AERATION TECHNOLOGY GUIDE:

A third-generation business originating in Germany, USA based Gummi-Jaeger AERATION LLC is the wastewater treatment industry pioneer of EPDM fine-bubble membrane diffusers. Arnold Jäger created the world’s first fine-bubble rubber membrane diffuser in 1973 as a replacement for ceramic diffusers.

Our OxyStrip™ diffuser line, integrated into our OxyProcess™, BioCube™, and OxyLift™ technologies, offer unique municipal & industrial WWT solutions. The streamlined system design offers low-cost, creative options for new & retrofit facilities, with the benefit of decreased power consumption and low O & M. OxyProcess™ aeration consulting and drawing are provided for facility designs for TN and TP using our decades of experience and diffuser design.

Conventional diffuser system design

Past and some current fine bubble diffuser system designs focus on SOTE% optimized yr. 1 to yr. 20+ projected average per capita WWT plant nutrient loading plus safety factors for peak loading events.

JAEGGER explains in sections FAQ & PLANET the basis of conventional diffuser system design, its shortcomings, & what other factors should be considered for diffuser system design.

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The Aeration System represent less than 1% / approx. 0.5% of the initial total capital:

Diffuser systems (diffusers & air lateral system) often represent less than 1% of the initial total capital investment of a modern wastewater treatment plant.

The activated sludge / aerobic biological nutrient removal stage where most fine diffuser systems are used is viewed as one of, or the most important reactor phase of a wastewater treatment [WWT] plant. The blowers supplying the diffuser systems consume approx. 60% of the WWT plant’s electrical power demand. The power cost of operating WWT plants represent the single largest operating budget item for many municipalities.

JAEGGER explains in sections FAQ & PLANET how the energy consumption of the WWT activated sludge phase can be reduced by up to 40%, and how the WWT process can be continually improved by employing actual nutrient loading driven process control – OxyProcess™ – see sections PRODUCTS, MEDIA, & PROJECTS.

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Limitations of 9” disc and conventional tubular diffuser systems – System Turndown:

Past and some current fine bubble diffuser system designs are based on 9” Ø disc or conventional tubular diffuser systems. 9” Ø disc especially, and most conventional tubular diffuser systems only offer a single SOTE % optimized point, or a narrow range for yr. 1 to yr. 20+ diffuser system design schemes. These diffuser systems prohibit, or substantially limit actual nutrient WWT plant loading driven, continual WWT process optimization, and power conserving system design.

JAEGER demonstrates in sections FAQ, & PLANET the importance of diffuser system turndown, its recommended 8:1 minimum turndown range, the need for multi-level system redundancy to meet current and future WWT process demands incl. the effects of rising temperatures, & increasing volatile WWT operating climate.

JAEGER demonstrates in sections PRODUCTS, BENCHMARK, MEDIA, & PROJECTS how OxyStrip™, Dual-Air-Control™, OxyLift™ are the only diffuser products in today’s market place meeting the above WWT process demands, & allowing for actual nutrient loading driven WWT process control, continual WWT process optimization, and power conserving system design.

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WWT systems resilience – Retrievable OxyLift diffuser systems:

Water sanitation / wastewater treatment infrastructure, its continual / non-interrupted operation are critical factors to human health and habitation. System redundancy, & resilience to rising average temperatures, & possible system upsets like extreme weather events of the WWT activated sludge phase are mandatory.

JAEGER demonstrates in sections PRODUCTS, MEDIA, & PROJECTS how OxyLift™ – the retrievable OxyStrip™ diffuser rack systems – can provide a piece of mind to all WWT plant owners & operators, infrastructure planners, & engineers. Any basin geometry or plant size can be made retrievable by employing OxyLift™ technology for as little as 1% to 2% of the initial total investment of a modern wastewater treatment plant.

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Buyer's guide disc, tubular, & strip diffuser systems – history of continual SOTE testing and product enhancement since 1985:

The today’s fine bubble membrane diffuser marketplace offers WWT plant owners & operators, infrastructure planners, & engineers many choices of diffuser models, designs, & manufactures. The are 3 main product categories:

1. Disc Diffusers
2. Tubular diffusers
3. Strip Diffuser & Plate Aerators

JAEGGER provides in sections BENCHMARK, PRODUCTS, guidance on

- How to compare different diffuser models & system designs based on
  - effective diffuser membrane area,
  - SOTE% performance at different flux rates,
  - diffuser model system turndown capabilities,
- Diffuser model design strength & weakness in terms of
  - overall utility, O&M
  - method of construction & materials
  - temperature range and max. suitable diffuser insertion depth
  - suitability for intermittent, ON – OFF aeration, BNR, & SBR applications
  - suitability for actual nutrient loading optimized process design
- Fine membrane material selection & application range
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Benchmark - OxyStrip vs. PU sheet bonded strip and plate aerators:

Strip diffusers & plate aerators are known for their superior oxygen transfer efficiency [SOTE]

JAEGGER provides in sections BENCHMARK & PRODUCTS, how OxyStrip™ is superior over PU sheet strip and plate aerators in terms of:

- Lower capital cost – the price of OxyStrip™ diffuser systems incl. air laterals are equal to conventional 9” Ø disc or tubular diffuser systems while offering substantial benefits over these systems at the same time
- Lower diffuser membrane replacement cost incl. complete retrofit of PU sheet membrane diffusers by reusing existing air laterals and coupling systems
- Equal or better SOTE performance over wider system turn down range
- The only retrievable Strip diffuser systems – OxyLift™ & OxyPOD™
- Higher WWT system temperatures
- Greater diffuser insertion depth
- > 10 yrs. diffuser membrane life

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System Turn Down – Diffuser Flux Rate Range
Actual nutrient loading driven process control & WWT process design – OxyProcess™

Modern WWT plant / Aeration diffuser system designs require diffuser products and systems which provide on a yr. 1 to yr. 20+ planning scheme, meet the challenges of rising average temperatures, & an increasing volatile operating environment:

- Supplying sufficient oxygen \([O_2]\) to meet the biological oxygen process demand \([BOD]\) at all times and operation conditions
- Minimum diffuser system turndown range of 8:1, 16:1 or better
- Optimizing blower air / minimizing power consumption driven by process oxygen uptake
- Provide low energy consumption mixing during low O\(_2\) uptake cycles, anoxic, or anaerobic phases
- Dissolved oxygen \([DO]\) process control
- Variable frequency drive \([VFD]\) control on blower and mixer system
- Multi-level diffuser system redundancy, ideally retrievability for 100% system uptime / resilience
- System flexibility, & scalability for continual WWT process optimization

JAEGGER explains OxyProcess™ in sections PRODUCTS, MEDIA, & PROJECTS how current and future WWT plant / Aeration diffuser system demands are met, how the energy consumption of the WWT activated sludge phase can be reduced by up to 40%, and how the WWT process can be continually improved by employing actual nutrient loading driven process control – OxyProcess™.

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