LIFE DeNTreat

Decentralized innovative treatment of ammonium-rich urban wastewater

PROJECT CONCEPT

Giovanni Bergna

Lariana Depur SpA

LIFE DeNTreat FINAL EVENT – web meeting

February 24th, 2021

The project has received funding from European Union´s LIFE Programme under Grant Agreement LIFE16 ENV/IT/000345

Why Life DeNTreat ?

Digital Textile Printing has spread globally due to its versatility with respect to conventional printing techniques.

The project stems from the need to develop sustainable solutions to deal with the problem of increasing nitrogen concentrations in industrial wastewater of digital textile printing.

Nitrogen: a new problem

Ink-jet printing requires a specific pre-treatment, where the reactive dye fixing agent carrier (urea) is applied

The specific pre-treatment with urea is applied to 100% all over of the textile material

Urea is then completely washed out after printing and fixation

Wastewater produced by DTP processes presents higher N concentration (in the forms of urea and ammonium)

Approximately 150 – 600 mg N/L

This increase correspond to an increase in nitrogen concentration in wastewaters of about 200%

Life DeNTreat
Preliminary activities and stakeholders

- Phase 1 preliminary study (10.2014 – 06.2015)
- Phase 2 continuous laboratory pilot plant (07.2015 – 04.2016)
- Phase 3 Life project - demonstration plant (07.2017 – 03.2021)

For the presentation of the proposal, the project had the support of industrial associations (Confindustria Como, Confindustria Lombardia, Sistema Moda Italia), private and public wastewater management companies (Comodepur, Consorzio Alto Seveso and Livescia) and public bodies (Ufficio d'Ambito)

DA CENT'ANNI NEL FUTURO
CONFINDUSTRIA COMO

COMO DEPUR

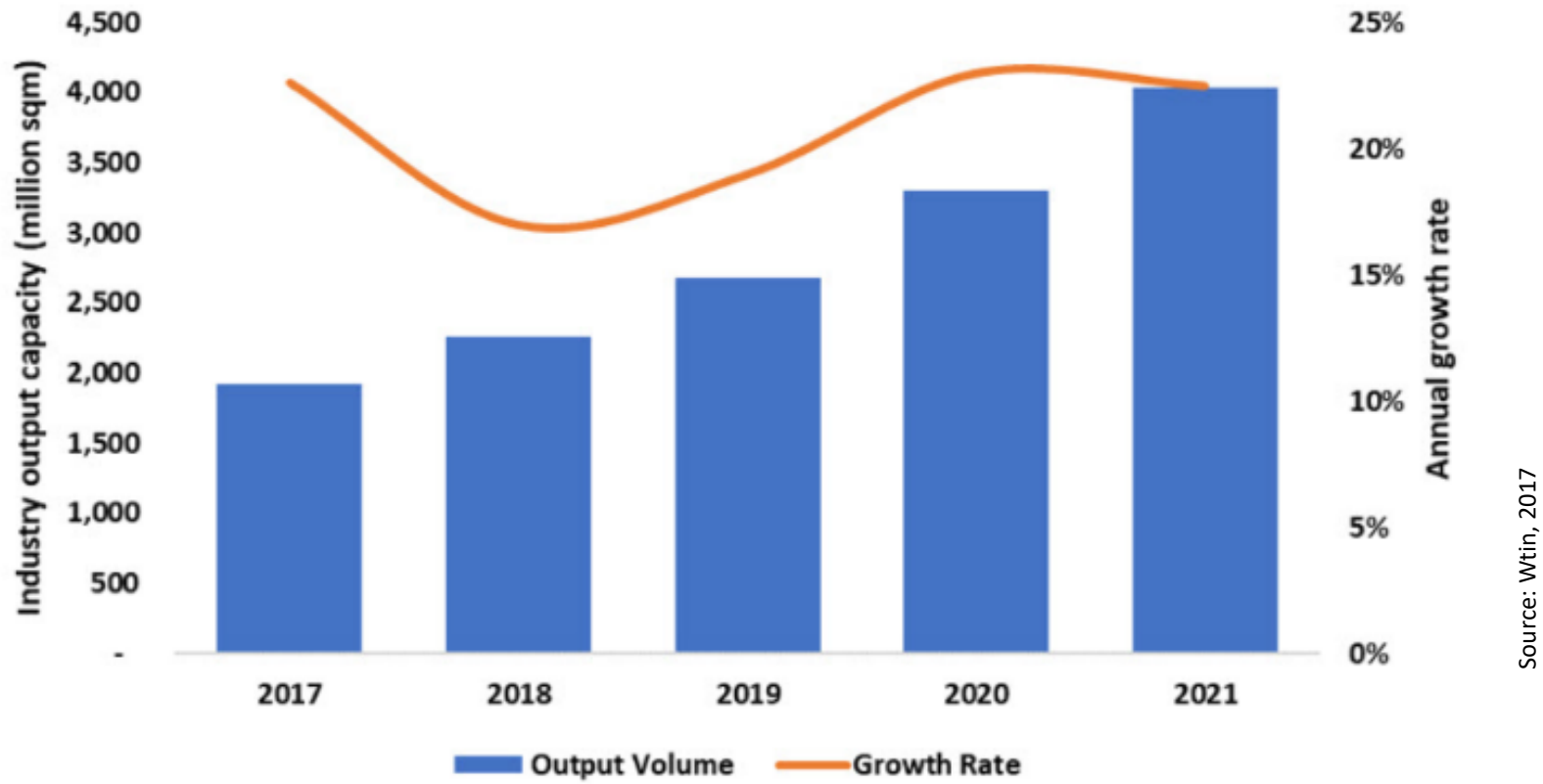
Life DeNTreat LIFE16 ENV/IT/000345 overview

Project Number: LIFE16 ENV/IT/000345
Title: Decentralized innovative treatment of ammonium-rich urban wastewater
Acronym : LIFE DeNTreat
Partners: Lariana Depur SpA (IT, Coordinating Beneficiary)
Politecnico di Milano (IT, Partner),
Stamperia di Cassina Rizzardi SpA (IT, Partner)
CITEVE - Centro Tecnológico Industrias Têxtil Vestuário Portugal (P,Partner)
EURATEX - European Apparel and Textile Confederation (BE, Partner)
Duration: 36(+9) months
Starting date: 1st July 2017
Conclusion date: 30th June 2020 (→ 31st March 2021)
Total budget: € 1,391,893
Project website: www.life-dentreat.eu

Project Coordinator

Project Partners

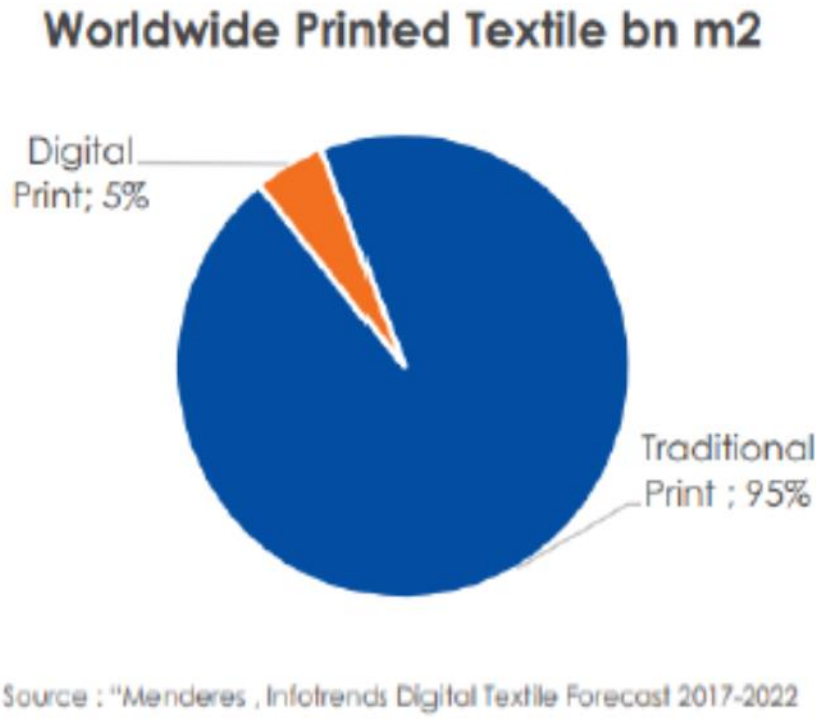
BACKGROUND
Global growth of Digital Textile Printing



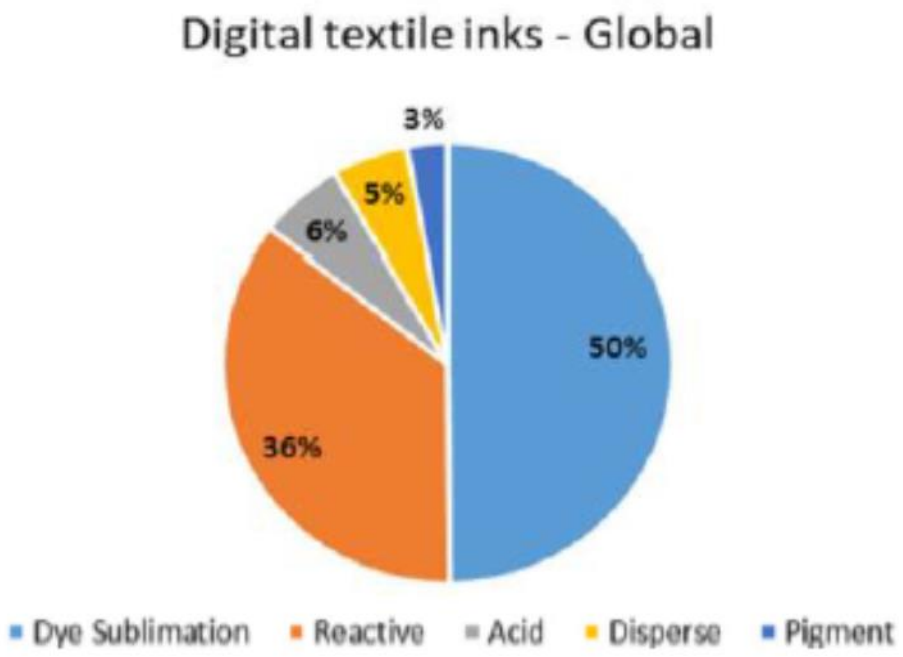
Source: Wtin, 2017

- In **2017** ,over **1.9 billion sqm** of fabric were digitally printed .
- The **annual growth rate** of digital textile textile printing is projected to **20 %** by volume through the period 2017 -2021.

BACKGROUND
Global growth of Digital Textile Printing



Source : "Menderes , Infotrends Digital Textile Forecast 2017-2022



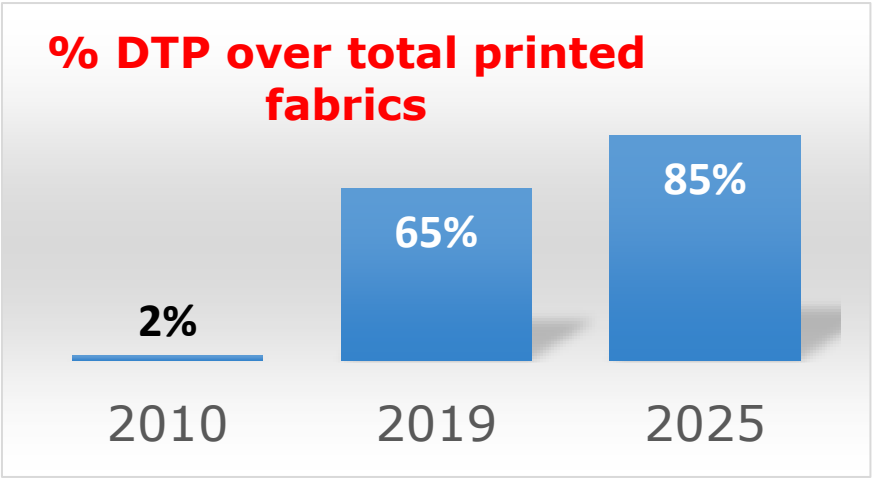
Source: Wtin, 2017

- Worldwide, digital textile printing has a **market share** of about **4-5%.**
- **Dye-sublimation ink** is the most consumed ink type, with a **50 % share**.
- **Reactive ink** follows with a **36 % share**.

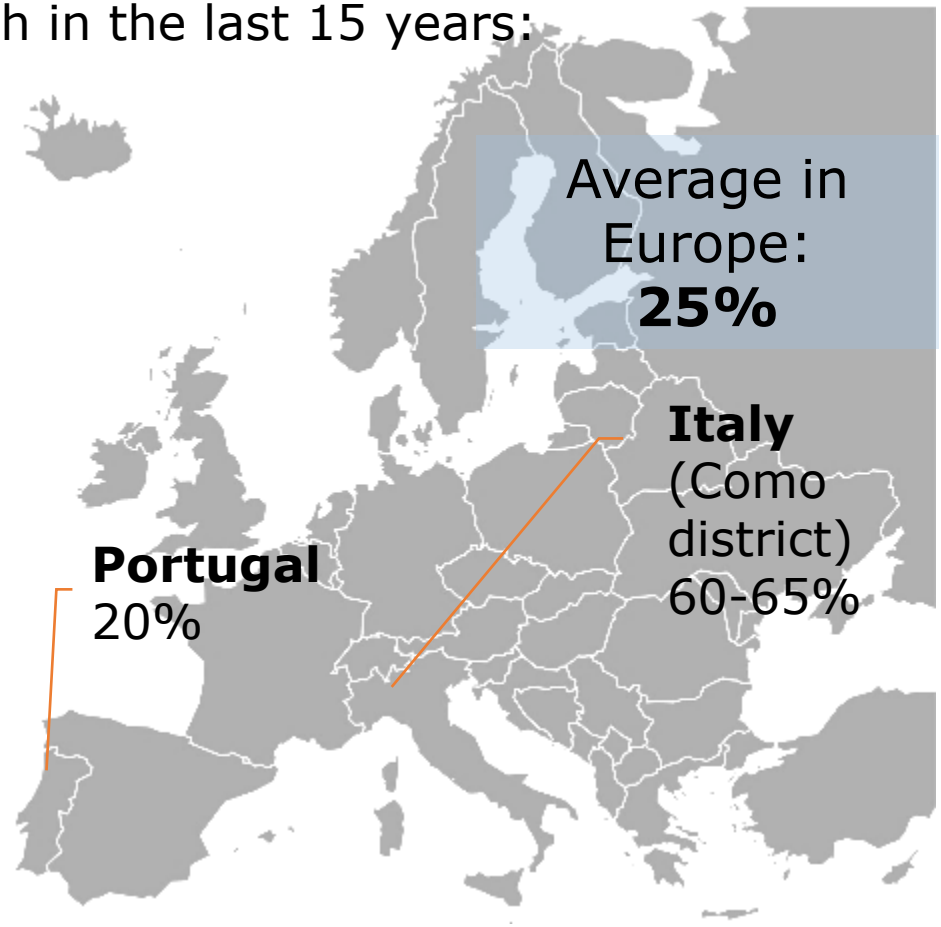
BACKGROUND
Global growth of Digital Textile Printing

Digital textile printing growth in the last 15 years:

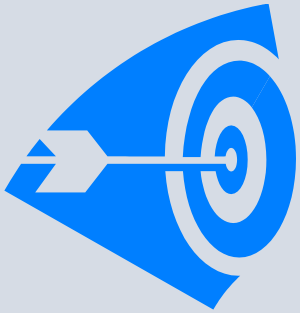
Como textile industrial district:



In the Como district, the adoption of digital printing is one of the responses to the difficulties in the textile sector linked to the global crisis.



PROJECT AIM

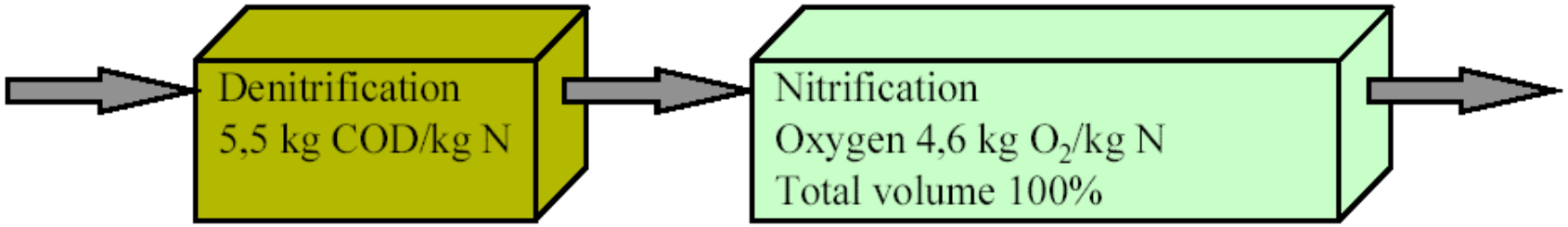


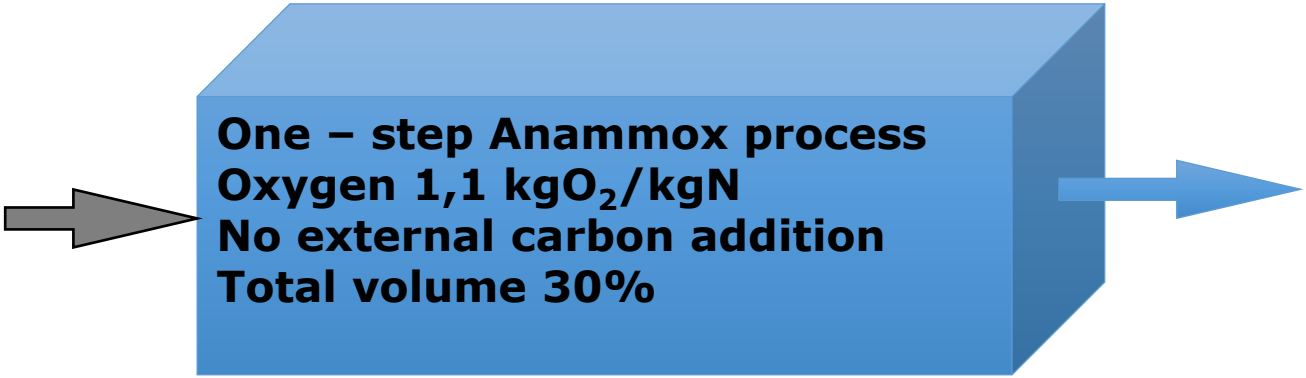
Life DeNTreat aims at demonstrating an **on site wastewater treatment module using Anammox** (Anaerobic AMMonium OXidation) technology to reduce nitrogen contents of wastewaters resulting from the **DTP process** and of overall urban ww

The Life DeNTreat tecnologies will allow to:

- obtain a residual N content below 100 mg/l in the wastewater released in the collection system;
- easily accomplish Directive 91/271/EEC art.5 requirements asking to ensure that the mini mum percentage of reduction of the overall load entering all urban WWTP in a given area is at least 75% for total nitrogen produced;
- assure the respect of residual nitrogen concentration in WWTP discharges, to be maintained below 10 mg/l enabling;
- an actual saving of up to 40% in investment and operational costs;
- a reduction of the GHG emissions of biological wastewater treatment;
- an abatement of the sludge produced as a result of the nitrogen abatement process to less than 25% of the currently adopted technologies.

PROBLEM:
cheap removal of N from N-rich wastewater





Max conversion efficiency = 88,8%

Reduced volume

Opex reduction due to:

- ✓ Low O_2 consumption
- ✓ External COD dosing absent
- ✓ Lower sludge production

THE PROCESS

- **PN → partial nitritation**

50% of N-NH_4^+ is converted

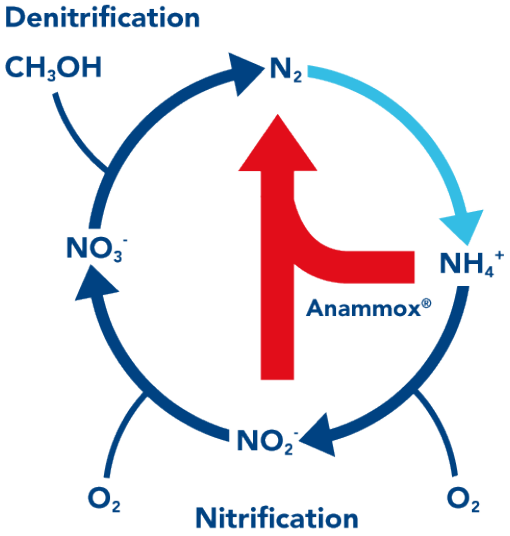
$$2NH_4^+ + 3O_2 \rightarrow 2NO_2^- + 4H^+ + 2H_2O$$

- **Anammox**

Nitrogen gas

$$NH_4^+ + 1.32NO_2^- + 0.066HCO_3^- + 0.13H^+ \rightarrow 1.02N_2 + 0.26NO_3^- + 0.066CH_2O_{0.5}N_{0.15} + 2.03H_2O$$

Nitrogen Cycle



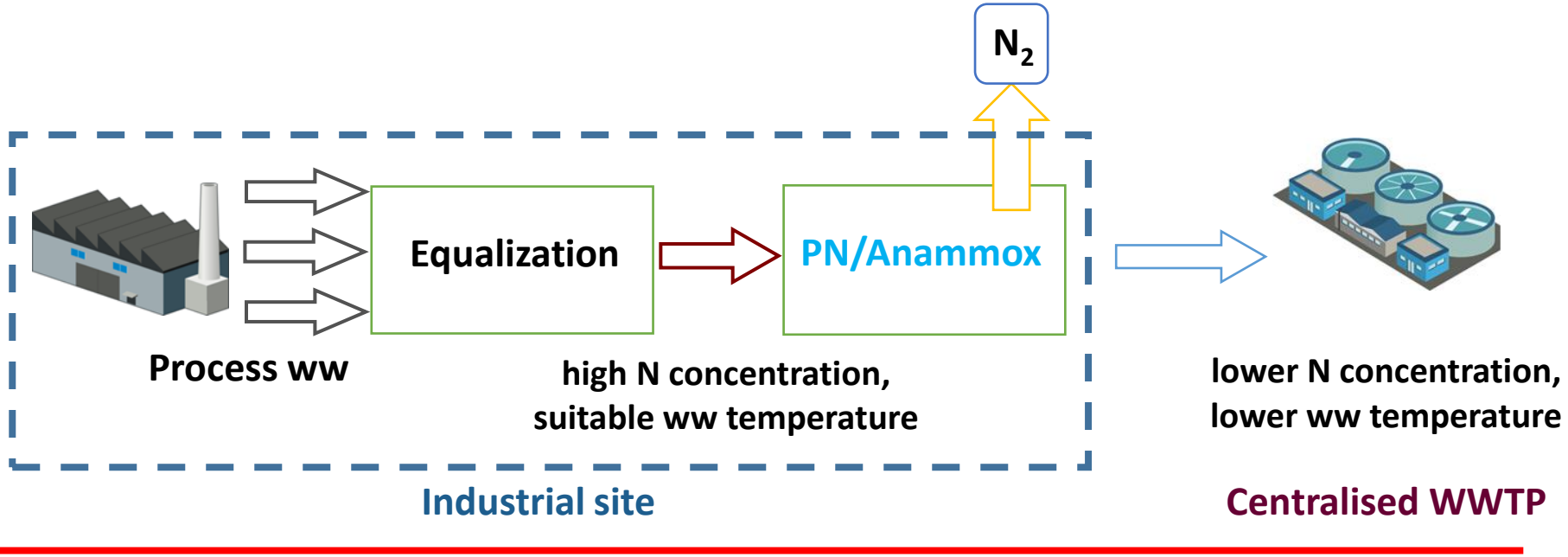
Max conversion efficiency = 88,8%

Reduced volume

Opex reduction due to:

- ✓ Low O_2 consumption – low energy consumption
- ✓ No dosing external carbon source
- ✓ Much lower sludge production

THE CONCEPT

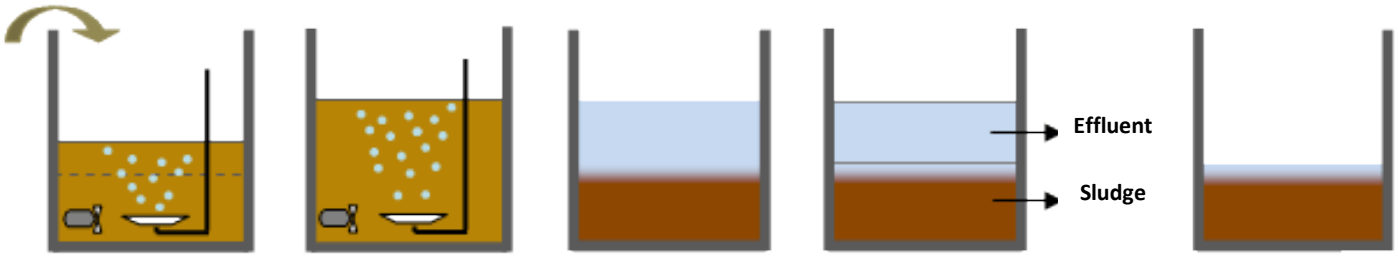

N_2
Equalization
PN/Anammox
Process ww
high N concentration,
suitable ww temperature
lower N concentration,
lower ww temperature
Industrial site
Centralised WWTP

From lab-scale pilot to demo plant at SCR

4 L PN/Anammox lab pilot reactor

12 m³ PN/Anammox reactor at SCR

GSSBR (Granular Sludge Sequencing Batch Reactor)



Phase 1
Feed with/without aeration

Phase 2
Aeration and mixing

Phase 3
Settling

Phase 4
Discharge of the effluent

New cycle

Thank you

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