RESET

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Innovative solutions to prevent and reduce water pollution by application of ecological textile finishing technologies and wastewater treatment

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The National Research & Development Institute for Textiles and Leather

INCDTP is a center of excellence in RDI in the field of textile-clothing, leather-footwear-rubber goods

- develops RDI activities having a fundamental and applicative character
- small and short series micro production
- consultancy & technical assistance services by 2 accredited laboratories
- editing & publishing of technical reviews, books, ISI-rated magazine
- standardization activity
- professional training activities

The research fields of interest for our institute

- Advanced products and technologies for textiles-clothing and leather-footwear-rubber consumer goods
- Functionalities for high performance materials
- Increase of flexibility and efficiency in the development of the products and materials through design
- Invasive and non-invasive medical devices with biomedical and bio-functional characteristics specific to the clinical use in medicine, health
- Clean technologies for textile and leather field and environment protection
- Conservation and protection of cultural heritage
- Support instruments for developing RDI capacity

About Cross-border area Romania-Bulgaria

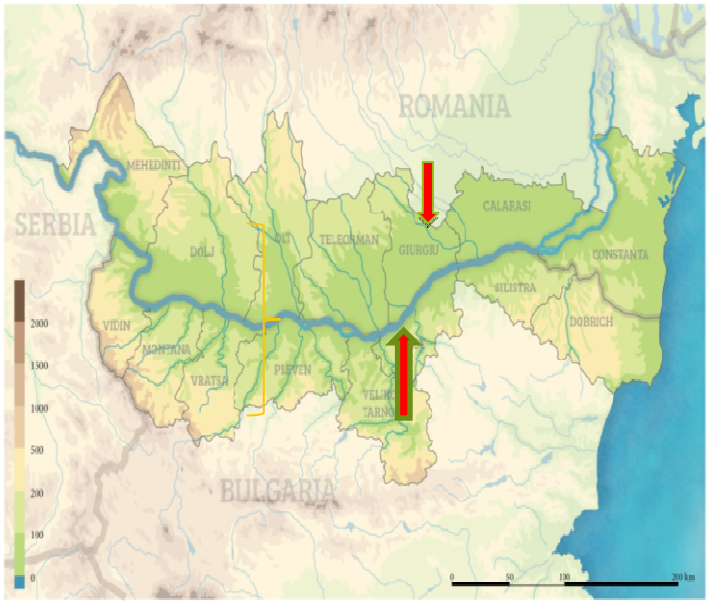
- Geographical confines of the area are one of the longest borders within the EU
- The border extends 610 km, while 470 km is demarcated by the Danube River

Romania – Bulgaria Cross-Border Cooperation Program 2007-2013 (CBC)

▪Was the first program addressed to the Bulgarian-Romanian border area as an internal border of the EU;

▪Aim: to support joint activities between both countries at different development spheres, like economic, social, environmental protection;

▪Ultimate objective: the achievement of sustainable territorial development - within national territories and at cross-border level /cooperation with neighboring regions



CBC eligible area

Romania - 7 counties: Mehedinti, Dolj, Olt, Teleorman, **Giurgiu**, Calarasi, Constanta

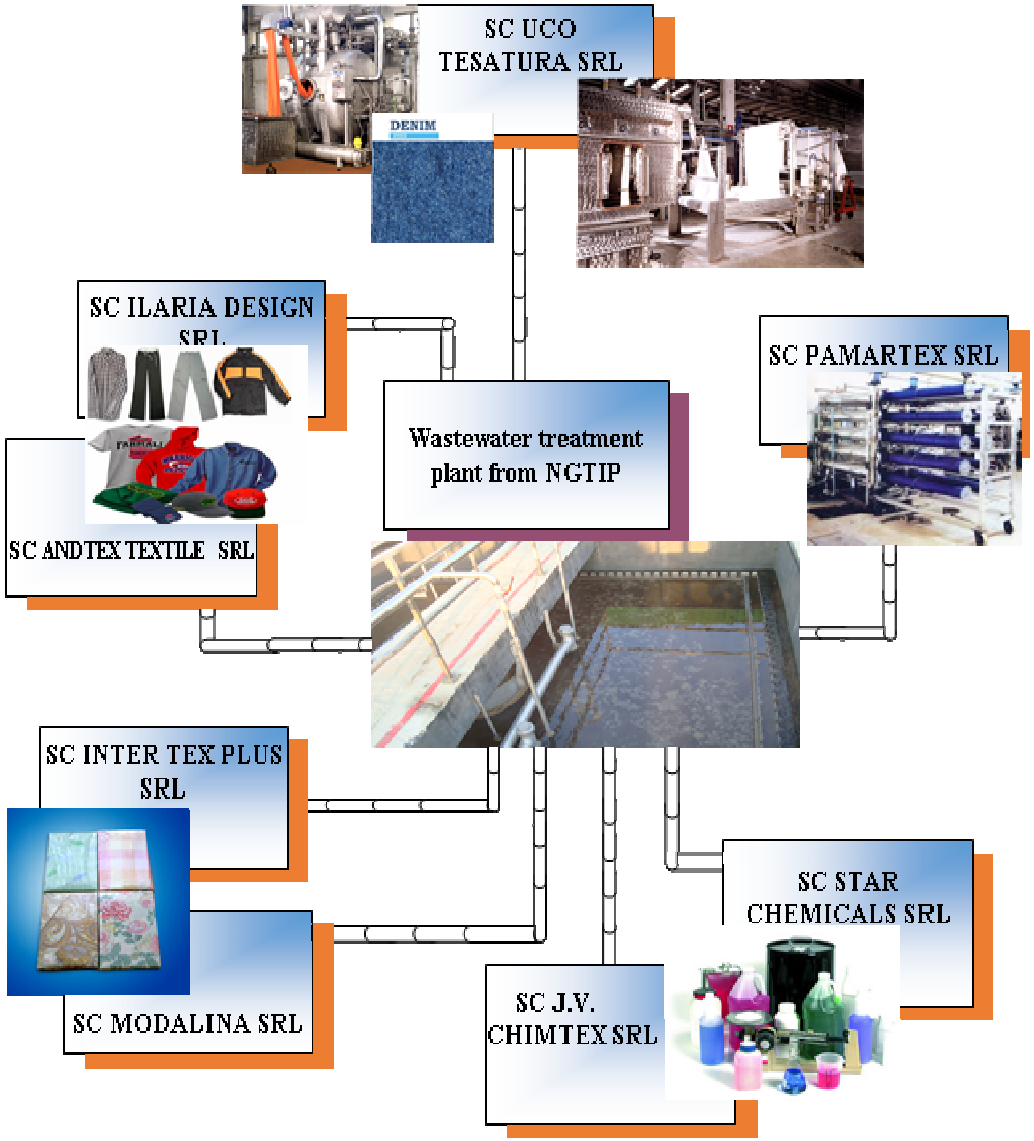
Bulgaria – 8 districts: Vidin, Vratsa, Montana, Pleven, Veliko Tarnovo, **Ruse,** Silistra, Dobrich

About North Giurgiu Technological and Industrial Park SA (NGTIP)

- Was founded in 2002;
- Administers the infrastructure of ground and buildings, to be available in best functional conditions for investors needs;
- Offers training courses for employees of the tenants in the textile and environmental fields;
- Manages efficiently the undesired products: wastewater and sludge, distributes electricity and gas, being preoccupied of implementing new energy sources.

Currently, the park hosts a total of 34 companies with different profiles of activity: the production of clothing, weaving textile fiberglass, manufacturing of chemicals for the textile industry and agriculture, etc.

Companies that discharge wastewaters in Giurgiu North Technological and Industrial Park WWTP



Background for the implementation of the GP

- ✓ The most important industrial pollutants are represented by **the textile effluents** discharges, containing dyestuffs, metals, electrolytes, surfactants, grease matters, etc., which can get into the main Danube River that crosses the Romanian-Bulgarian border area;

- ✓ An important **negative influence on water quality from urban wastewater treatment plants** from **Ro-Bg border area** and **consequently the Danube's water quality is determined by the discharge of waste water untreated or insufficiently treated, by textile trading companies in the area;**

- ✓ The exigencies expressed at present, at **water quality parameters level,** impose:
  - **a reassessment of the vision on the technological processes activity,**
  - **the use of best available techniques in the textile-chemical processing industry,**
  - **research and implementation of advanced wastewater treatment.**

Background for the implementation of the GP

- ✓ Water consumption and water price represent a factor that plays an essential role in all economic decisions aimed at choosing manufacturing processes and effluent treatment plants;

- ✓ In the calculation of water cost, in addition to the water supply cost, the effluent treatment costs are also included;

- ✓ An European study showed that there are different levels of water cost by country as follows:
  - in Germany, costs range from 2.77 to 4.3 €/m^3;
  - in the UK, the current cost is between 0.6 -1.4 €/m^3;
  - in France, Italy, Spain, costs range from 3 to 5.2 €/m^3;
  - in Romania, the cost ranges from **3.5 to 5.5 €/m^3**

Costs for highly polluting effluent treatment are much higher sometimes exceeding 15.4 €/m3

A Ro-Bg consortium has developed **Enviconteh** project - ***Integrated systems of monitoring and controlling wastewater, the quality and security of textile products commercialized in Romania and Bulgaria*** **-** funded with the support of the EU under the Ro-Bg Cross-Border Cooperation Programme 2007-2013, Priority axis no. 2 - Environment: Sustainable use and protection of natural resources and environment and promotion of efficient risk management in the cross-border area.

Aim the project

To develop and accomplish of:

- new eco-technological solutions for textile chemical processing;
- integrated environmental systems and monitoring tools;
- advanced environmental technologies in compliance with Environmental Acquis;
- reducing water and energy consumption;
- finding reuse possibilities for the wastewaters after treatments.

Stakeholders involved

- commercial **companies from de Ro and Bg cross border area**, direct users of the services offered by the project partnership;
- **local communities and institutions responsible with environmental protection**, from the GIURGIU-RUSE cross border area.

Detailed content and working of the Good Practice

ACTIVITIES

✓**Analysis of the present situation** referring to:

- technological textile processing;
- endowment with technological equipment and installations;
- performance level of wastewater plant.

✓**Identification of the pollution sources for the technological processes** and of **the pollution indicators of the wastewater, on each wastewater treatment plant phases;**

✓**Evaluation of the wastewater treatment plant efficiency** at companies from the target group in RO and BG by: analysis of the wastewater quality parameters and comparing them with national and European norms (approx. 4000 tests);

✓**Implementing eco-friendly technological solutions** for textile processing;

✓**Implementing modern techniques of waste water treatment** .

Solutions for minimizing the waste water pollution generated by textile finishing

- ✓ **Modern technology solutions for textile chemical processing;**
- ✓ **Modern wastewater treatment technologies.**

Description of the GP

❖ ***Using Sulphur dyes and ecological chemical auxiliaries with minimal environmental impact***

- Replacement of the denim conventional dyeing technology with an ecological dyeing technology (PAD-OX process) with low sulphur content dyes and high exhaustion grade (98%);
- Wastewater quality indicators

were evaluated against the norms in force.

Economic and ecological advantages:

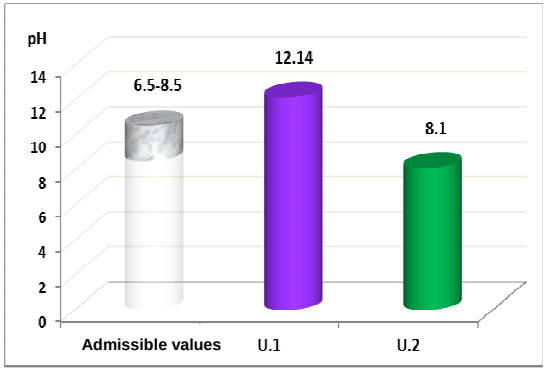
40% less reducing agent
90-100% dye exhaustion
50-70 % **less water consumption**
15-20% **less water pollutants**
10-20% less sludge

S.C. UCO TESATURA

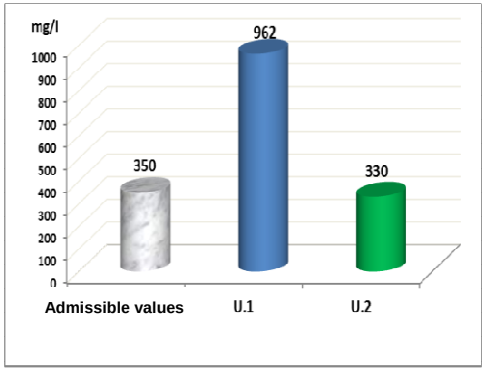
Wastewater quality indicators

Parameter		pH	Suspended matter	BOD	COD	NH_4^+	Sulphur and hydrogen sulphide	Sulphate	Free residual chlorine	Detergents	Fixed residue
Admissible values according to NTPA 002/2005		6.5-8.5 unit pH	350 mg/l	300 mgO_2/l	500 mgO_2/l	30 mg/l	1.0 mg/l	2 mg/l	0.1 mg/l	25 mg/l	
Standard		SR ISO 10523-97	STAS 6953-81	SR EN 1899-1/ 2003	SR ISO 6060/96	SR ISO 71501-2001	SR ISO 10530-97	STAS 8601/ 70	STAS 7167-92	SR EN ISO 7393-1/2002	
Sampling location: PTIGN	U.1	12.14	962	4424.6	7742.8	1.94	1.94	128.64	1.48	120	**2384**
	U.2	8.1	330	410	610	1.14	0.9	3.4	0.9	35	**350**
	Diminishing of WQI U.1/U.2, %	**33**	**68**	**91**	**92**	**41**	**54**	**97**	**39**	**71**	**85**

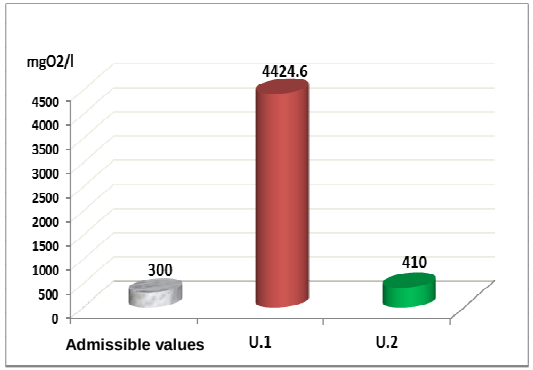
LEGEND:
U.1 - sample 1 classical dyeing process with sulfur dyes;
*U.2 – sample 2 ecological dyeing with DIRESUL dye, through **PAD–OX** process*



pH

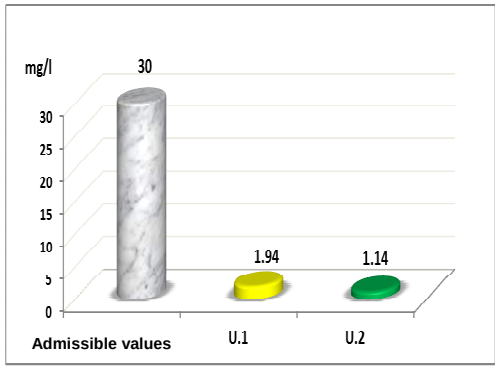


Suspended matter

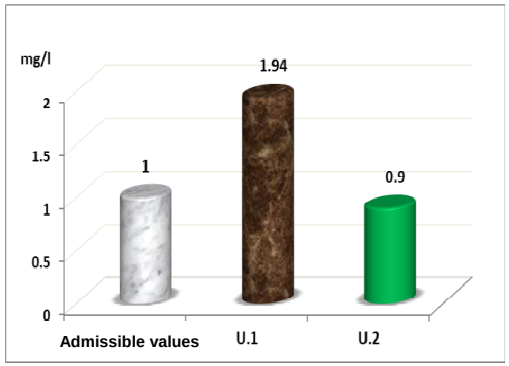


BOD

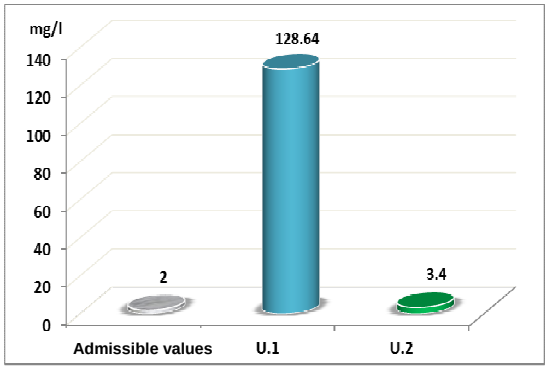
Wastewater quality indicators



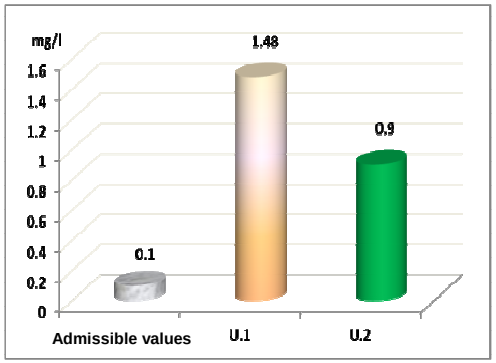
NH_4^+



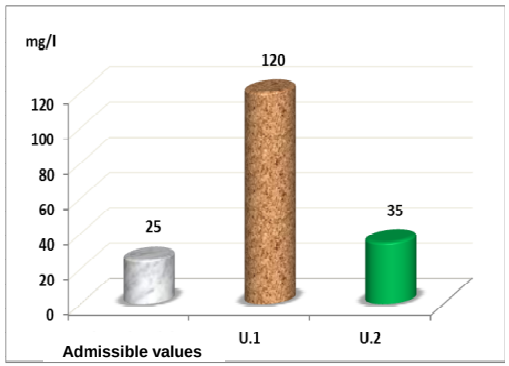
Sulphurs and hydrogen sulphide



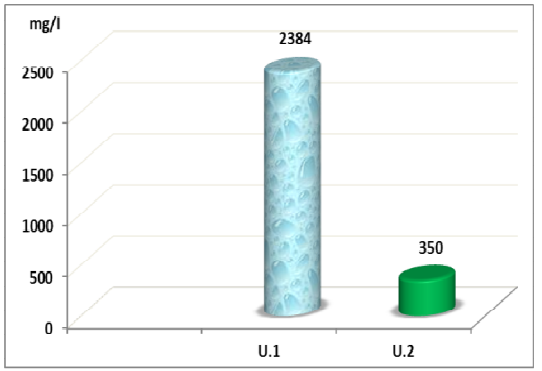
Sulphates



Free residual chlorine



Detergents



Fixed residue

Description of the GP

❖ ***Ecological technology for preliminary preparation and dyeing of cellulosic textile material by combining certain stages of technological process using an multifunctional auxiliary and enzymes***

Avantages

▪Reduction of technological consumptions/kg textile material
- **Water:** by 56 l/kg water
- **Electrical energy**: by 0.007 kWh/kg
- Steam by: 1.02 kg/kg,
- Chemical: by 0.05 kg/kg

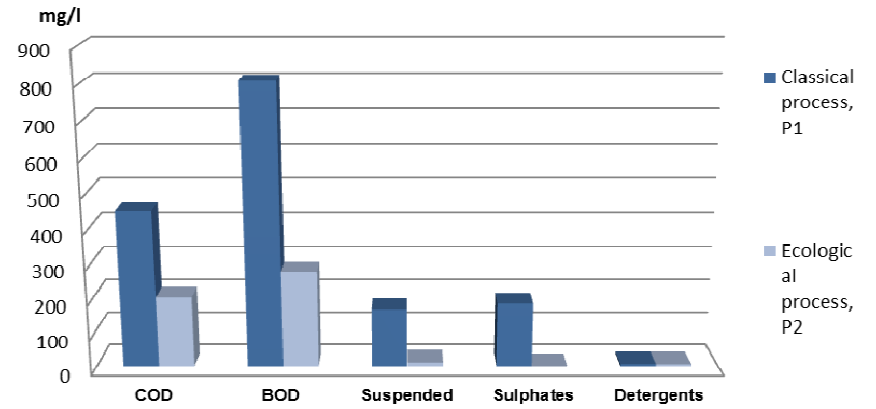
▪Reduction of total costs/kg textile material (water, power, steam, chemical) by 0.293 Euro/kg textile material

▪Reduction value of quality indicators for wastewater (pH, COD, BOD, sulphates, detergents, etc.), between 35-65%

▪Cost reduction for wastewater de-pollution by 2-4 Euro/l wastewater

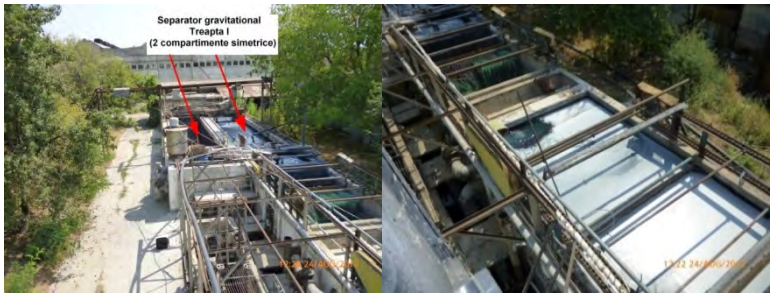
Comparative analysis of wastewater quality indicators (WQI) from classical and ecological technological process

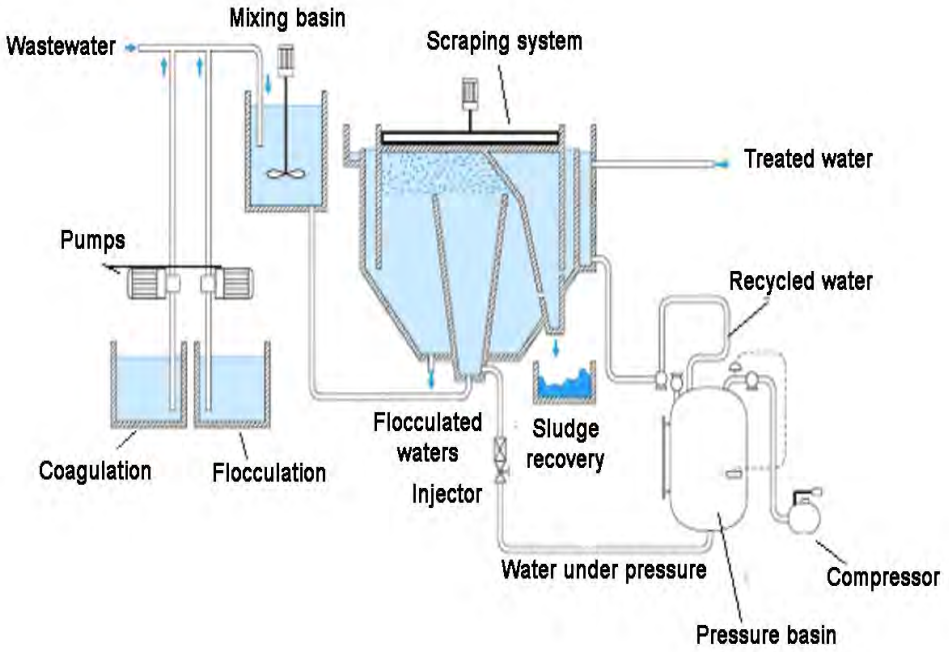
Test	pH	COD mgO_2/l	BOD mg O_2/l	Suspended matter, mg/l	Sulphates mg/l	Detergents mg/l	Fixed residues mg/l
P1 wastewater -classical process	12,3	449,82	807,38	167	184,5	6,3	1810
P2- wastewater -ecological process	7,6	201,9	275,8	11	92,.9	5,7	1100
NTPA 002/2005	6,5-8,5	300	500	350	600	25	
Diminishing of WQI P1/P2, %	38,2	55,1	65,8	93,4	49,6	9,5	39,2



The wastewater treatment plant in Giurgiu North Technological and Industrial Park

The wastewater treatment process is conducted in five circuits each with its own specificity.



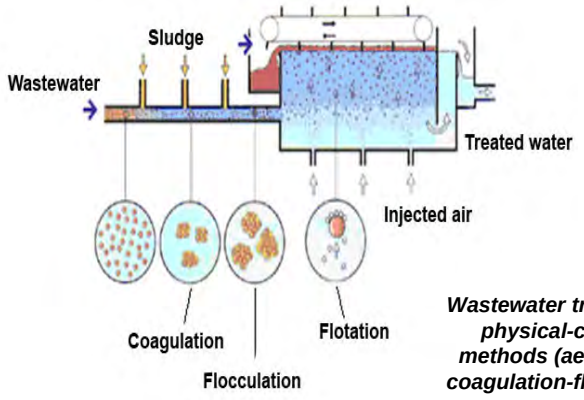


Physical – chemical treatment installation with air flotation

❖ *Introduction of a pneumatic aeration systems in the second phase of wastewater treatment*

In the NGTIP upgraded aeration basin, wastewater, mixed with activated recirculated sludge, is oxygenated by a pneumatic aeration process.

Treated water, in a percentage of 94-97%, is separated from the flocs of activated sludge in the secondary settler.



Wastewater treatment by physical-chemical methods (aeration and coagulation-flocculation)

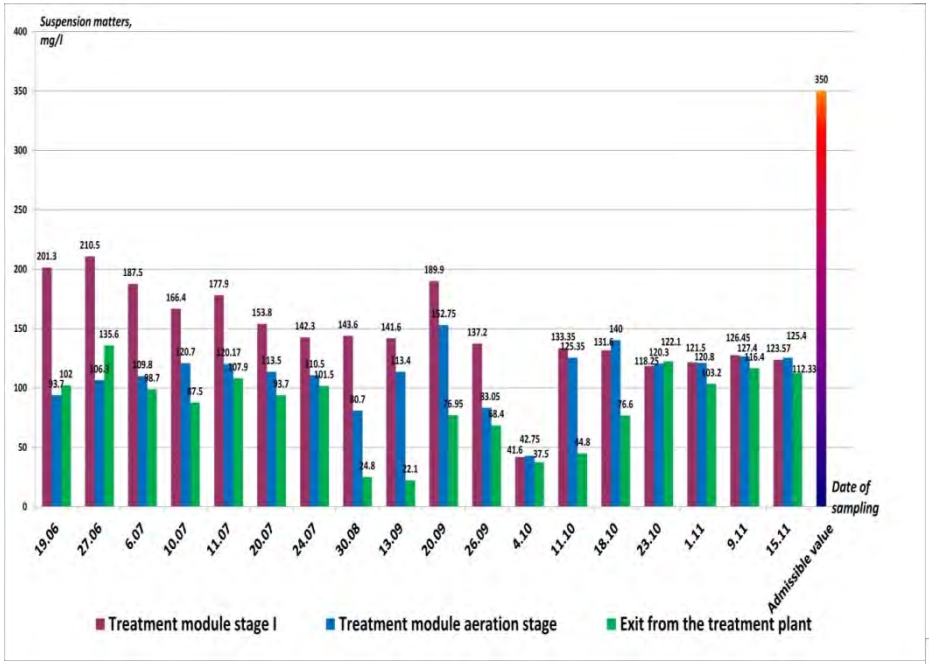
Advantages

- Improvement of the removal efficiency of wastewater pollutants by 10-26% (reduced values of COD, BOD, NH_4^+, P total , SO_4^{2-}, detergents, discoloration degree, sludge)
- Reducing the consumption of chemicals used in the wastewater treatment process (coagulation, flocculation, pH adjustment, discoloration)
- Reducing the wastewater treatment time.

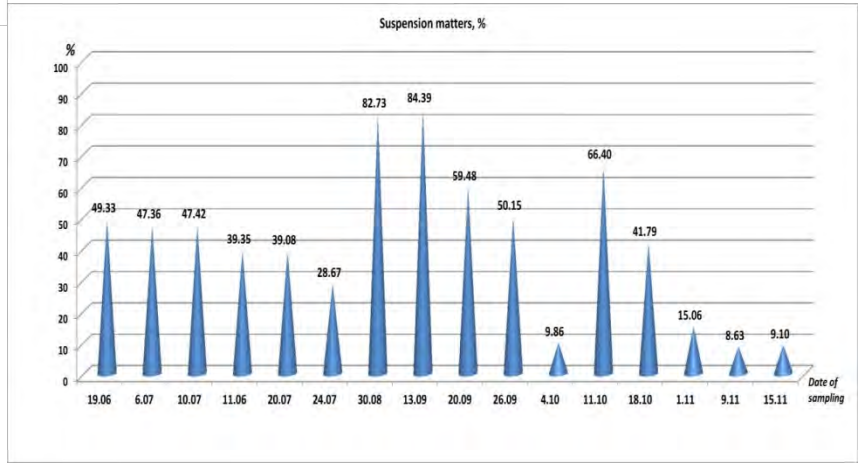
*Advantages obtained by the introduction of aeration system in the wastewater technology flow can be seen in the graphs regarding the evolution of the main **quality indicators of wastewater** and from the treatment degree of the modernized installation*

Oxygenation in the aeration basin

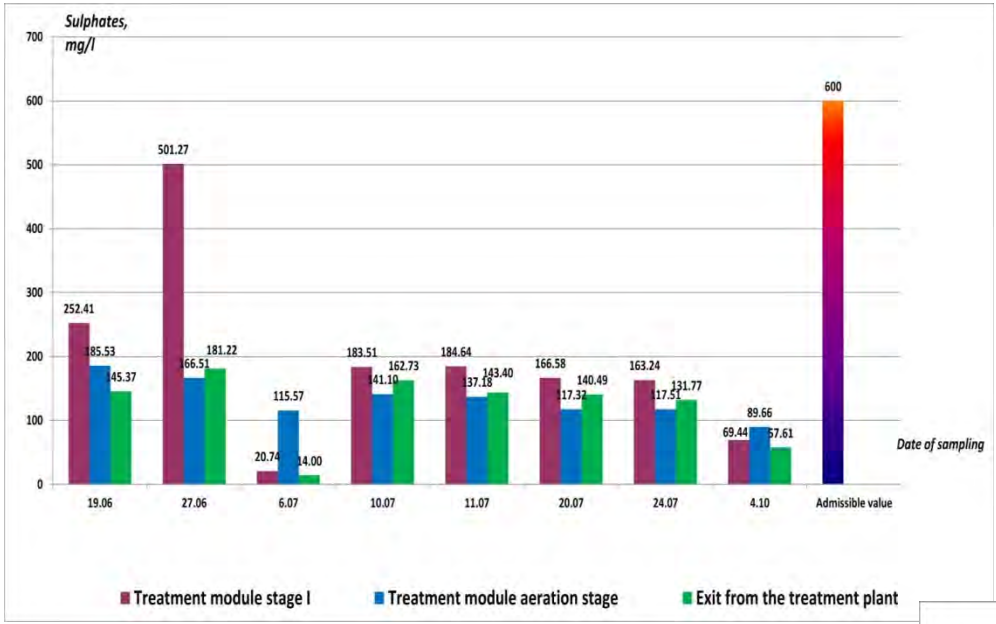
Wastewater quality indicators



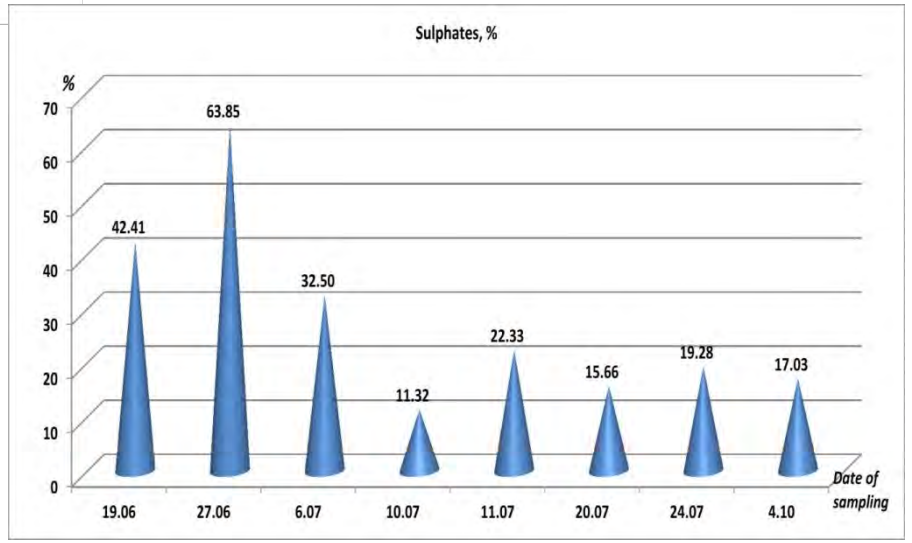
Weekly monitoring of suspended matter after each treatment step



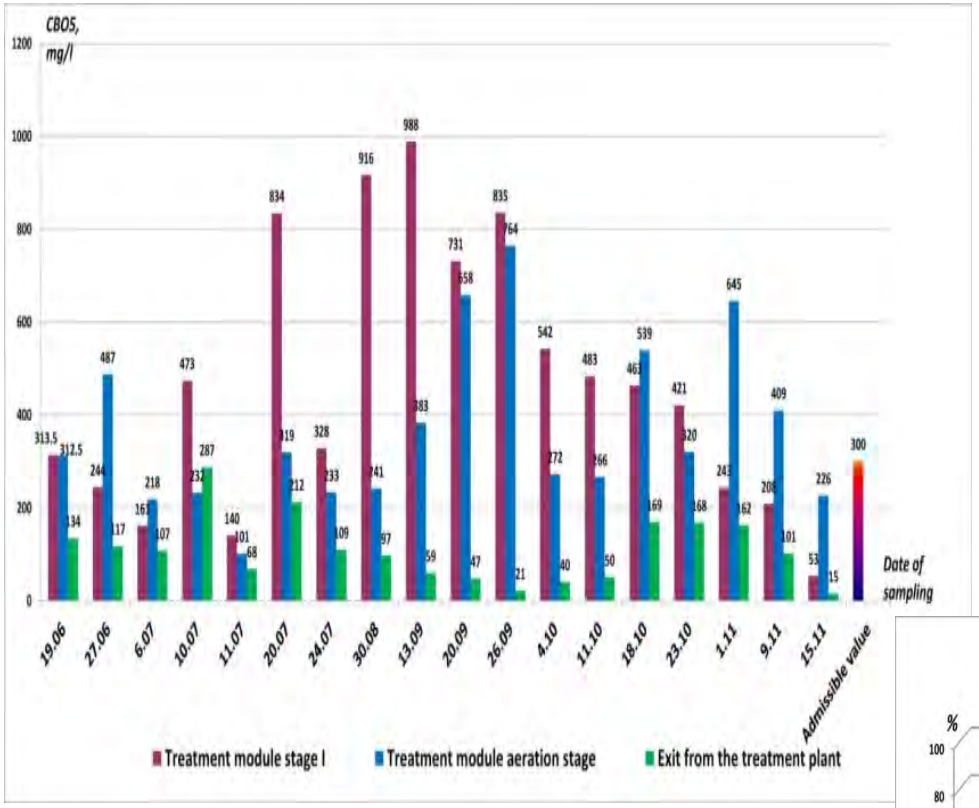
The evolution of suspended matter removal efficiency (%)



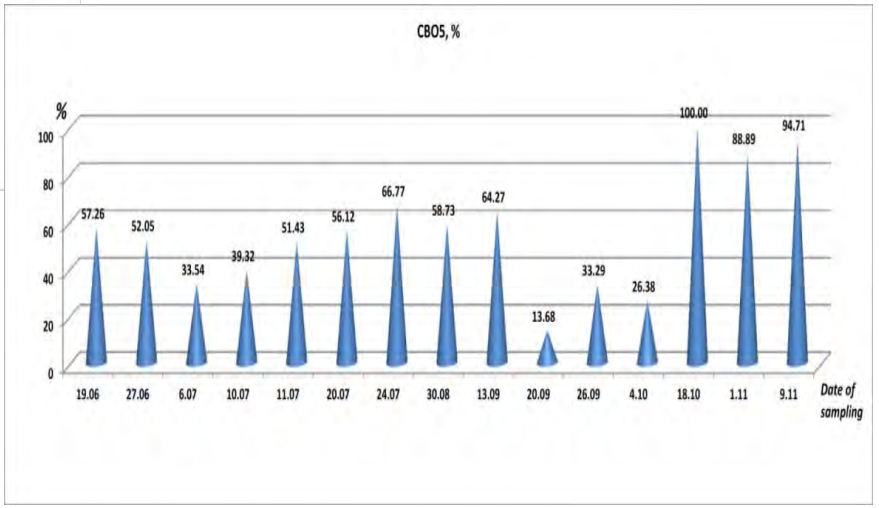
Weekly monitoring of sulphates after each treatment step



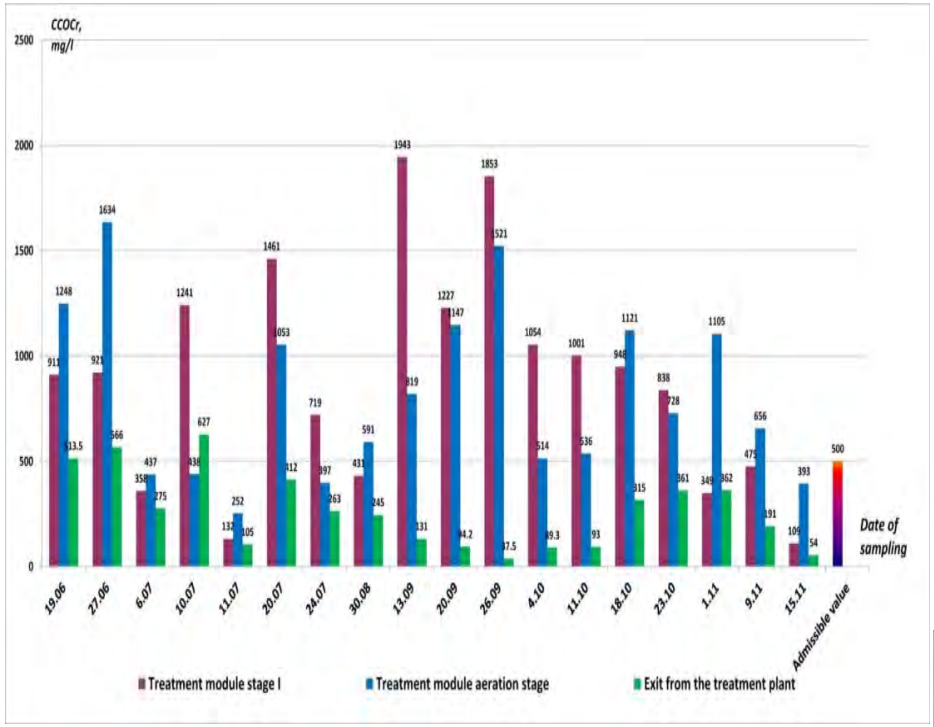
The evolution of sulfphtes removal efficiency (%)



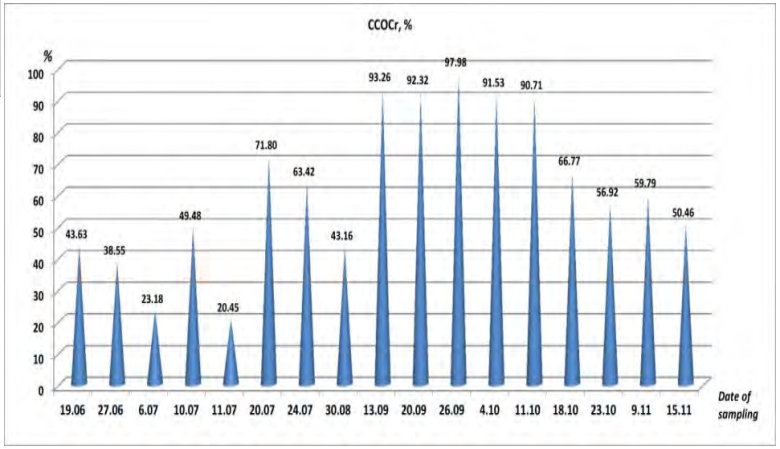
Weekly monitoring of BOD after each treatment step



The evolution of BOD removal efficiency (%)



Weekly monitoring of COD after each treatment steps



The evolution of COD removal efficiency (%)

Success factors of GP

- By applying the suggested solutions, the textile companies from Romanian-Bulgarian cross-border area manage to comply with the national rules relating to treated water discharge into sewer systems or natural receptors;
- By applying the modern technology solutions for textile chemical processing, less water & energy is needed per kg of fabrics and less water pollutants & less sludge can be found at the end of the process;
- By introducing the aeration system in the wastewater treatment plant, the treatment time and the chemicals consumption used for wastewater depollution are both reduced, obtaining at the end of the process, wastewater indicators with diminished values.

Difficulties encountered and lessons learnt from the practice

- Missing of wastewater testing devices within cross-border textile companies' leads to some difficulties for on spot monitoring and controlling of wastewater quality indicators, thus delaying the decision making.

Remarks on the durability of the GP results and impacts

The durability of the GP can be seen in the following aspects

- Water reuse and sustainability will continue to be important goals for environmental pollution prevention/reduction practices in the textile industry
- The textile industry will continue to choose and utilize water treatment solutions not only to reduce its operating costs, but also to reduce its water footprint and decrease the ecological impact from its wastewater discharge and solids sludge generation on the surrounding ecosystem.

Good Practice value added at regional and transregional (EU) levels

- Cooperation between the existing institutional frameworks (environmental protection agencies, administrations of the protected areas and project partners) for the maintenance of the sustainability of ecosystems and protection of the shared natural environment, a cross-border integrated approach and networking;
- Improve the public cross-border awareness on environmental management and protection;
- Increased competence of textile companies from cross-border area in the field of advanced wastewater treatments.

GP Contact

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