

**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.

JAEGER explains in sections [FAQ](#), & [PLANET](#) the basis of conventional diffuser system design, its shortcomings, & what other factors should be considered for diffuser system design.

See topics / questions #:

FAQ	PLANET	BENCHMARK	PRODUCTS	PROJECTS
2; 3;10; 12; 17; 18; 13; 14; 15; 1; 8;	1; 2; 3; 5; 6; 8; 15; 16; 17; 18; 19; 20; 21; 22; 23; 24;			

**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.

JAEGER 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](#).

See topics / questions #:

FAQ	PLANET	BENCHMARK	PRODUCTS	PROJECTS
5; 6; 9; 10; 11; 12; 17; 18;	4; 7; 8; 9; 10; 11; 12; 13; 14; 2;	4; 5; 6; 7; 8;	OxyStrip; OxyLift; Dual-Air-Control; OxyProcess	Retrievable: 1, 2, & 3; Fixed Grid: 1, & 2: Lagoon: 2

**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.

See topics / questions #:

FAQ	PLANET	BENCHMARK	PRODUCTS	PROJECTS
5; 6; 7; 10; 12;	12; 11; 13; 14; 9; 10;	4; 5; 6; 7; 8;	OxyStrip; OxyLift; Dual-Air-Control; OxyProcess	Retrievable: 1, 2, & 3; Fixed Grid: 1, & 2; Lagoon: 2

**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.

See topics / questions #:

FAQ	PLANET	BENCHMARK	PRODUCTS	PROJECTS
8; 12; 16; 11; 10;	13; 14; 15; 16;	5;	OxyStrip; OxyLift; OxyProcess	Retrievable: 1, 2, 3, & 4; Lagoon:

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

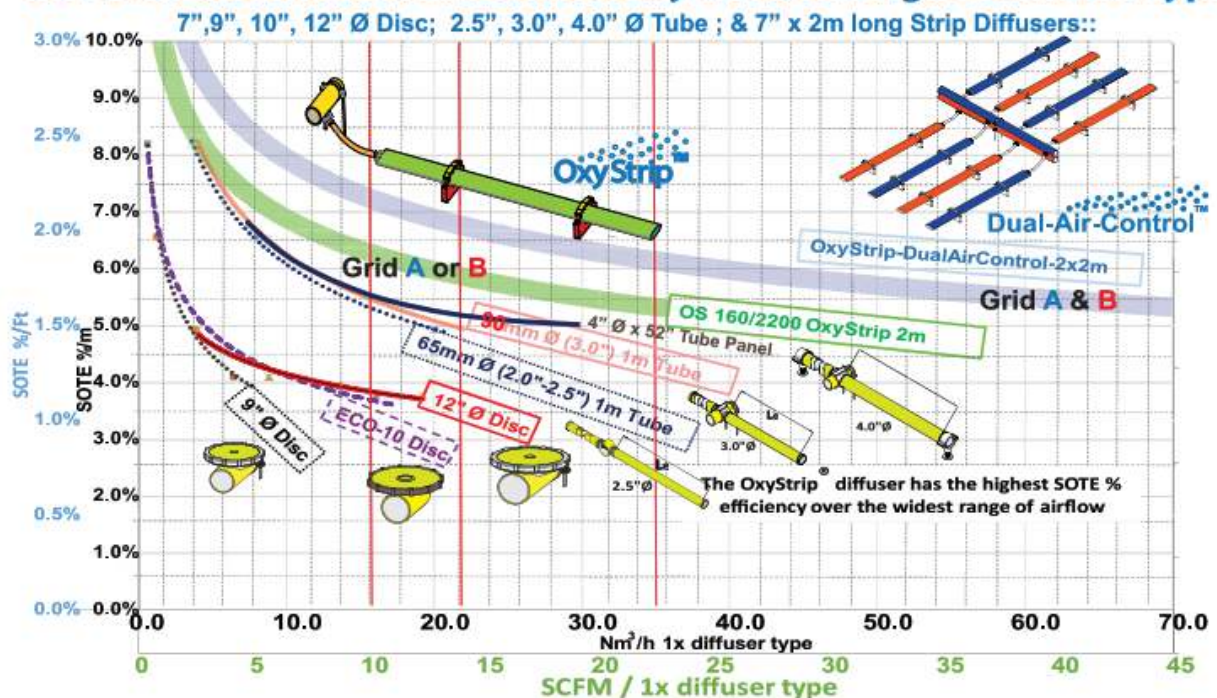
The today’s fine bubble membrane diffuser marketplace offers WWT plant owners & operators, infrastructure planners, & engineers many choices of diffuser models, designs, & manufactures. The are 3 main product categories:

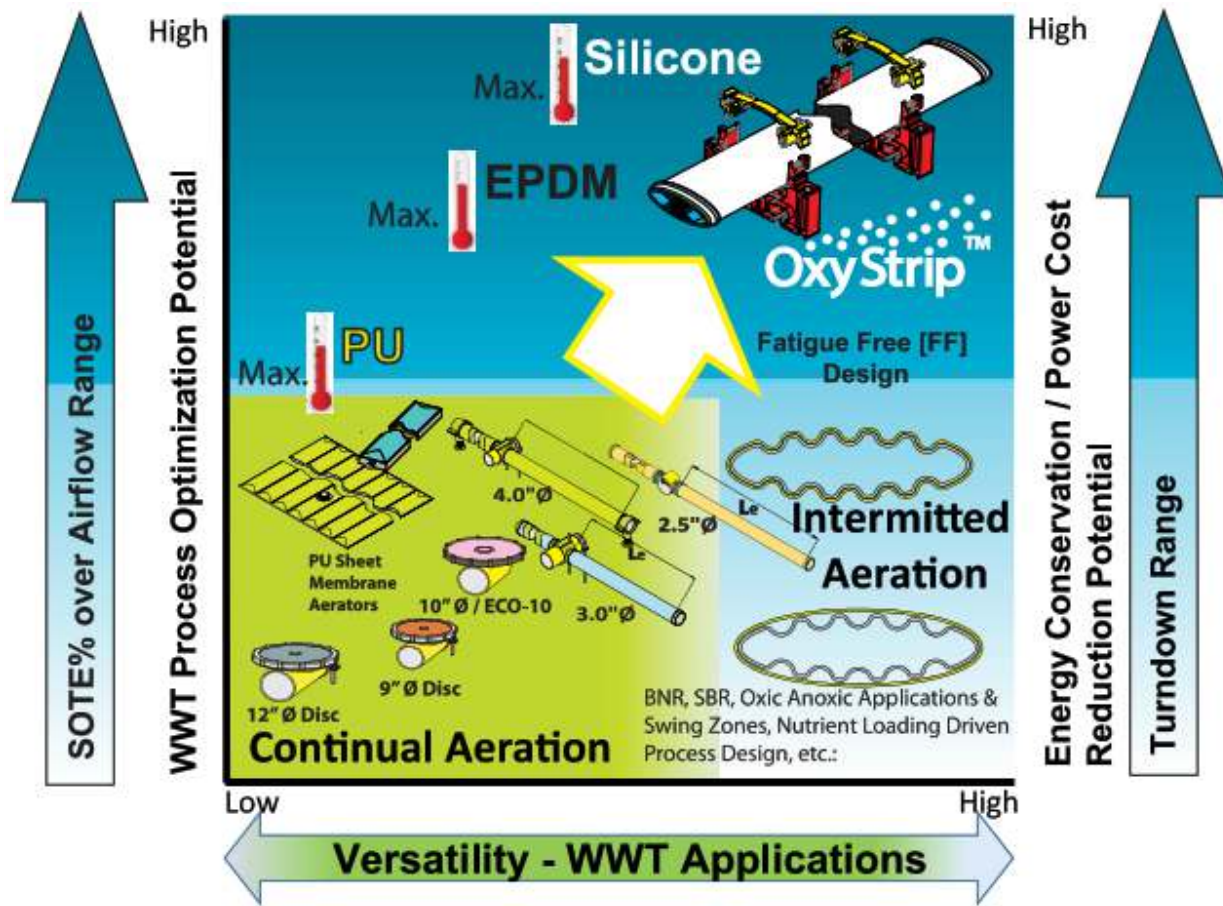
1. Disc Diffusers
2. Tubular diffusers
3. Strip Diffuser & Plate Aerators

JAEGER 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

**SOTE% Performance benchmark by airflow range & diffuser type**





See topics / questions #:

FAQ	PLANET	BENCHMARK	PRODUCTS	PROJECTS
1; 4; 7; 8; 11; 10; 6;	4;	1; 2; 3; 13; 14; 4; 5; 6; 7; 8; 9; 10; 19;	OxyStrip; OxyLift; Dual-Air-Control; OxyProcess; OxyTube; OxyDisc	Fixed Grid; Retrievable: 1, 2, & 3; MEDIA

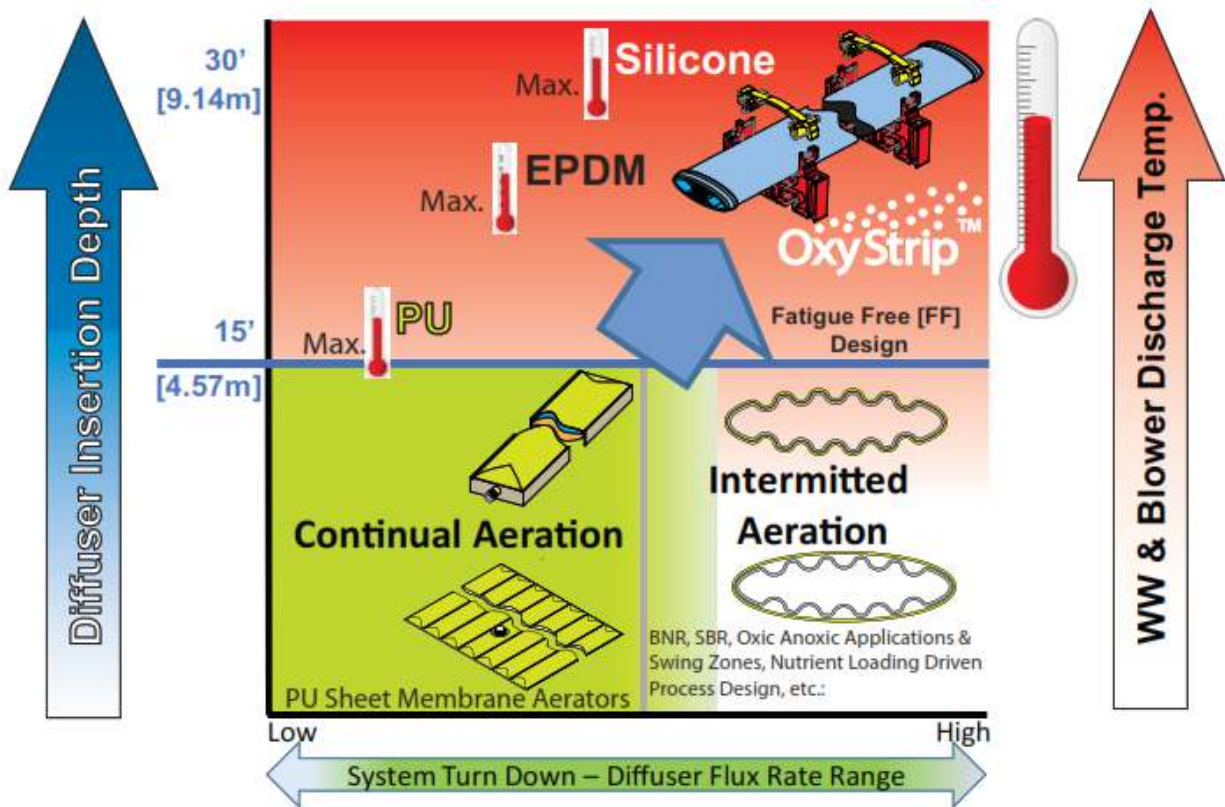


**Benchmark - OxyStrip vs. PU sheet bonded strip and plate aerators:**

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

JAEGER 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



See topics / questions #:

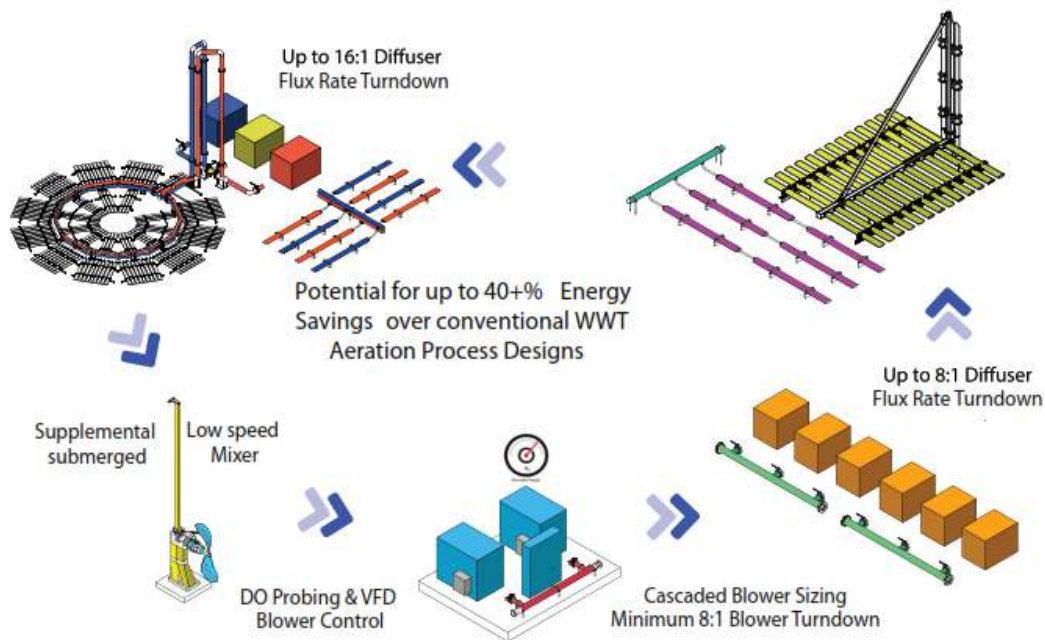
FAQ	PLANET	BENCHMARK	PRODUCTS	PROJECTS
1; 4; 7;	4;	1; 2; 3; 15; 16; 17; 18;	OxyStrip; OxyLift; Dual-Air-Control; OxyProcess;	Fixed Grid; Retrievable

**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<sub>2</sub>] 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<sub>2</sub> 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

JAEGER 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™**.



See topics / questions #:

FAQ	PLANET	BENCHMARK	PRODUCTS	PROJECTS
5; 6; 9; 10; 11; 12; 17; 18;	4; 7; 8; 9; 10; 11; 12; 13; 14; 2;	4; 5; 6; 7; 8;	OxyStrip; OxyLift; Dual-Air-Control; OxyProcess	Retrievable: 1, 2, & 3; Fixed Grid: 1, & 2; Lagoon: 2