

BIOGRADEX®

Americas Inc.



**New
and
Innovative
BNR TECHNOLOGIES**



CONTENTS

[BNR Upgrades](#)

[Technology Summary](#)

[Technology Details](#)

[Technology Animation](#)

[New Developments](#)

[Features & Benefits](#)

[Projects List](#)

[Patents List](#)

[Mission Statement](#)

[Contact Us](#)

*A ground breaking
technology
providing
affordable BNR
Solution for new and
existing
activated sludge
wastewater plants*

BNR Upgrades



Jawor, Poland - Average daily flow 6000 [m3/day]



Lubliniec, Poland - Average daily flow 9000 [m3/day]



Tartu, Estonia - Average daily flow 20500 [m3/day]

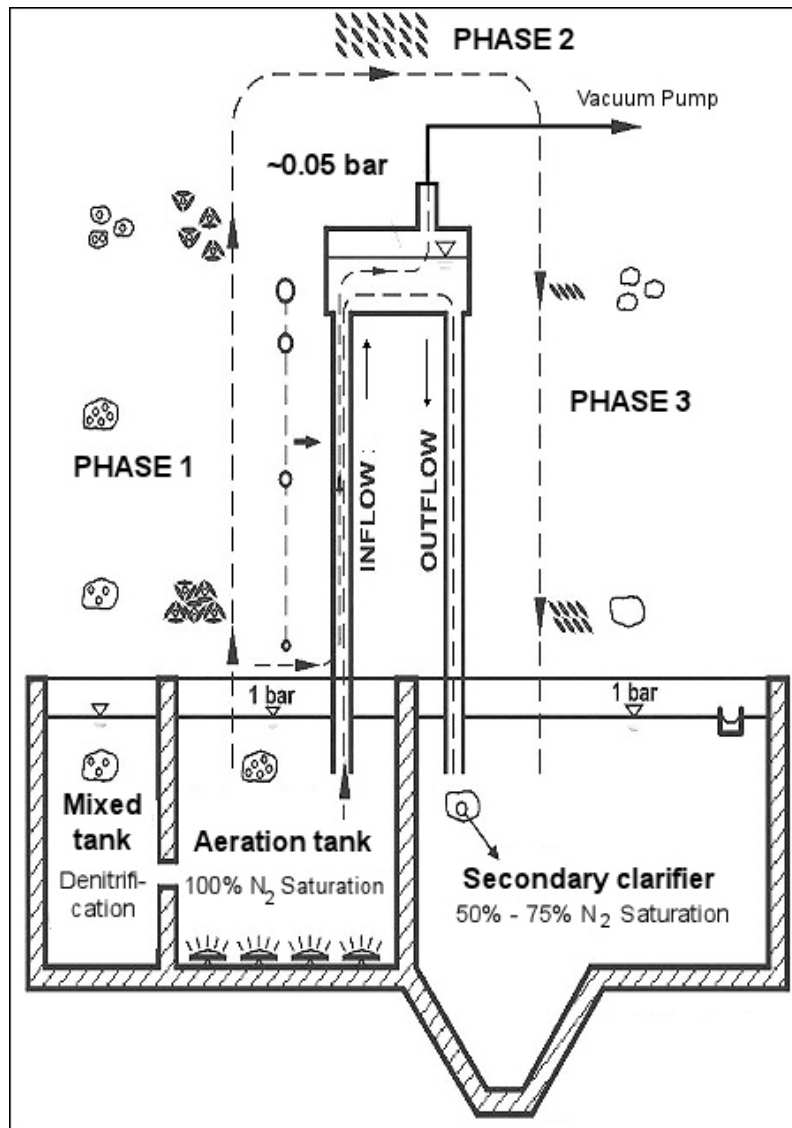
CONTENTS

- [BNR Upgrades](#)
- [Technology Summary](#)
- [Technology Details](#)
- [Technology Animation](#)
- [New Developments](#)
- [Features & Benefits](#)
- [Projects List](#)
- [Patents List](#)
- [Mission Statement](#)
- [Contact Us](#)

Summary of Technology

BIOGRADEX® Technology is a new and unique, but fully proven technology with over a decade of full-scale BNR operating experience in Europe. This technology is now being introduced to North America to provide effective year round Biological Nutrient Removal with unparalleled low cost, minimal land use, and high treatment efficiency for existing and new activated sludge Waste Water Treatment Plants.

The core of the proprietary, worldwide patented BIOGRADEX technology is a unique process enhancement of BNR treatment by vacuum degassing of mixed liquor. The MLSS is degassed in a low energy input BIOGRADEX tower immediately after biological treatment and before secondary clarification. MLSS vacuum degassing results in major improvements of sludge settling, thickening and stabilization in clarifiers. RAS concentrations of up to 2% and MLSS concentrations of 6,000 – 8,000 mg/l or more are routinely achieved.



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CONTENTS

[BNR Upgrades](#)

[Technology Summary](#)

[Technology Details](#)

[Technology Animation](#)

[New Developments](#)

[Features & Benefits](#)

[Projects List](#)

[Patents List](#)

[Mission Statement](#)

[Contact Us](#)

Technology Details

At present there are over 30 full-scale BNR WWTPs using BIOGRADEX technology with flows from under 500 m³/d up to 35,000 m³/d in service. Feasibility designs for 300,000 m³/d applications indicate BIOGRADEX technology to be very cost effective at this size as well. Designs completed for plants of 50,000 - 60,000 m³/d flow per train indicate this technology will also be effective for very large BNR WWTPs.

The most sophisticated leading-edge suspended growth activated sludge BNR Processes used with BIOGRADEX technology can also benefit from substantially reduced land requirements, and lower construction and operating cost with this new technology.

For conventional BNR WWTPs, denitrification typically occurs in the secondary clarifiers settled sludge. Water in the sludge is also normally Nitrogen Saturated. This situation produces micro nitrogen bubbles that are released and trapped in the settled sludge floc structure. As more nitrogen is produced, more and more micro bubbles are enmeshed and that causes the sludge to be bulky, stop settling / thickening and produce scum on clarifiers.

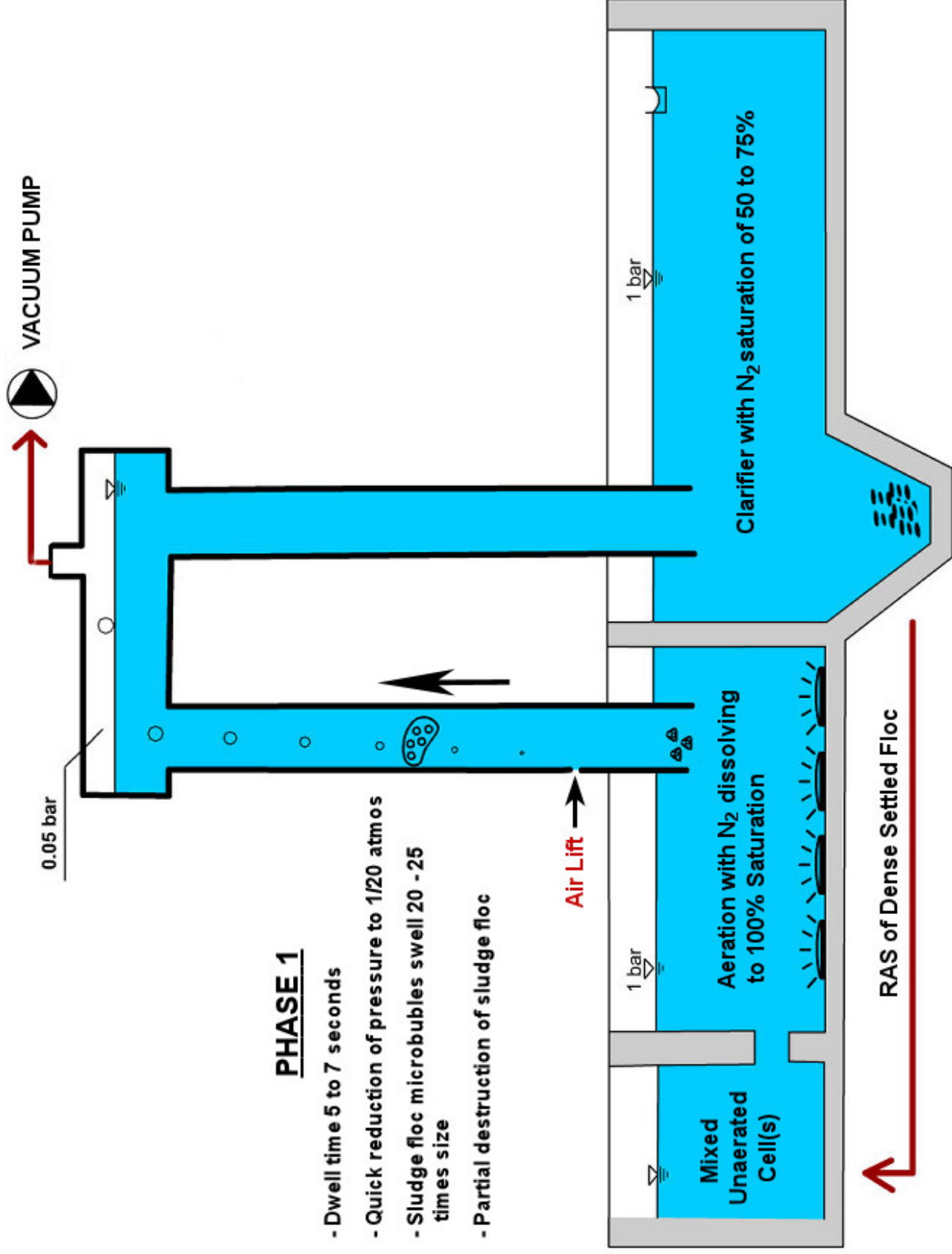
In contrast for BIOGRADEX technology WWTPs, MLSS degassing reduces 100 % saturation of dissolved nitrogen conditions down to the range of 50-75% saturation as the MLSS enters secondary clarification. The sludge can then operate in stable, nitrogen non-saturated conditions, is not bulky and can continue to settle and thicken in the clarifiers even during continuing denitrification conditions. Nitrogen released during denitrification is thus dissolved in water rather than otherwise becoming micro nitrogen bubbles enmeshed in sludge floc which contributes to high SVI conditions. The resulting thick, low SVI settled sludge even with high levels of filamentous organisms in the MLSS, can then be recycled to Biotreatment Cells with low RAS flow and high % solids concentration. Very high RAS concentrations then allow ground-breaking high MLSS concentrations to be achieved which proportionally reduces the size of the WWTP Biotreatment tanks.

The BIOGRADEX technology MLSS vacuum degassing process also breaks up the activated sludge floc as dissolved gas micro bubbles are removed. The floc is then reformed by BIOGRADEX technology to produce floc that settles better than before degassing. The degassed sludge in the clarifier does not become bulky after settling. Also the resulting elimination of scum on secondary clarifiers helps prevent *nocardia* infestation which is one of the major operating risks for BNR type WWTPs.

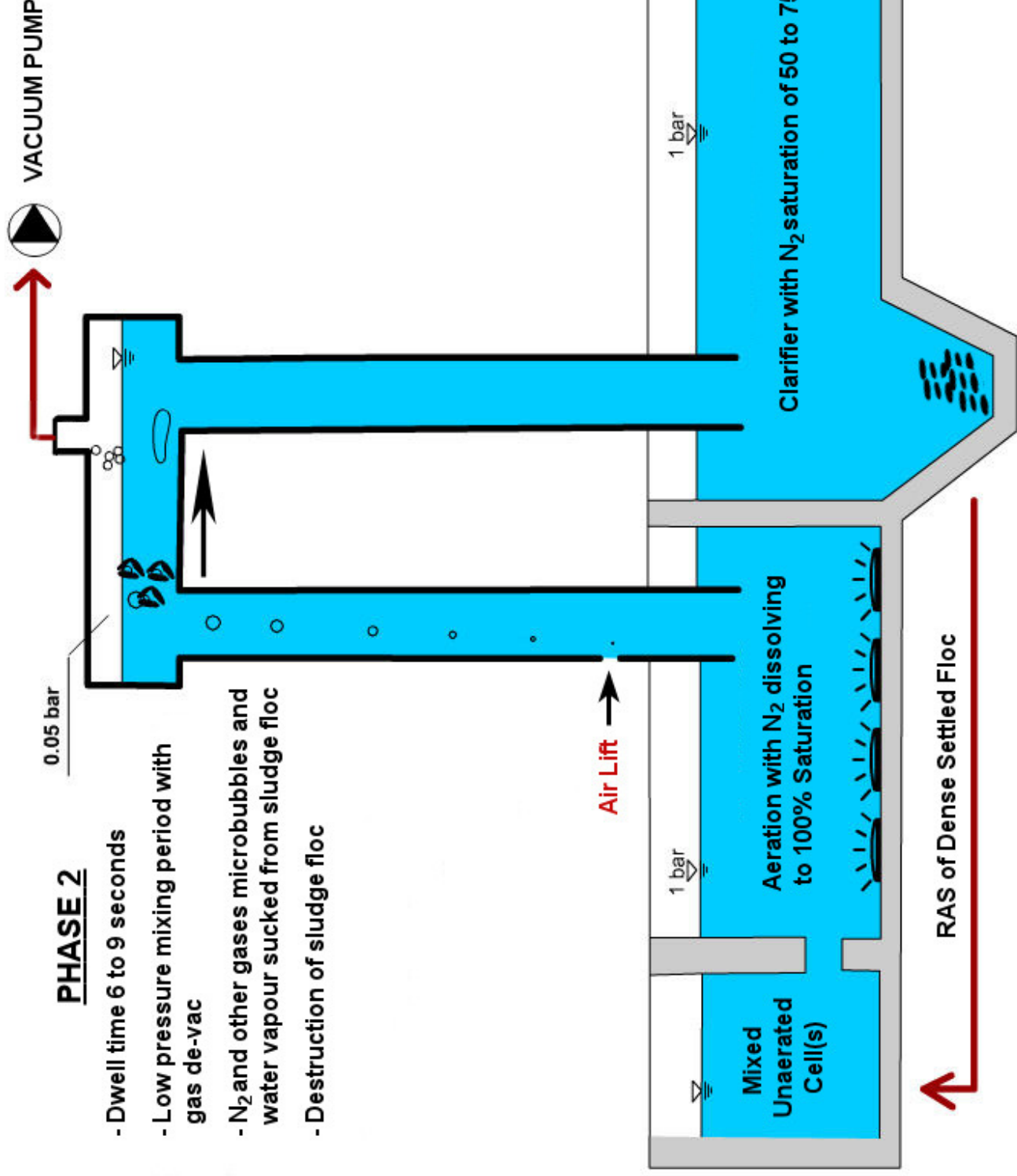
Treatment process and operation enhancements by BIOGRADEX technology vacuum degassing of mixed liquor has been proven to achieve full-scale, ground-breaking WWTP enhancements that are unparalleled for BNR activated sludge wastewater treatment technology. A new BNR treatment benchmark has now been established by BIOGRADEX technology for cost effective, compact wastewater Biological Nutrient Removal, as well as a new standard of WWTP operational efficiencies, stability and flexibility.

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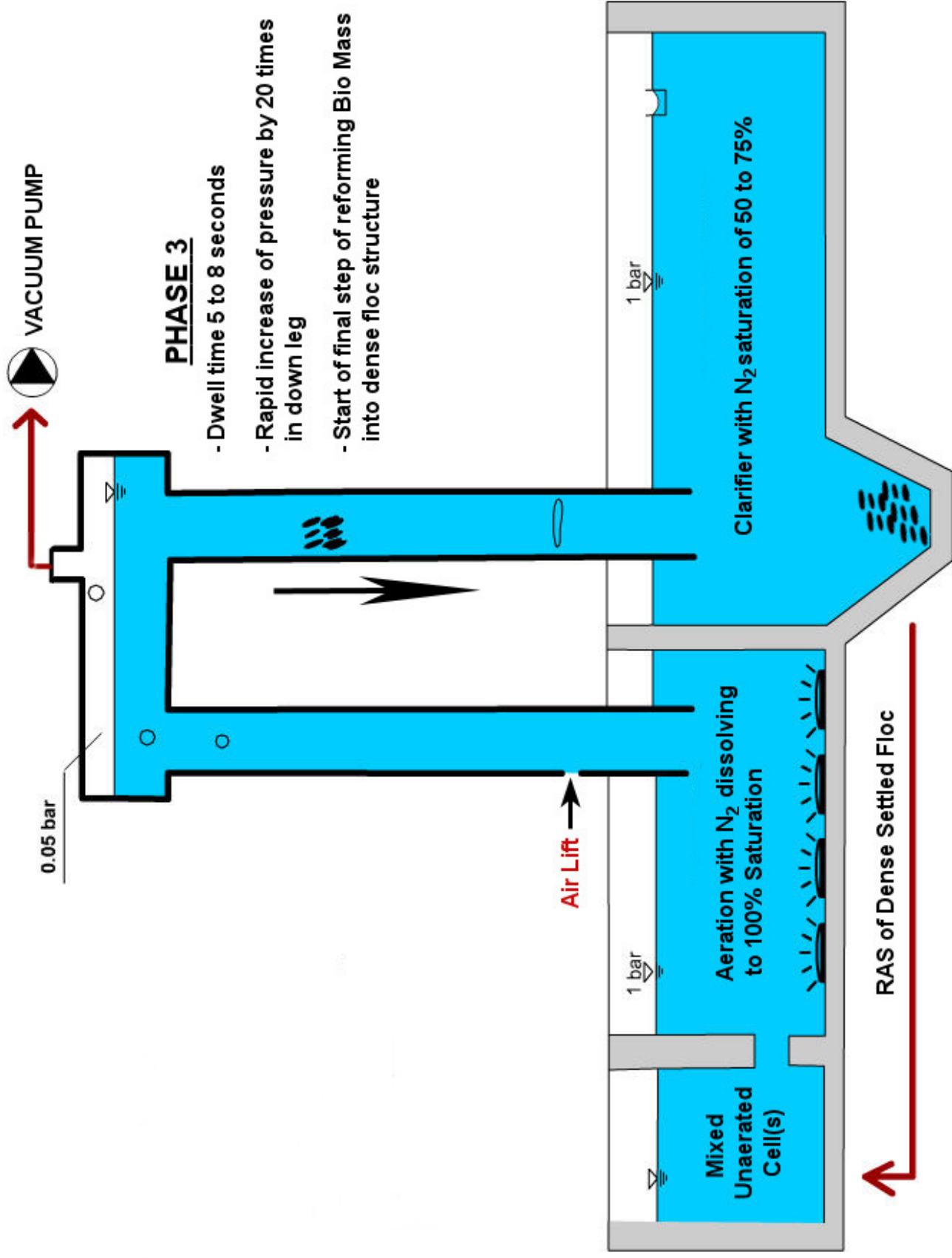
Technology Animation - PHASE 1



Technology Animation - PHASE 2



Technology Animation - PHASE 3



CONTENTS

[BNR Upgrades](#)

[Technology Summary](#)

[Technology Details](#)

[Technology Animation](#)

[New Developments](#)

[Features & Benefits](#)

[Projects List](#)

[Patents List](#)

[Mission Statement](#)

[Contact Us](#)

New Developments



Dzierzgon, Poland - Average daily flow 2300 [m3/day]



Lubochnia Dworska, Poland -
Average daily flow 1000 [m3/



Jakubowice, Poland - Average
daily flow 200 [m3/day]

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CONTENTS

[BNR Upgrades](#)

[Technology Summary](#)

[Technology Details](#)

[Technology Animation](#)

[New Developments](#)

[Features & Benefits](#)

[Projects List](#)

[Patents List](#)

[Mission Statement](#)

[Contact Us](#)

Technology Features & Benefits

- Greatly improved MLSS settling characteristics year-round
- Eliminates sludge bulking even for high filamentous organism conditions, and helps prevent potential *nocardia* infestations
- Consistent high RAS concentrations up to 2%
- Maintains year-round MLSS concentrations of 6,000 – 8,000 mg/l or higher
- Reduced Biotreatment cells size up to approximately 50% smaller than conventional activated sludge BNR WWTPs of same depth
- True Anoxic and Anaerobic conditions to optimize BNR processes
- Energy savings up to 50% for mixing of reduced volume Bio Cells
- No settled sludge “pop-up” in secondary clarifiers
- Reduced secondary clarifiers surface area by up to 30%, and protects from storm flow overloading poor performance
- No floating scum nuisance on secondary clarifiers, so collection, management and disposal of scum can be eliminated
- Operator-friendly, stable WWTP performance and minimum process supervision required
- High Resistance to organic shocks and impacts from maximum hour hydraulic overloading
- Allows for substantially reduced WAS production and use of WAS Gravity Thickening options
- Thicker WAS up to 2% reduces dewatering costs, energy consumption, and chemicals use

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CONTENTS

[BNR Upgrades](#)

[Technology Summary](#)

[Technology Details](#)

[Technology Animation](#)

[New Developments](#)

[Features & Benefits](#)

[Projects List](#)

[Patents List](#)

[Mission Statement](#)

[Contact Us](#)

Patents List (by Country)

- **U.S.A.**
- **CANADA**
- **EUROPE**
- **KOREA**
- **JAPAN**
- **BRAZIL**
- **POLAND**
- **CZECH REPUBLIC**
- **HUNGARY**
- **RUSSIA**

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technology
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Solution for new and
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wastewater plants*

CONTENTS

[BNR Upgrades](#)

[Technology Summary](#)

[Technology Details](#)

[Technology Animation](#)

[New Developments](#)

[Features & Benefits](#)

[Projects List](#)

[Patents List](#)

[Mission Statement](#)

[Contact Us](#)

Our Mission

**BIOGRADEX is committed to
provide its clients with
affordable solutions appropriate
for their wastewater treatment
needs and to protect and
enhance the Environment
through
new and innovative
biological nutrient removal.**

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Design, Manufacturing & Engineering Support for BIOGRADEX Technology

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