The need of eco-positive and innovative water and waste water technologies

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- Whatever the men find out, whatever he created, it was against the nature – i.e. destruction of the equilibrium in the environment. Invented bow, rifle, or axe have been the tools for mass destruction of the flora and fauna.
- Many thousand years later the invention of steam-engine resulted in drastic evolution of the industry and as a result to drastic destruction of the environment . This was the beginning of the „carbon era" - massive use of carbon and later other fuels.
- **The consequences of skills and knowledge upgrading means most often higher degree of environmental destruction**

Old slogans versus new ideas

- Safe drinking water
- Supply to everybody
- Clean surface waters
- High degree waste waters treatment
- Avoid water pollution
- Last top technology adoption (BAT)

- **Innovative …..**

- Low cost
- Low foot print
- Low power consumption
- Low environmental impact

B B B

WATER

Ultrafiltration

Nano-materials, e.g. nano-textiles

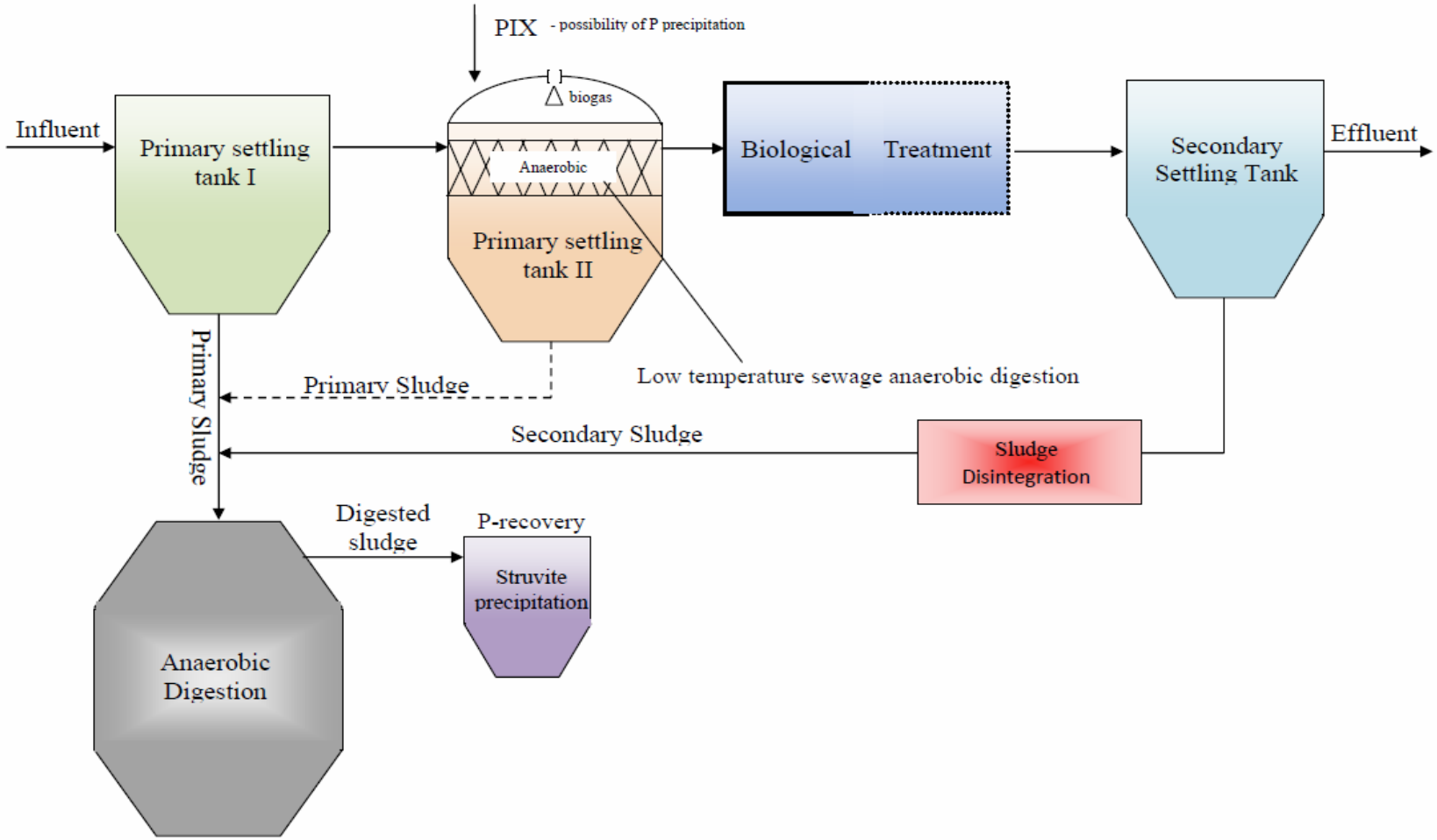
Permanent removal of refractory compounds

Zeolites, intelligent capture materials

SEWAGE

Eco-positive primary and secondary sewage treatment

C P N



Selected development and research activities in Poland following „innovation”

- Introduction and application of pre-hydrolyzed chemicals for drinking water treatment
- Ultrafiltration for water disinfection – nano technology

- Low temperature sewage anaerobic treatment (preliminary stage)
- Two stage mesophilic + thermophilic anaerobic sludge digestion
- Chemical nitrogen removal

- Water recovery for industrial use, mainly as cooling water (thermal power plants)
- Variety of new or innovative industrial waste waters treatment technologies for, steel, coke cooking and chemical industry

- Within the established in 2005,

Polish Platform on Environmental Technologies

a Strategic Research Agenda

was elaborated which include water resources

Priority technologies

defined within the polish Strategic Research Agenda (exceptions)

- Low cost and power consumption wastewater treatment

- Membrane technologies in water and wastewater treatment, closing water cycles in industrial plants
- Bioengineering systems in water protection
- Models of integrated water management in catchment scale (surface runoff, retention, spatial planning, mass transport in sewerage systems, storm overflows)
- Monitoring of specific substances in the environment (monitoring, prevention, micro-contaminants, soil and water environment)
- Models of operation and revitalization of water infrastructure (non-excavation methods, water supply systems, sewage systems, wastewater treatment plants, hydrotechnical constructions)
- Techniques and technologies for reclamation and oligotrophication of lymnic ecosystems – reduction of internal enhancement process, immobilization of phosphorus
- Techniques for reduction of biogenic elements discharge to surface waters

Carried out development and research activities are a part of the more general subjects or pilots.

- Sustainable Water Management in urban areas
- Sustainable Water Management for agricultural areas
- Sustainable Water Management for industries
- Restoration of degraded water resources
- Adaptation & mitigation management of extreme water events

- The subjects given in the mentioned above SRA do not exactly follow the WssTP SRA, sometimes it is simple a different wording, but also other subjects are more specific for water problems in Poland.

- Nevertheless the WssTP SRA comprise a much wider list of subjects to consider. Most of the subjects are also of interest to the Polish “water community”.

Thanks for your attention

Possible contribution to Pilot 2

Sustainable Water Management in urban areas

- Rethinking of presently applied municipal wastewater treatment technologies aiming at development of low footprint and low power consumption.
- innovative anaerobic municipal sewage treatment technology (as the first step of biological treatment)
- new nutrients (nitrogen and phosphorous) removal processes aiming also at their recovery
- closer integration of sludge and wastewater processes
- introduction of innovative power saving and/or power positive, treatment technologies

Possible contribution to Pilot 2 & 3

Sustainable Water Management for agricultural areas and for industries.

- Control and more stringent requirements for industrial plants as well as for animal farms.
- closing water circuits with the application of newest nanotechnology achievements and membrane technology
- elaboration of technology for priority pollutants retention, including e.g. pharmaceuticals (produced or used in production processes)
- invention a zero discharge concept for selected chemicals

Possible contribution to Pilot 4

Restoration of degraded water resources

- Promoting local solutions – small scale actions as effective and more environmentaly friendly
- Local restoration of a small piece of land, forest or water resource is feasible and should be practiced more frequently
- Attention on local level to be given to the performance and interaction of ecological, hydrological and biogeochemical functions of vegetation and fauna to maintain an equilibrium in the water environment
- Better understanding the importance of river marginal wet areas contributing to water quality conservation and maintain regional water balance. (in many cases local droughts and floods could be avoided or the effects minimized)

Possible contribution to Pilot 6.
Adaptation & mitigation management of extreme water events

Restoration and introduction o novel (innovative) technology (ideas) of hydrotechnical constructions aiming at ecological effects upgrading.

- **Novel systems of intermediary storm water reservoirs (open and closed) in suburban areas and city centres**
- **Identification of increased hydro-soil errosion in sub-mountainous (hilly) regions (trees transport channels – gutters) and methods curbing suspended solids (soils particles) transport to water uptake reservoirs**
- **elaboration of an integrated waters rehabilitation system which should be based on engineering, biological and ecological sciences**
- **provision of clauses, impoundments and other concepts for climate changes mitigation**
- **wet areas (marshes, swamps, ponds, boogies, wetlands) restoration**

- development of innovative technologies for transport and temporary storage of waste water in combined sewer systems in critical hydrological events.

- Identification of increased hydro-soil errosion in sub-mountainous (hilly) regions (trees transport channels – gutters) and methods curbing suspended solids (soils particles) transport to waterworks uptake reservoirs

- Revision of existing procedures of storm water retention in small reservoirs based on appropriate models, introduction of innovative sewerage constructions of a higher retention capacity, integration with „wet areas” impoundments ponds, marshes etc.

Pilot 4.
Sustainable water management for industry

- **Thermal power plants cooling system (Poland)**
- Water scarcity and high cost of municipal potable water drives for alternative sources for cooling water. Drainage water from deep coal mines can only be used for partial recharge of cooling systems due to relatively high salinity. Treated municipal wastewater seems to be the best alternative water source. In spite of the high quality of biological treaded municipal wastewaters in terms of BOD, COD, nutrients and suspended solids, direct use in cooling systems is limited by the presence of micro-organisms and potential scaling effects. The determination of the sufficient disinfection rate – permitted number of various microorganisms including pathogens, is the crucial aspect. Also evaluation of the potential scaling effects is necessary.

Pilot 5.
Reclamation of degraded water zones (surface and ground water)

- **Rehabilitation of the Klodnica River including appertaining reservoirs. (Poland)**
- Draining a large area of the Silesian Industrial Region the Klodnica River is highly polluted in spite of newly constructed and modernized municipal wastewater treatment plants, and major measures taken by the industry. Discharges form coal mines apart from being of high salinity have resulted in deposition of suspended mineral solids. Apart form PAH's discharged mainly by coke cooking plants, the waste waters from steel mills and nonferrous industry resulted in contamination with heavy metals. Wider introduction of ponds, impoundments and constructed wetlands is seen as an additional engineering approach to contribute to water quality upgrading. Rehabilitation of the water course including two relatively large reservoirs requires partial dredging and enhanced biological oxidation of PAH's and other organic pollutants. Also implementation of other measures are considered

Regarding Wastewater Treatment Technologies the **Institute for Ecology of Industrial Areas**

is ready to participate in preparation of tools based on mathematical models including:

- **different technologies evaluation;**
- **assessment of scenarios for particular technologies;**
- **real-time systems combining monitoring and modelling tools.**
- **also;**
- **tools for simulation of chemical and biochemical processes;**
- **modelling of new technologies for WWTPs (e.g. like low-temperature methane fermentation of organic wastewater);**
- **assessment of sewage treatment technologies s.**