Development of advanced sewage treatment (AST) for sustainable water reuse 'Sewage water'- BL/00/C31

(Geographic) study area (country/region) : North-East China

Data used: Changchun & Belgian sewage data

Context and objectives

The socio-economic and environmental development in arid North-East China is hindered by decreasing water resources, increasing water pollution and low water availability (only 30% in Jilin). Hence sustainable water management and water reuse are becoming top priorities for agriculture and urban use in this region.
In the European Union (EU), the Water Framework Directive forces designers and operators to boost the efficiency and performance of their sewage/wastewater treatment plants (STP's) as to further improve the quality of the surface and ground water.
In both cases (China and EU), the most critical effluent quality parameter is the residual organic matter (soluble and solids), represented by the chemical oxygen demand (COD).
As to meet the Class IV Water Quality Standards (COD < 50 mg/l, …) for water reuse in irrigation in a sustainable way, an integrated advanced sewage treatment (AST) process is proposed. This innovative process extends the standard activated sludge (AS) system used in most STP's, by enhanced selection-biosorption combined with regeneration-hydrolysis. AST is intended as a cost-effective upgrade of new and existing STP's.
The main objectives of the AST project are to achieve Class IV water quality by enhanced biological treatment with no chemicals, less waste sludge and less energy as compared to state-of-the-art STP's (Changchun case).

Methodology

- Establishing the state-of-the-art on the removal of 'hard' COD from sewage.
- Characterisation of sewage focussing on COD fractions and biodegradation kinetics
- Lab research on biosorption and enhanced biodegradation by activated sludge and fungi
- Industrial scale pilot testing of the AST on sewage in field conditions
- Dynamic modelling and validation of the AST
- Model based (re)design of full-scale AST and dynamic simulations in summer and winter conditions
- Performance/cost comparison between AST and standard AS based STP's

Results

- Biosorption model (key AST model component)
- Industrial scale AST meets Class IV water quality for reuse: CODt as low as 33 mg/l in field conditions
- Validated dynamic AST model applied to full-scale Changchun STP design
- Enhanced biodegradation in AST : 17% less waste sludge in summer and 23% less in winter
- High energy efficiency in AST : 26% less aeration energy in summer and 22% less in winter

Products and services

1. Dynamic AST model with simulation software for training and evaluation (annex)
2. Model based (re)design and upgrade of new and existing STP's

Execution

Period: 1-April-2005 until 31-March-2007

Laboratory/network: - Karel de Grote Hogeschool Antwerpen – Prof. L.Geuens
- CEBEDEAU Liège
- Model Engineering

-Changdun Tongji environment protection Technology Co. Ltd (TEPCC)-
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- Science and technology Commission of Henan Province

Discipline

Hydrology & freshwater resources (waste water treatment)
Land planning & infrastructures
Urban & suburban
Information & communication technology
Economic issues