



RESET
Interreg Europe



European Union
European Regional
Development Fund

AquaFit4Use

The project for sustainable water use in industry

Olga Chybová

INOTEX Ltd., Czech Republic

chybova@inotex.cz

14 February, 2017 | 2nd RESET seminar in Porto

Private small textile company - innovation, R&D, textiles and auxiliaries production, technologies development, optimization and transfer.

SME: 47 employees

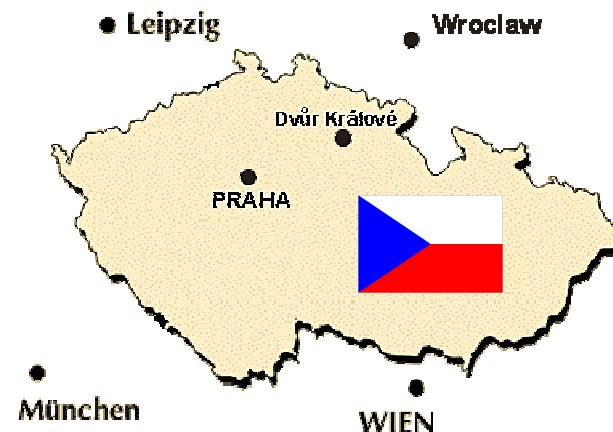
KEY STRATEGY:

***TO SUPPORT IMPLEMENTATION OF TAILORED R&D RESULTS
INTO THE PRACTICE OF TEXTILE COMPANIES
BY USE OF OWN PILOT PRODUCTION CAPACITIES***

CZ 544 01 Dvůr Králové n.L.

Czech Republic

inotex@inotex.cz, www.inotex.cz



ACTIVITY AREA

TEXTILE WET PROCESSING AND PRODUCT SALE

- Production and service - small scale production unit
- New products development and transfer to the SME's
- Development and introduction of new eco-friendly technologies
- Textile biotechnology



SPECIAL MACHINERY equipment and devices production

SMALL-SCALE finishing / coating capacity

functional textiles, technical textiles,.....



ACTIVITY AREA

DYES, COLOURISTIC DEPARTMENT

- Complex colouristic service
- Colourmatching
- Customization of dyeing processes
- Supply of dyes and auxiliary agents of reputable producers



ACCREDITED TESTING LABORATORY (ISO EN 17025)

- testing of textiles (colour fastness, formaldehyde content, material resistance, flame resistance, MMT, dimensional changes,...)

CENTRE OF ECOLOGY

- consultancy and testing for ecolabelling (CZ Ecolabel), IPPC, eco-friendly techniques
- decolourisation and separation of heavy metal ions from textile waste water
- ADR (road transport of dangerous goods)

R& D / INNOVATIONS

Experience in the national and international team cooperation

International R&D programmes



Multidisciplinary clusters



*Cluster for
technical textiles*



*Biopharmaceutical
cluster*

Coordination

*EU R&D Roadmap for
Textile Biotechnology*





AquaFit4Use



- The FP7 project (211534) for sustainable water use in industry
- Duration 48 months (June 2008 – August 2012)
- Total Budget: 14.800.000 EUR
- Total EC Funding: 9.700.000 EUR
- 33 partners from 11 countries
(Netherlands, Germany, Spain, Belgium, France, Slovenia, Italy, Sweden, Denmark, Poland, Czech Republic)
- 12 pilot cases





AquaFit4Use



Aim of the project:

- development and implementation of emerging, cost-effective cross-sectorial technologies, tools and methods to reuse water in four main water consuming industries (chemical, paper, textile and food)





AquaFit4Use



Aim of the project:

- **solutions to improve water management**
- **solutions to solve the industrial common problems:**
 - biofouling and scaling
 - concentrate and saline streams
 - membranes management (retention rate, membrane fouling)
 - enhancement of bio-treatment
 - removal of COD and specific substances
 - disinfection



AquaFit4Use



Aim of the project:

- **custom-made treatment trains for participating sectors (pilots, solutions):**
 - application of MBR on variable and harsh chemical wastewater and effluent reuse (chemical industry)
 - removing of recalcitrant substrates (paper industry)
 - separation of streams and their effective treatment and reusability (textile industry)
 - optimization of cleaning-in-place processes and alternative water use possibilities (food industry)



AquaFit4Use



Objectives:

- Reduction of fresh water needs (30 % water savings)
- Closing the water cycle
- Decreased environmental impact (energy, emissions, sludge)
- Water fit-for-use (increasing productivity, safety, health)
- Replacement of use of drinking water for industrial application



AquaFit4Use



Results:

- **Treatment trains as custom made solutions**
Pilots and solutions for textile industry
- textile sector needs large volumes of process water (up to 800 L/kg of processed material)
- in textile sector, use of the fresh high quality water is still preferred in all production processes after softening to be sure that the quality of the final product will be preserved





AquaFit4Use



Pilots and solutions for textile industry

The water-reuse in textile production is a challenge

- large volumes of heavily charged waste water (dyes, salts, acids, bases, surfactants, metals, organics, biocides, toxic anions, persistent organic pollutants, metals ...)
- the typical characteristic of textile wastewater:
 - extremely high and very frequent variability of its composition (seasonally, even daily)
 - significantly different from company to company
- each textile plant should be considered individually, tailor-made solution is needed





AquaFit4Use



Pilots and solutions for textile industry

- participating industrial partners



- participating technology suppliers



- participating research organisations





AquaFit4Use



Pilots and solutions for textile industry

Objectives:

- to increase treatability and reusability options of effluents by conventional treatment technologies and their combinations
- real implementation of water cycle closure in Tekstina and Svilanit
- implementation of a tailor-made treatment train for mixed waste streams in Inotex





AquaFit4Use



Pilots and solutions for textile industry

The applied strategy:

- separation of streams regarding their pollution level (high-concentrated and low-concentrated) and
- their separate cost-effective treatment with high reusability potential





AquaFit4Use

Pilots and solutions for textile industry

The technologies:

- membrane filtration (UF, NF)
- evapoconcentration
- AOPs (UV/H₂O₂)
- membrane bioreactor
- flocculation
- biological treatment



The technologies were tested in new combinations on each group of waste water streams (laboratory scale, the most promising in pilot scale)



AquaFit4Use



Pilots and solutions for textile industry

Strategy :

Step 1: systematic assessment, analysis and evaluation of process data – comprehensive mapping of all process related water circuits and relevant loadings in water streams

Step 2: definition of waste streams and study of their treatability and reusability

Step 3: identification of possibilities to improve the water and wastewater networks in companies





AquaFit4Use



Pilots and solutions for textile industry

Solutions:

Tekstina:

- the high concentrated effluents from three machineries contribute very significantly to annual COD load
- rest of the effluent treated together after mixing in low-medium concentrated streams





AquaFit4Use



Pilots and solutions for textile industry

Solutions:

Tekstina:

- the high concentrated streams treated by **evapoconcentrator** (VEOLIA, France)
 - COD removal ~ 96-98 %
 - conductivity removal ~ 98-99 %
 - produced distillate quality good enough for re-use
 - amount of waste reduced by ~85%





AquaFit4Use

Pilots and solutions for textile industry

Solutions:

Tekstina:

- the low-medium concentrated streams treated by **MBR/AOP or MBR/NF**
 - absorbance reduced by AOP below the recommended value ($<0.01 \text{ cm}^{-1}$) for water reuse in a very short time (max 10 min)
 - COD removal ~ 93-98 %
 - conductivity removal ~ 70-80 %
 - turbidity removal ~ 99 %



All treated samples met the reusability criteria



AquaFit4Use



Pilots and solutions for textile industry

Solutions:

Svilanit:

- no useful effluents segregation could be obtained by simply connecting each machinery to separate streams due the polyvalent application of different processes in the same machinery
- the waste streams separation was based on monitoring of effluent characteristics
- dual pipelines system allowing separation of the first, high concentrated discharges





AquaFit4Use

Pilots and solutions for textile industry

Solutions:

Svilanit:

- no typical high-concentrated streams suitable for evapoconcentration treatment
- majority of streams low-concentrated
- treatment by **UF/NF** or **UF/AOP** depending on the dominating dyestuffs in wastewater

Both treatment trains combinations are equally efficient considering water reuse criteria when waste discharges were obtained from reactive dyeing processes





AquaFit4Use



Pilots and solutions for textile industry

Solutions:

Inotex:

- lab-scale test
- treatment train for mixed waste water consisting from **flocculation/biological treatment/AOP (UV/H₂O₂)** as end of pipe treatment without any effluents segregation

Resulting treated water has good quality in case of effluents containing reactive dyestuffs





AquaFit4Use



Pilots and solutions for textile industry

Conclusions:

- each textile company shall be considered individually
- separation of waste water streams and their separate treatment can enable to reach the right water quality for further reuse purposes



Pilots and solutions for textile industry

Results:



- ultrafiltration (UF) proved to be very effective as pre-treatment step (significant colour and complete SS removal) before NF or AOPs
- NF significantly reduces colour (98%), conductivity (67%), COD (above 90 %) and turbidity (97%)
- AOPs were efficiently used in treatment train combinations with UF and NF. Moreover as standalone technology was self sufficient for the treatment of specific, very low concentrated streams (e.g. the last fabric rinsing, where the main parameter to be treated is colour)
- MBR with anaerobic pre-treatment enables good COD (85%), colour (78%) and turbidity (~100%) removals
- evapoconcentration enables further reduction of wastewater to be disposed of due to the treatment of particular textile waste streams heavily charged with very high COD, salinity and turbidity. The distillate has the potential for re-use after secondary treatment

More about the project

[*http://www.aquafit4use.eu*](http://www.aquafit4use.eu)





European Union
European Regional
Development Fund

Thank you!

Questions welcome



Project smedia