

Doruchów Commune

Industrial Wastewater Treatment with innovative filter media for Phosphorous removal

GMINA DORUCHÓW / DORUCHOW COMMUNE ,KĘPIŃSKA 13 , 63 – 505

Doruchów , Poland -Project Partner No. 6

JÓZEF WILKOSZ – MAYOR

Prepared by Andrzej Erwinski - Project Expert , contact point.

***Project BEST – Better Efficiency for Industrial Sewage Treatment
#R054 BEST***

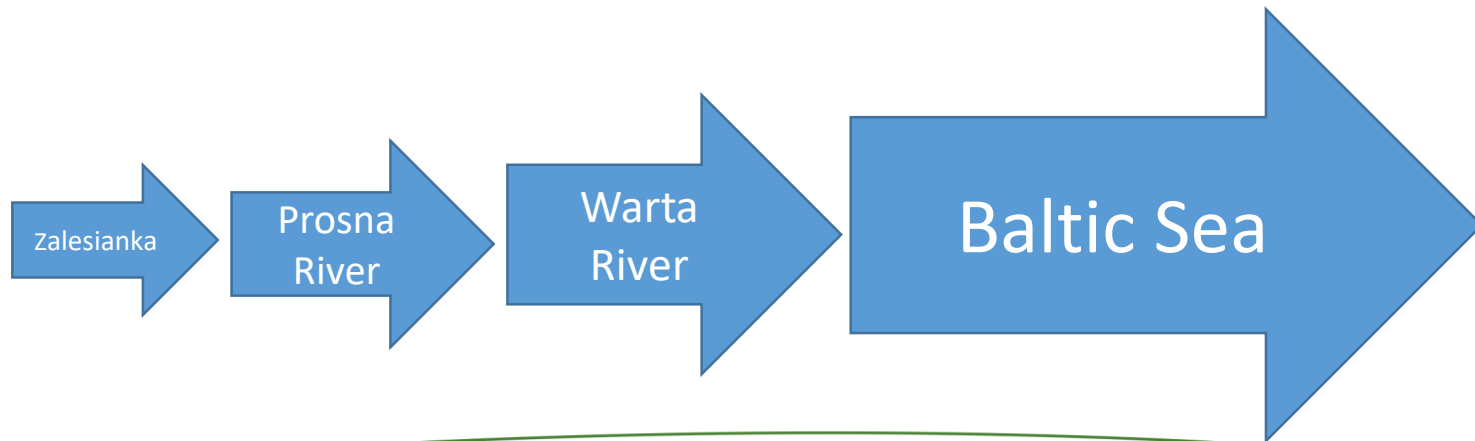
Treated Industrial water flow to Baltic Sea



Current Situation

existing conditions

- The Doruchów municipality is currently the operator of its biological wastewater treatment plant built in 2003 (WWTP)
- The WWTP is treating mixed industrial and municipal waste waters
- After treatment, the wastewater is released to a nearby Zalesianka creek that leads to the Prosna river, later to the Warta river and eventually to the Odra river with a delta flowing into the Baltic Sea



Current Situation

phosphorous levels

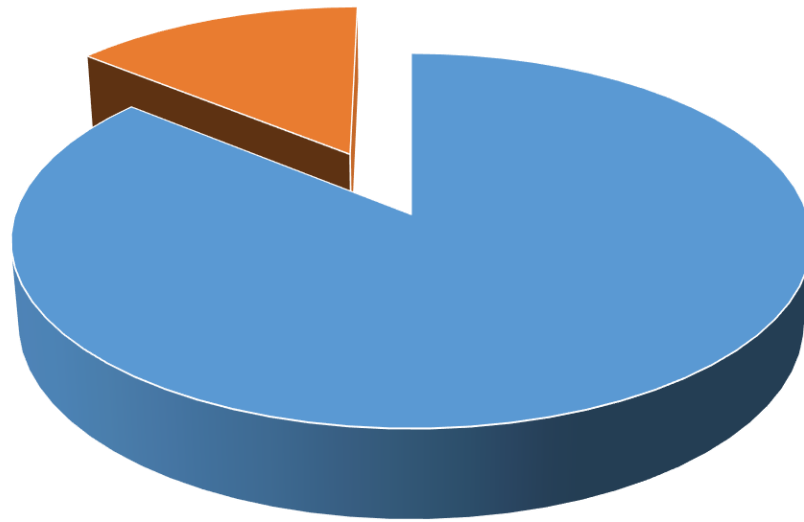
- Phosphorous level in Municipal wastewater combined with industrial wastewater as on the inlet to WWTP is 7-15 mg/l
- The industrial wastewater sources and levels of total phosphorus are:

Source	Q (m ³ /d)	P _{tot} (mg/l)
Poultry Slaughterhouse	11	38
Cattle Slaughterhouse	6	41
Meat Processing Plant	48	40
TOTAL	65	40

Current Situation

wastewater discharge daily flows

m³/d



- 400 m³/d municipal
- 65 m³/d industrial

■ municipal ■ industrial

Modernization Needs targets

- Problem: High levels of Phosphorus in industrial water
- Approach: Separating the treatment of the industrial and municipal wastewater
- Exception: Reconstruction of a new municipal WWTP for domestic wastewater will not be discussed at this point



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Stakeholders summary

Government

- The Doruchów Commune
- The County district office of Environmental Protection in Ostrzeszów
- Regional Directorate for Environmental Protection in Poznań
- District Sanitary Inspector in Ostrzeszów

Subject Matter Experts

- Supplier of filter media and system set-up know how
- KTH Royal Institute of Technology
- Wrocław University of Science and Technology
- Engineering firm who will design the industrial wastewater system

Local Industry

- Meat Processing Plant
- Cattle Slaughterhouse
- Poultry Slaughterhouse

Preliminary project description

overall scope

- Design and build a completely new system for industrial wastewater treatment (IWWTP) including:
 - P-removal up to 3mg/l with innovative filter media without using chemicals
 - using unique filter media, the P-removal process will take place at the effluent of the industrial wastewater biological treatment process

Preliminary Project Description

Approach, authorship and assumptions

- The project is based on previous tests and studies made by the Commune and external experts
- The original approach assumed that a pre-treatment of the industrial wastewater shall be initiated at the source, i.e. at the premises of the food processing plants . But this idea was not well received by all industrial wastewater producers.
- Subsequently, only the Meat Processing Plant (responsible for about 75% of total industrial wastewater) has since installed a pre-treatment system changing the pre-treatment assumptions



Plant	Pre-treatment	Wastewater Connection to WWTP	% of total waste
Meat Processing Plant	Installed and Operational	Delivered by tank truck	74%
Cattle Slaughterhouse	None	Delivered by tank truck	9%
Poultry Slaughterhouse	None	Connected to central sewer	17%



Preliminary Project Description

industrial wastewater train

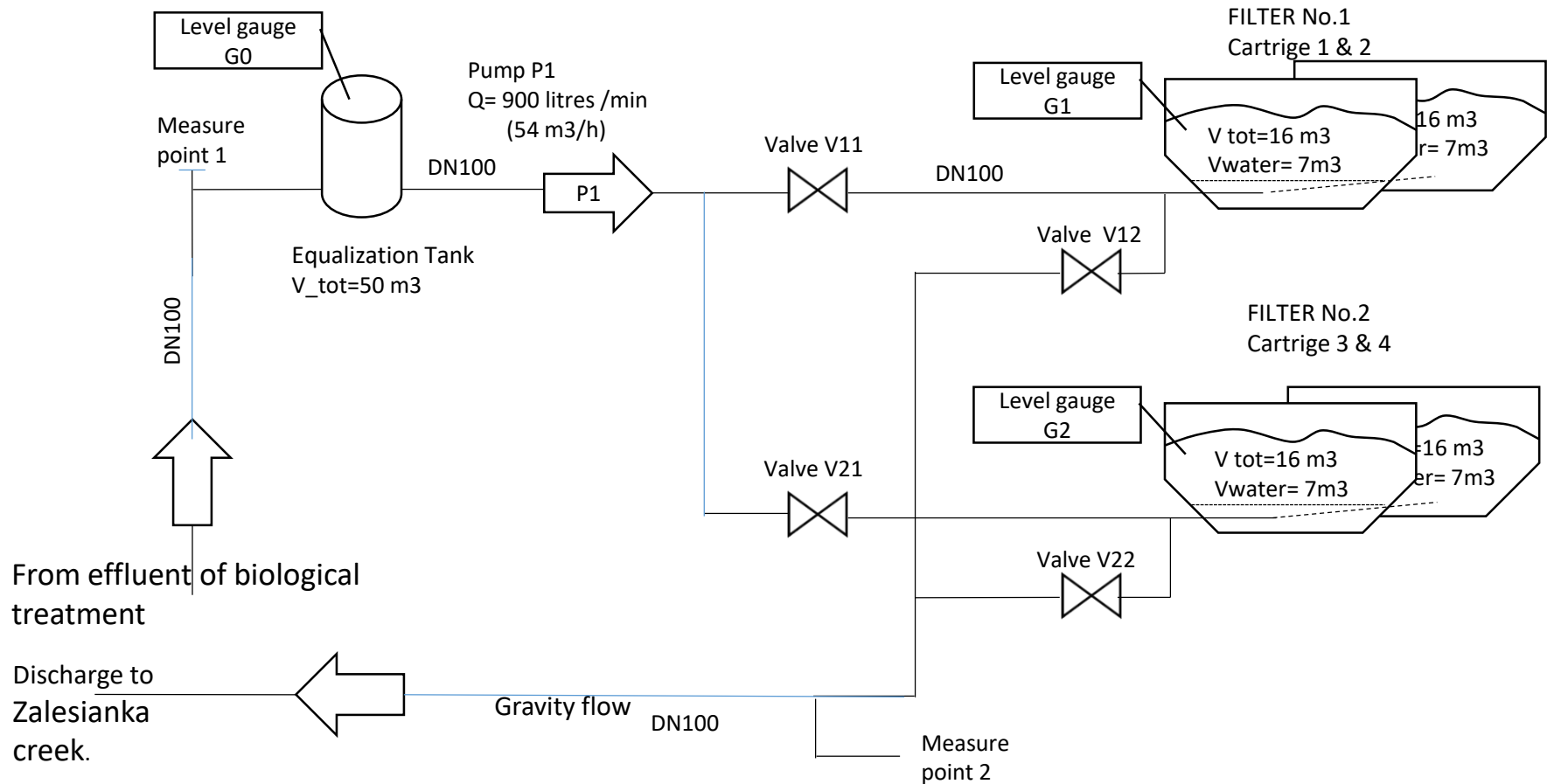
- Wastewater receiving station
- Grit removal and rotary screen
- Pumping station/ retention tank with capacity around 60 m³ with aeration system
- Biological treatment system:
 - primary separation tank
 - dephosphorization chamber with mixer
 - denitrification chamber with mixer
 - aeration tank
 - clarifier

Preliminary project description

Industrial wastewater train

- At the clarifier effluent, tanks filled with filter media will be installed for phosphorous and partially nitrogen removal
- The volume of the tank will be calculated to fit enough filter media for 3 to 12 months switching period (The switching period and the size of the filter will be finally decided during the design stage of the Project)
- The filter media will be in a form of highly porous calcium silicate material

Process Diagram – P_{tot.} Removal Filter System



Work Cycles

Cartridge	Step	Sequence	Sequence	Sequence	Sequence	Sequence	
1	Fill	10 min				10min	
	Rest	40 min				40 min	
	Empty				10 min		
2	Fill		10 min			10 min	
	Rest		40 min				40 min
	Empty					10 min	

Work Cycles

Cartridge	Step	Sequence	Sequence	Sequence	Sequence	Sequence
11	open	10 min				10 min
	closed	40 min				40 min
	closed			10 min		
12	closed		10 min			10 min
	closed		40 min			
	open				10 min	
21	open			10 min		
	closed		40 min			
	closed					10 min
22	closed	10 min				10 min
	closed	40 min				40 min
	open			10 min		

Preliminary Project Description

industrial wastewater train

- All components of the filtering system are a unique and completely innovative approach to P removal and recycling without using chemicals
- The used (saturated/ spent) filter media use possibilities:
 - stored in one of the ponds
 - use as fertilizer enhancement on soils when their high pH is needed (pending necessary approvals)
- Additional tank filled with bark to lower the pH installed after the filter system may be necessary in order to keep pH within limits of Water Discharge Permit (6,5 – 9.0).

Preliminary Project Description

industrial wastewater train

- Two tanks for wasted sludge oxygen stabilization will be installed:
 1. domestic waste sludge
 2. industrial waste sludge
- Sludge dewatering will take place at the site of domestic wastewater WWTP



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Budget

funding sources

- PROJECT BEST has granted funds for partial cost of industrial wastewater train and for innovative filter system design, equipment delivery and construction
- Doruchow Municipality will finance partial cost of the Industrial wastewater train (mechanical and biological)
- The total cost will be determined after the design stage of the IWWTP is finished and cost estimate sheets are made



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Project implementation Costs

overall budget

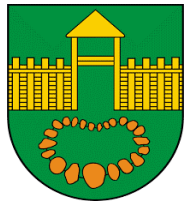
	Assumption	Estimated Cost (Euro)
Gross staff costs including of personnel employed by project partner - Coordination and management of the project	600 Euro/month for 36 months	21 600
Office and administrative expenditure including rent, utilities etc.	15% of personnel budget	3 240
Travel costs of personnel employed by project partner	6 trips for 2 persons at 800 Euro per person per trip	9 600
External expertise and service costs. Consulting : design and legal processes.		21 000
Infrastructure and works (design and implementation : New industrial wastewater treatment facilities/ construction		160 000
TOTAL		215 440

I.W.W.P operational Costs estimate breakdown

Description	Estimated Cost (Euro)
Filter media : 40 tons per year	20000.00
Electrical energy , cost for one year	11000.00
Plant oprator's salary ,per one year	12000.00
Removal and reinstalling the filter media cost per year	6800.00
Real estate taxes , environmental fees , treated wastewater analysis	4200.00
Sspare parts, maintenance, break downs , etc. Per year	4800.00
Total estimated operational cost per year	3200.00
Total estimated WWTP operational cost per year	62000.00
Price per 1 m3 of delivered industrial wastewater to be set by Doruchow Commune	

DORUCHOW COMMUNE , POLAND

Project Best – Better efficiency for Industrial Sewage treatment at local level.



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