



# End User Conference of EU-Projects INNOWATECH and NEPTUNE

## Introduction

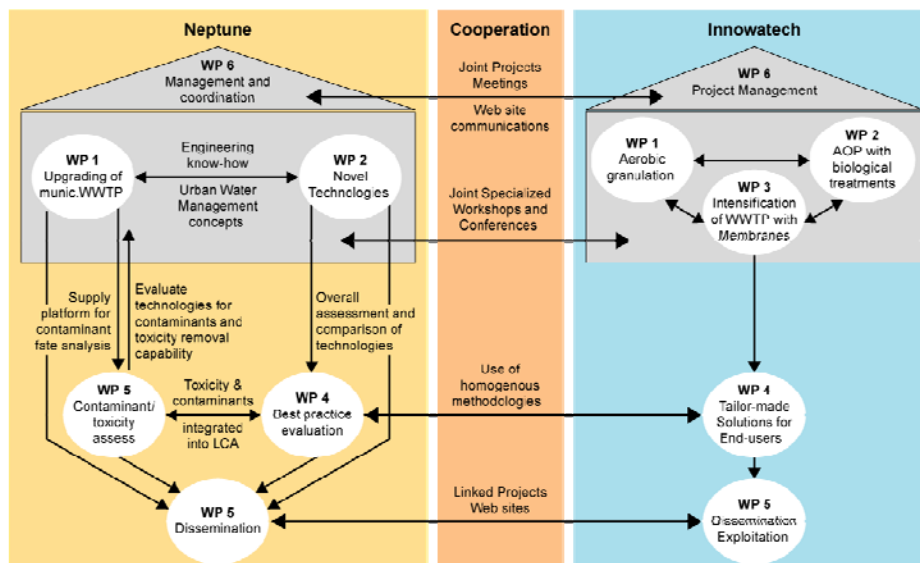


Antonio Lopez and Hansruedi Siegrist



27 January 2010, Gent, Belgium

## Neptune-Innowatech cooperation



## Neptune and Innowatech End User Conference

- 9:00 - 9:10 Official conference opening,  
Boudewijn Van De Steene, Aquafin NV, Belgium
- 9:10 - 9:20 Introduction by a EU Project Coordinators  
Antonio Lopez (Innowatech) and Hansruedi Siegrist (Neptune)
- 9:20 - 9:50 [Micropollutants and ecotoxicity in municipal WWTP effluents,](#)  
[Thomas Ternes, BfG, Germany](#)
- 9:50 -10:20 [Ozone-enhanced granular sludge sequential biofilter for the](#)  
[treatment of mature municipal landfill leachates,](#)  
[Claudio Di Iaconi, IRSA, Italy](#)
- 10:20 -10:50 Coffee break
- 10:50 -11:10 [LCA and nutrient removal, Joris Roels, Aquafin NV, Belgium](#)
- 11:10 -11:30 [Biorecalcitrant industrial wastewater treatment by integrating ad-](#)  
[vanced oxidation and biological processes, Sixto Malato, PSA, Spain](#)
- 11:30 -11:50 [Sustainable sludge handling, Giuseppe Minnini, IRSA, Italy](#)
- 11:50 -12:10 [Optimisation of landfill leachate treatment in a moving-bed biofilm](#)  
[system by means of reactor staging and controlled ozonation: the](#)  
[BIOZO concept, Benedek Plosz, NIVA, Norway](#)
- 12:10 -13:40 Lunch and poster session

### Innowatech Session

- 13:40: Advancements in Aerobic Granular  
Biomass processes, Jurg Keller,  
Giesen, The Netherlands
- 14:20: Integrated MBR and AOP processes  
for organics removal from  
pharmaceutical wastewater,  
Giuseppe Mascolo, IRSA, Italy
- 14:50: Heterogeneous photo-Fenton system  
for solar degradation of organic  
pollutants promising flow schemes,  
Felicien Mazille, EPFL, Switzerland
- 15:00: Recovery of phenols by membrane  
contactors,  
Christoph Bayer, RWTH, Germany

15:20-15:50 Coffee break

- 15:50: Membrane chemical reactor for  
industrial wastewater treatment,  
Bruce Jefferson, Cranfield  
University, UK
- 16:10: Modelling and comparing the environ-  
mental efficiency of new and existing  
technologies to treat toxic wastewater,  
Mats Almemark , IVL, Sweden

- 16:30-17:00 Keynote lecture: Exit conventional activated sludge approach, Willy Verstraete,  
University Ghent, Belgium

RECEPTION FOR ALL PARTICIPANTS

### Neptune Session

- 13:40: Full-scale application by nitrification/  
anammox process, Australia, A.  
Adriano Joss, EAWAG, Switzerland
- 14:00: Full-scale ozonation of WWTP  
effluent followed by sandfiltration  
Saskia Zimmermann, EAWAG,  
Switzerland
- 14:30: PAC addition to remove  
micropollutants,  
Ben Zwickenpflug, EAWAG,  
Switzerland
- 15:00: Sludge inertisation with high  
temperature pyrolysis - comparison  
with other inertisation processes,  
N. Miladinovic, EAWAG, Switzerland
- 15:50: Bioelectrochemical Systems – from  
power to value added chemicals  
production from wastewater,  
Jurg Keller, AWMC, Australia
- 16:10: Bioplastics as by-products of  
wastewater treatment,  
Fernando Morgan, AnoxKaldness  
Sweden



## Project Neptune

### New Sustainable Concepts and Processes for Optimization and Upgrading Municipal Wastewater and Sludge Treatment

Introduction to Neptune

Hansruedi Siegrist

January 2010, Gent, Belgium



## General scope of NEPTUNE

**The scope of sewage treatment is changing:** today municipal WWTP are seen as end-of-pipe treatment before discharge to avoid eutrophication, toxic effects and hygienic health hazard in surface water.

Due to the global demographic trends, climate change and new legislations, future focus is put on the quantity and quality of effluents: **WWTP are delivering resources to the environment and for the human activities.**

### Existing focus:

- Wastewater treatment
- nutrient removal
- pathogens removal
- energy optimization
- sludge disposal

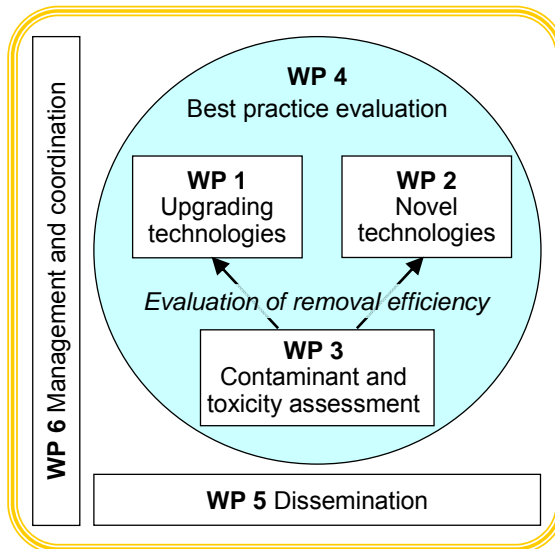
### New focus:

- water reuse
- nutrient recycling
- micropollutants and ecotoxicity removal
- energy production
- reuse of sludge and of its resources

This shift has implications on the quality goals for WWTP products.

## Structure of the EU Project NEPTUNE

New sustainable concepts and processes for optimisation and upgrading municipal wastewater and sludge treatment



### Consortium:

7 GOs and Universities  
2 Industry and consulting  
7 SMEs  
2 Non-European partners  
28 End-users

## NEPTUNE WPs (1)

### Upgrading of municipal infrastructure (WP1)

**WP-leader: Adriano Joss, Eawag, Switzerland**

- New control strategies with in-situ sensors
- Micropollutant removal with chemical oxidation, activated carbon adsorption and wetland treatment
- Safe sludge processing and reuse (sludge triage and inertisation)
- Waste design to improve overall treatment efficiency (separate sludge liquid and hospital wastewater treatment)

### Novel technologies (WP2)

**WP-leader: Ilse Forrez, LabMet, Uni Gent, Belgium**

- Microbial fuel cell applications: energy from waste water
- New oxidation processes (with Ferrate and  $MnO_2$ )
- Production of polymer from sludge
- High temperature pyrolysis with heavy metal and phosphate recycling

## NEPTUNE WPs (2)

### Ecotoxicity and micropollutant assessment (WP3)

**WP-leader: Thomas Ternes, Bundesanstalt für Gewässerkunde (BfG), Germany**

- Fate of selected micropollutants and transformation products in wastewater treatment
- Assessment of the ecotoxicological hazard of whole effluents in conventional and advanced treatment and effluent upgrades
- Identification of process variables that influence the removal of bacterial and viral indicators
- Development of a concept for the necessary basic equipment of an on-site mobile unit for performing ecotoxicological, biological and chemical assessment of effluents

## NEPTUNE WPs (3)

### Comparability of various technical options (WP4)

**WP-leader: Henrik Larsen, TU Denmark (DTU)**

- Life cycle assessment studies (LCA) including pathogens and ecotoxicity aspects
- Ranking for following technical options (best practice evaluation)
  - Upgrading of biologically treated effluent
  - Innovative nutrient removal control and processes
  - Sludge reduction methods: physical, chemical and thermal
  - Sludge inertisation and resource recycling

### Dissemination (WP5)

**WP leader: Marjoleine Weemaes, Aquafin, Belgium**

- Website construction (Eawag)
- Midterm workshop and end user conference
- General dissemination of results
- Catalogue with description of investigated processes



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## INNOWATECH - Facts

### WORK PROGRAMME, SUB-PRIORITY 1.1.6.3, "GLOBAL CHANGE AND ECOSYSTEMS"

4th Call for Proposals

Area II: Water cycle, including soil-related aspects

II.3 Integrated management strategies and mitigation technologies

II.3.2 New concepts and processes in wastewater treatment

## INNOWATECH

**Innovative and Integrated Technologies  
for the Treatment of Industrial Wastewater**

<http://www.innowatech.org>

FP6-2005-Global 4  
Contract n° 36882

Total cost: 4.8 MIL €



Duration: 1 Nov.'06 – 31 March.'10



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## INNOWATECH – Main Objectives

- Investigate and enhance the performance of promising industrial wastewater treatment options, particularly with respect to enhancement of process stability and efficiency removal of recalcitrant compounds and/or priority hazardous compounds
- Achieve fundamental and technological knowledge advancements necessary for a more wide-spread advanced wastewater treatment application
- Assess and improve the economic and environmental sustainability of the investigated treatment options



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### INNOWATECH - Industrial WW treatments: Difficulties and investigated Solutions

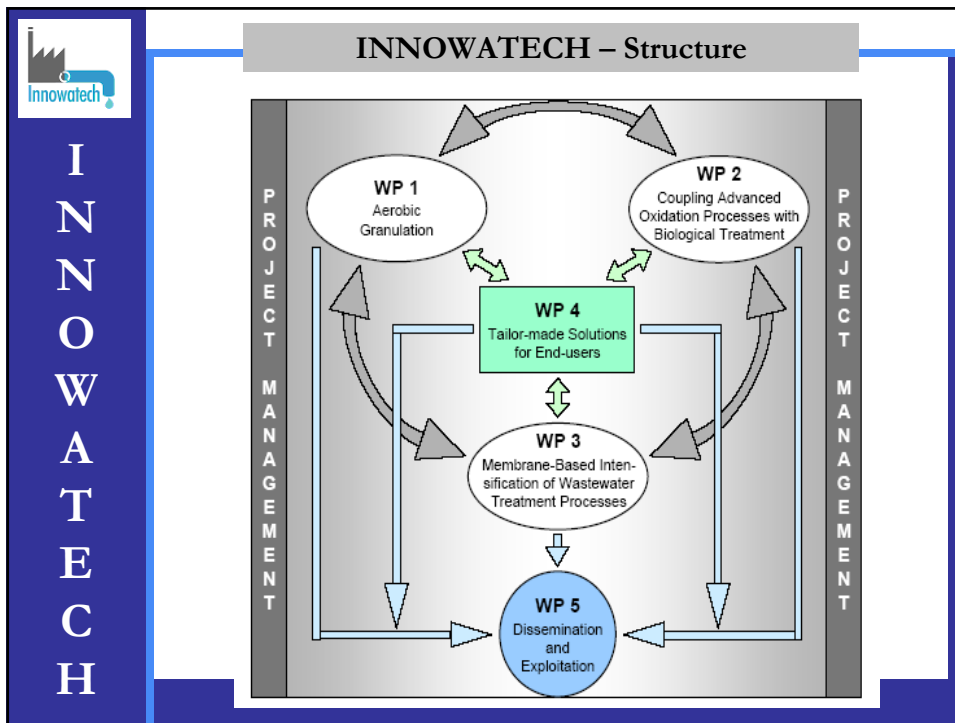
WW Treatment Difficulties	Investigated Solutions
Inefficient biological treatment lacking in operational flexibility and stability. High sludge production	Aerobic granular sludge systems
Occurrence of recalcitrant and/or toxic compounds impairing biodegradability	Advanced oxidation processes combined and/or integrated with biological treatment steps
Lack of technologies for selective removal and/or recovery of raw materials and/or priority organic pollutants	Membrane-based technologies for process intensification in wastewater treatment
Non-ideal combination and adaptation of treatment options for specific processes	Evaluation of economical and ecological sustainability and system integration



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### INNOWATECH: Treated Wastewater

Industry	Features	Technology/Process
Food	-High concentrated load -High sludge production	-Nereda -SBBGR -UniFed
Landfill leachate	-Recalcitrant -Qualitatively complex and variable	-SBBGR+Ozonation -BIOZO concept
Pharmaceutical	- Low concentration of pharmaceuticals in complex WW often saline. Tox. Byproducts	-MBR+AOP -PhotoFenton+IBR -IBR+PhotoFenton
Pesticides	-Highly toxic -Not biodegradable	-PhotoFenton+IBR
Chemical	-Hardly biodegradable -Often containing chemicals worthy to be selectively recovered	-MC -MCR



### INNOWATECH – Consortium

**17 partners, 16 from 8 European Countries, 1 from Australia:**  
**5 Universities, 3 Research Institutes, 6 Specialized SMEs, 3 Commercial Organizations,**

**Coordinator:** [Italian Water Research Institute](#)

**IRSA CNR**

**IVL**

**NIVA**

**Bayer MaterialScience**

**ANOXKALDNES**

**RWTH AACHEN**

**Cranfield UNIVERSITY**

**EPFL**  
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

**WATERINNOVATE**  
bringing innovation to market

**SolSep BV**  
Robust Separation technologies

**TU Delft**  
Delft University of Technology

**WEDECO**  
Water Technology, Ltd

**AWMC**

INNOWATECH