wastewater treatment plants for clients across various industries, including Oil & Gas, Chemicals, Food & Beverages, Textiles, Steelworks, and more.

# WABAG's proven and innovative processes for industrial effluent treatment:

- » Aerobic biological processes
  - o Activated sludge processes: CYCLOPUR®, Hybrid™
  - o Biofiltration: BIOPUR®
  - o Moving bed biofilm reactor: FLUOPUR®
  - o MBR: MARAPUR®
  - o Granular Activated Sludge: NEREDA® (licensee)
- » Chemical-physical processes
  - o Flocculation, Clarification
  - o Filtration, Membrane filtration: MARAPUR®, MICROPUR-MBR®
  - o Desalination
  - o MEE, MD/Crystallization: ZEROPUR™
  - o Oxidation: BIOZONE®, CERAMOZONE®
- » Anaerobic biological processes
  - o UASB
  - o EGSB





## Offering more performance.

# Sea and brackish water desalination



WABAG has established a strong reputation as a trusted partner in the field of desalination technology, providing comprehensive solutions for many years. We have successfully designed, commissioned, and delivered over 100 desalination plants. What sets us apart is our ability to offer

both reverse osmosis desalination technologies and thermal desalination (MED and MSF) processes, making us one of the few companies worldwide capable of providing a full range of desalination options for high-capacity plants.





#### Saving energy and costs

Desalination plants play a crucial role in separating saline water into two distinct streams: one with very low salt concentration (known as condensate in thermal processes and permeate in reverse osmosis) and another with a high salt concentration (referred to as brine or concentrate). The process of salt separation in desalination technologies requires energy, which can be supplied through thermal or mechanical means. At WABAG, our extensive expertise allows us to maximize energy efficiency, optimizing energy consumption in the desalination process and reducing operational costs.

#### **Complete Plants with Pre- and Post-Treatment**

As a comprehensive systems supplier, we provide not only the necessary inflow and outflow structures, including subsea pipelines, but also prioritize efficient pre-treatment processes. The success of a desalination plant relies heavily on its pre-treatment system. Our pre-treatment solutions go beyond conventional filtration technologies, addressing

specific concerns such as red tide, oil in seawater, and high total suspended solids. We utilize advanced techniques such as Dissolved Air Floatation (DAF), lamella clarifiers, and highly effective micro and ultrafiltration systems, ensuring superior pre-treated water quality and enhancing the overall efficiency of the RO treatment process.

#### **Innovative Layouts and Energy Efficiency**

WABAG's innovative layouts, including compact Inline systems, optimize space utilization with a smaller footprint while reducing specific power consumption in the RO system. We provide energy-efficient two-pass Reverse Osmosis (RO) systems equipped with the latest energy recovery devices, minimizing energy consumption and producing high-quality permeate for various industrial applications. To meet potable water standards, we incorporate post-treatment remineralization systems using methods such as lime and CO<sub>2</sub>.



## The key to sustainable water management.



Given the limited availability of water and the importance of preserving existing resources, incorporating water recycling concepts as part of sustainable water management strategies is of paramount significance. Water recycling not only increases accessibility for private, commercial, agricultural, and industrial consumers but also enhances supply reliability. It holds particular importance in arid and semi-arid regions.

**Recycle and Reuse of Municipal Wastewater** 

Reclaiming municipal wastewater for potable, agricultural, urban, and industrial reuse is vital for sustainable water management. Through advanced treatment processes, muni-

cipal wastewater can be efficiently reclaimed and reused, relieving pressure on freshwater sources, fostering water conservation and contributing to socio-economic development. By utilizing innovative treatment technologies, WABAG facilitates the safe and sustainable transformation of wastewater into a reliable and safe water supply, enhancing water security.

We take great pride in our achievement of establishing the world's only direct potable reuse plant in Windhoek, Namibia, where treated municipal wastewater is converted into potable water.





#### **Recycle and Reuse of Industrial Wastewater**

Wherever potable water supply is endangered, the public authorities first reduce the supply to industry. Alternative water resources are to be found in the used water flows from industrial and municipal treatment plants. Tailor-made treatment systems enable the reuse of purified wastewater for various industrial purposes, including cooling, boiler make-up, process water, and industrial service water.

WABAG has already implemented resource- and cost-efficient water reuse and recycling systems that have fully satisfied the needs of customers in sectors such as petrochemicals, steel, textiles, chemicals, and thermal power plants.

Leveraging our comprehensive process portfolio, our experts design customized and optimized concepts for each operation, ranging from basic tertiary treatment to achieving zero liquid discharge (ZLD), ensuring water conservation and cost savings while securing the water supply.

In recent years, WABAG has successfully executed a series of projects focused on water recycling and reuse, catering to both municipal and industrial requirements. These endeavors demonstrate our commitment to advancing sustainable water solutions and our ability to deliver innovative projects in water recycling and reuse, supporting water conservation and meeting the diverse needs of our clients worldwide.



# Water Recycling & Reuse

# Optimal water management.

With extensive experience in designing and operating water technology plants, WABAG possesses profound knowledge and recognized expertise in operational water management. Trusted by numerous local authorities and leading industrial enterprises, we offer a comprehensive range of services for water supply and wastewater treatment.

Water management presents significant challenges as business requirements grow, technologies evolve, and regulatory standards tighten. WABAG addresses these challenges as an innovative specialist company, allowing our customers to focus on their core tasks while benefiting from competitive prices and services.

By choosing WABAG for their water management needs, customers gain access to specialized knowledge, advanced technologies, and efficient solutions. This partnership enables effective navigation of water management complexities, compliance with regulations, and confident achievement of water-related goals.







#### State-of-the-art plants

WABAG's customers benefit from the company's long-term international experience, extensive technological expertise, and the outcomes of its research activities. This enables WABAG to guarantee safety, quality, process optimization, and enhanced efficiency.

Achieving effective water management and ensuring excellent water quality requires holistic solutions. WABAG understands this and provides tailor-made solutions that meet the specific requirements of each customer. Our collaboration models are diverse and familiar, encompassing options such as classic outsourcing (O&M), DBO (Design-Build-Operate), and BOOT (Build-Own-Operate-Transfer).

By leveraging our comprehensive business and technical knowledge, WABAG ensures that our customers receive the highest quality operational management combined with the sustainability offered by a leading company in the water and wastewater technology sector. We are dedicated to supporting our customers in achieving their water management goals while maintaining operational excellence and environmental stewardship.



# Operational management and maintenance

## Innovation is a dimension of performance.

We firmly believe in the power of innovation and continuously invest in technologies that shape the future.

As a forward-thinking company, we consistently strive to develop and implement innovative solutions for the benefit of our customers. This commitment drives us to engage in extensive research and development (R&D) activities, with our current particular focus on

- » Potable Reuse
- » Contaminents of emerging concern (micropollutants)
- » Antibiotic-resistant bacteria and genes
- » Deammonification
- » Minimum/Zero-Liquid Discharge (MLD/ZLD)
- » Ceramic membranes

Membrane filtration processes have become a state-of-the-art separation method and over the years, WABAG has successfully completed more than 100 membrane filtration plants for fresh water and wastewater treatment. Building on this knowledge, our current focus lies in developing processes that utilize optimized membranes, known for their low life cycle costs. This includes the use of ceramic membranes in our newly developed CERAMOZONE® and CERAMOPUR® processes.

The demand for the concentration of brines up to zero liquid discharge (ZLD) is increasing steadily. In this regard, Vacuum Membrane Distillation is a promising technology,

which has been tested successfully for various industrial applications and a new patented process has been developed for membrane distillation with continuous crystallization.

Another crucial aspect is the safe removal of micropollutants from pre-treated municipal wastewater and contaminated groundwater. We have achieved outstanding results with new processes involving ozone and bioactive filter (BIOZONE®) as well as adsorption processes with activated carbon, such as CARBOPUR® and PACOPUR®.

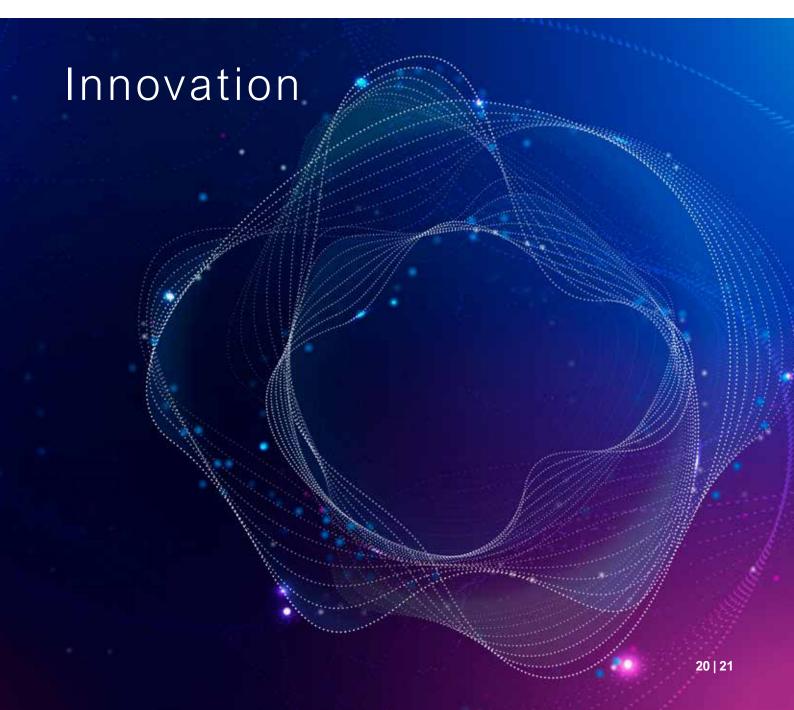
The emergence of antibiotic-resistant bacteria and genes presents a significant health threat. Their presence in water systems raises concerns about the potential spread of drug-resistant infections and the limited effectiveness of antibiotics. Addressing this growing challenge is urgent to safeguard public health. WABAG is actively engaged in research activities to safely remove these resistant contaminants from wastewater and among others have been collaborating with a European research consortium in an EU project. Furthermore, WABAG has conducted a study for Direct Potable Reuse at Windhoek, Namibia.

Through our unwavering commitment to innovation and cutting-edge solutions, we strive to deliver advanced water treatment technologies that cater to the evolving needs of our customers. Our goal is to promote sustainability, efficiency, and safety in the water industry and for people.









### An approach based on partnership.

In the global field of plant building, establishing close relationships with customers is fundamental to mutual success. The WABAG Group is a leading multinational player, operating in over 20 countries with a strong focus on emerging markets in Europe, Africa, the Middle East, South East Asia, and India. This market focus enables us to provide our customers with enhanced support and tailored solutions.

Our approach is twofold. Firstly, we prioritize maximum accessibility to our know-how by implementing a local competence strategy. This ensures that our customers can benefit from our expertise on a regional level. Secondly, we remain vigilant to market trends and developments, allowing us to react swiftly to changing demands. We assist municipal and industrial customers across various regions worldwide, addressing their specific requirements through competencies developed through continuous market observation. Further, we engage in strategic alliances, such as co-operations and joint ventures, to further expand our market-oriented service portfolio.

Understanding our customers' needs also means implementing modern management and monitoring tools for operational excellence, enhancing competitiveness, and investing in the training of local and international specialists.

Our belief is that flexibility, interconnected expertise, and solution-oriented competence are the keys to achieving success. By combining these elements, we strive to deliver exceptional value to our customers and contribute to their growth and prosperity.

# GLOBAL PRESENCE

WABAG EMPLOYS OVER 1,600 EMPLOYEES (PERMANENT) IN OVER 20 COUNTRIES.





and markets



sustainable solutions. for a better life.

Global HQ
VA TECH WABAG Ltd.

"WABAG House"
No.17, 200 Feet
Thoraipakkam – Pallavaram Main Road
Sunnambu Kolathur, Chennai 600 117, India
Tel: +91 44 3923 2323
wabag@wabag.in

HQ Cluster Europe VA TECH WABAG GmbH Dresdner Str. 87-91 1200 Vienna, Austria Tel. +43-1-25 105-0 contact@wabag.com

