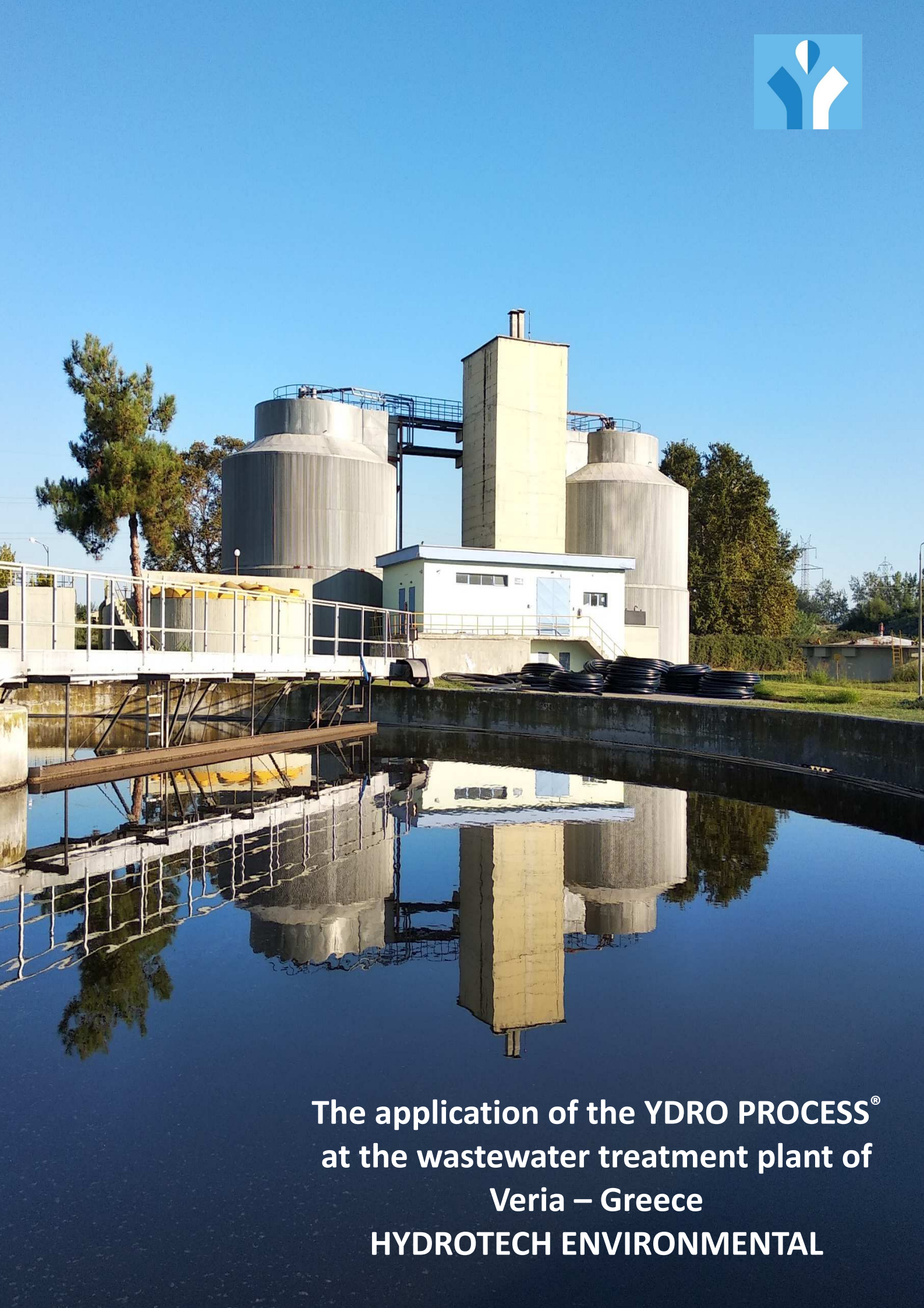


The application of the YDRO PROCESS® at the wastewater treatment plant of Veria – Greece

HYDROTECH ENVIRONMENTAL

1. GENERAL OVERVIEW

The wastewater treatment plant of Veria has been operating since 1996 and is serving a population of approximately 70.000 inhabitants and treating approximately 11.000 m^3/day. The main fraction of the incoming wastewater is introduced through the sewer grid network and a small part is transported to the plant with trucks and originated from septic systems which are not connected to the sewer grid. In the end of 2013 the Ydro Process® was implemented for the first time at the wastewater treatment plant and is still applied successfully until today. In the end of 2018 the Ydro Process® was simultaneously applied at the wastewater treatment plant as well as the sewer system achieving optimum results which will be analyzed in depth below.

2. INPUT – OUTPUT CHARACTERISTICS

The input daily wastewater treated is approximately 10.000 - 12.000 m^3 (in dry weather conditions) and the characteristics are shown in the table below:

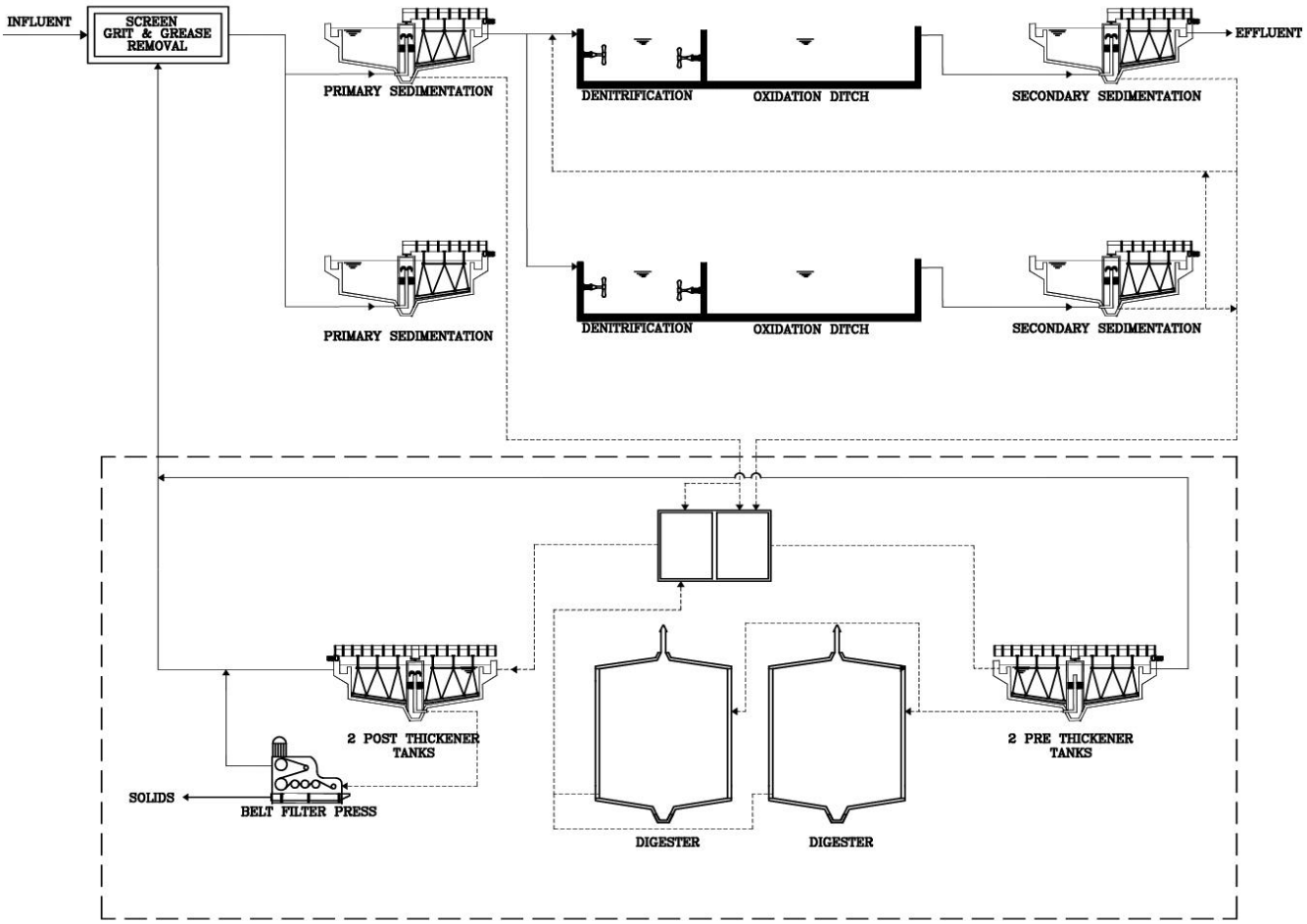
Wastewater origin	Volume per day (m^3/day)	COD (mg/lt)
Sewer system wastewater	10.000 – 12.000	600 – 800
Septic wastewater	200 – 400	1.000 – 1.500

The effluent recipient is the trench No 66, which then enters river Aliakmonas (Haliacmon) and then flows into the Thermaic Gulf. According to the environmental permit of the wastewater facility the effluent characteristics are:

Parameter	Concentration limit
BOD	<25 mg/lt
COD	<125 mg/lt
Suspended Solids (SS)	<35 mg/lt
Total Nitrogen (TN)	< 15 mg/lt
Total Phosphorus (TP)	< 5 mg/lt
Fat, Oil, Grease (F.O.G.)	0

3. THE CONVENTIONAL FACILITY PROCESS STAGES

The wastewater treatment plant consists of all the process stages as shown in the following flow diagram:



The anaerobic digesters were never set in operation.

4. THE YDRO PROCESS®

The Ydro Process® is a technology based on the controlled cultivation of selected organisms, characterized by their unique properties, into a specific environment. The purpose of their addition into this specified environment is to carry out a specific objective. Our microorganisms are natural occurring, non- toxic, non-pathogenic and not derived from animal sources.

When the microorganisms are in an environment where all necessary nutrients are found, they grow, reproduce and produce enzymes and substances that are necessary for the biological stabilization of wastewater, the sludge hydrolysis and degradation as well as the elimination of fats.

The application of these microorganisms in wastewater treatment plants and sewer grid systems results in the enhancement of the system performance and the control of the processing, increasing the system's efficiency with the following potential benefits:

- Enhancement and acceleration of the degradation of wastewater content in organic matter and fats.
- Improvement of plant effluent quality.
- Reduction (or elimination) of the surplus sludge production up to more than 70%, improved sludge stabilization and de-waterability.
- Reduction of energy consumption for aeration purposes, because of less oxygen requirements of the selected species compared to a conventional activated sludge process.
- Reduction of energy consumption as a result of a different process model against conventional operations.
- Total digestion and degradation of fats, oil and grease in the equipment and the treatment plant.
- Reduction of polyelectrolyte consumption.
- Reduction of odours at the wastewater facility and the sewer grid, pumping stations and manholes.
- It does not allow the production of Hydrogen Sulphide (H_2S) which creates odours or the formation of Sulphuric Acid (H_2SO_4) which induces the corrosion of the sewer pipelines. This way huge investments of replacing pipelines are avoided.
- Increases efficiency in cold weather conditions
- Significant reduction of micro-pollutants
- Minimization of cleaning in the sewer grid with mechanical means with simultaneous minimization and even elimination of clogging incidents.

5. YDRO PROCESS® ENERGY SAVINGS

The application of the Ydro Process® has significant energy savings according to the process stage. The savings against conventional operation are shown in the table below:

Mechanical Equipment		Conventional operation			Ydro Process®			Reduction	
		Units in operation	Hrs/day	kWh/day	Units in operation	Hrs/day	kWh/day	kWh/day	%
Dephosphorization mixers	2,2kW	4	24	211,2	2	24	105,6	105,6	50,0
Aerators	45,0kW	6	24	6.480,0	6	15	4.050,0	2.430,0	37,5
Sludge recirculation pumps	15,0kW	2	24	720,0	1	8	120,0	600,0	83,3
Post thickener rake scrapper	0,12kW	2	24	5,76	0	0	0	5,76	100,0
Belt press feeding pump	3,0kW	2	24	144,0	0	0	0	144,0	100,0
Polymer dosing pump	0,37kW	2	24	17,76	0	0	0	17,76	100,0
Sludge conveyor belt	1,8kW	2	24	86,4	0	0	0	86,4	100,0
Belt Press	1,5kW	2	24	72,0	0	0	0	72,0	100,0
Polymer preparation mixer	1,1kW	1	24	26,4	0	0	0	26,4	100,0
TOTAL	-	-	-	7.763,5	-	-	4.275,6	**3.487,9**	**44,9**

The total daily saving in electricity is approximately 3.500 kWh or 385 € (0,11 €/kWh) and approximately 140.000€ per year.

The energy savings can vary significantly as it is strictly dependent on parameters such as: the wastewater plant infrastructure, the hydraulic residence time in various stages, the type of aeration, the existence of motor inverters (VSD-Variable Speed Drives), the installed motor power, the wastewater temperature and many more.

The plant also has a Carbon credit fee which is a variable cost as the value per kWh is set by international values, country treaties and of course the electricity consumption. The average value for the wastewater treatment plant of Veria for the first months of 2020 is 0,009 €/kWh. Since the implementation of the Ydro Process® saves approximately 3.500 kWh per day the savings on Carbon credits are approximately 32€ daily or 11.680€ annually.

6. YDRO PROCESS® SLUDGE ELIMINATION

The sludge elimination at the plant of Veria is the one with the most significant impact financially and environmentally. The huge issue of environmental permits and legal disposal of sludge was solved, simultaneously benefiting the municipality financially. The plant produced approximately

12 tons of dehydrated sludge. The savings from this sludge elimination are shown in the following table:

Parameter	Per day	Per year
Excess sludge production	12 tn	4.380 tn
Sludge transportation (20 €/tn)	**240 €**	**87.600 €**
Sludge disposal fee (60 €/tn)	**720 €**	**262.800 €**
Polyelectrolyte usage (5kg/tn DS)	15 kg	5.475 kg
Polyelectrolyte cost (3,5 €/kg)	**52,5 €**	**19.162 €**
Iron Chloride usage($F3Cl_3$) 30~ ppm	0,3 tn	109,5 tn
Iron Chloride cost (150 €/tn)	**45 €**	**16.425 €**
Manpower (2 press operators)	**82 €**	**30.000 €**
TOTAL	**~1.150 €**	**~420.000 €**

7. EXTERNAL SLUDGE ELIMINATION WITH THE YDRO PROCESS®

The plant environmental permit was changed and from 2014 it could legally receive compatible sludge from external plants in order to eliminate it with the use of the Ydro Process®. The sludge received was either from municipal plants or industrial such as food and vegetable industry, milk and dairy or olive factories. The total amounts of sludge received from external plants are shown below:

Year	Quantity (tons)
2014	11.400
2015	15.300
2016	17.600
2017	10.500
2018	8.200
2019	400

Since the beginning of 2019 and due to high activity of the implementation of the Ydro Process® worldwide, we have ceased receiving external sludge. Alternatively we have applied the technology to most of the sludge producing plants eliminating the excess produced sludge locally at those plants.

8. CERTIFICATE OF GOOD OPERATION

Below is an indicative certificate of good operation that we obtain as a proof document that the plant is producing zero sludge and that the effluent meets the permit characteristics.

Veria 29-07-2014

No. Ref.: 2343

MUNICIPAL WATER & SEWERAGE
OF VERIA (D.E.Y.A.V.)
TECHNICAL SERVICE DEPT.
Address: Kentrikis 203
Postal Code: 59 100 Veria
Tel.: 23310-78800, 23310-78805
Fax: 23310-25172
Email: deyav@otenet.gr

TO: G. GANATSIOS E.D.E.
Laertou str. 22
P.O.Box: 8711 – Capital Center
Postal Code: 57 001 Thermi
Thessaloniki

SUBJECT: CERTIFICATE OF GOOD OPERATION

The undersigned Achtsis Thomas, general manager of the municipal water and sewerage municipality of Veria and according to:

1. The application of G.GANATSIOS E.D.E., chemical engineer, dated 28/07/2014
2. The signed service contract with a protocol number 2660/20-07-2012 regarding the **"OPERATION OF THE SLUDGE SECTOR AND THE MANAGEMENT AND DISPOSAL OF THE PRODUCED SLUDGE OF THE WASTEWATER TREATMENT PLANT OF VERIA"**
3. All data from the municipality records

CONFIRMS

That the company G. GANATSIOS E.D.E. has an active contract regarding the "OPERATION OF THE SLUDGE SECTOR AND THE MANAGEMENT AND DISPOSAL OF THE PRODUCED SLUDGE OF THE WASTEWATER TREATMENT PLANT OF VERIA" which expires on the 20/07/2017.

The above company has implemented the above mentioned service in accordance with the technical specifications and contractual obligations.

Additionally, from 15/03/2013 until today, the method of Bioaugmentation is implemented with the addition of microorganisms which are provided by the company "A.GANATSIOS & CO E.E.".

During the application period it was determined that:

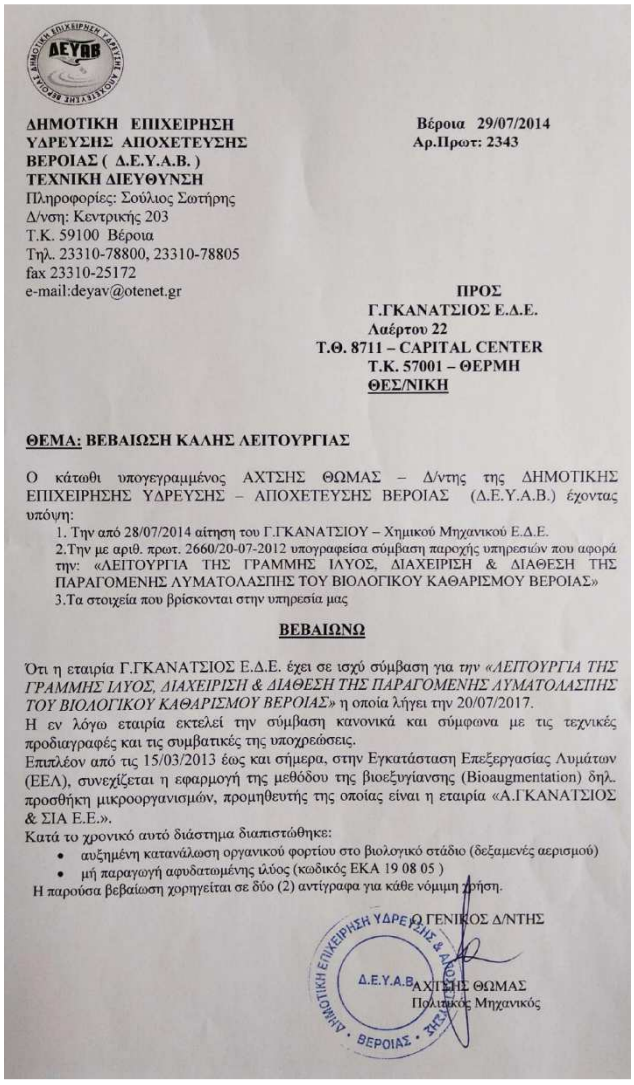
- There is a high rate of organic load degradation in the biological stage (aeration tanks)
- There was no production of dehydrated sludge (European Waste Catalogue (EWC) code 19 08 05)

This certificate is issued in two (2) copies for any legal use.

The general manager of the Municipal
Water & Sewerage of Veria

Achtsis Thomas

Civil Engineer



ΔΗΜΟΤΙΚΗ ΕΠΙΧΕΙΡΗΣΗ
ΥΔΡΕΥΣΗΣ ΑΠΟΧΕΤΕΥΣΗΣ
ΒΕΡΟΙΑΣ (Δ.Ε.Υ.Α.Β.)
ΤΕΧΝΙΚΗ ΔΙΕΥΘΥΝΣΗ
Πληροφορίες: Σούλιος Σωτήρης
Δ/νση: Κεντρικής 203
Τ.Κ. 59100 Βέροια
Τηλ. 23310-78800, 23310-78805
fax 23310-25172
e-mail:deyav@otenet.gr

Βέροια 29/07/2014
Αρ.Πρωτ: 2343

ΠΡΟΣ
Γ.ΓΚΑΝΑΤΣΙΟΣ Ε.Δ.Ε.
Λαέρτου 22
Τ.Θ. 8711 – CAPITAL CENTER
Τ.Κ. 57001 – ΘΕΡΜΗ
ΘΕΣ/ΝΙΚΗ

ΘΕΜΑ: ΒΕΒΑΙΩΣΗ ΚΑΛΗΣ ΛΕΙΤΟΥΡΓΙΑΣ

Ο κάτωθι υπογεγραμμένος ΑΧΤΣΗΣ ΘΩΜΑΣ – Δ/ντης της ΔΗΜΟΤΙΚΗΣ ΕΠΙΧΕΙΡΗΣΗΣ ΥΔΡΕΥΣΗΣ – ΑΠΟΧΕΤΕΥΣΗΣ ΒΕΡΟΙΑΣ (Δ.Ε.Υ.Α.Β.) έχοντας υπόψη:

1. Την από 28/07/2014 αίτηση του Γ.ΓΚΑΝΑΤΣΙΟΥ – Χημικού Μηχανικού Ε.Δ.Ε.
2. Την με αριθ. πρωτ. 2660/20-07-2012 υπογραφείσα σύμβαση παροχής υπηρεσιών που αφορά την: «ΛΕΙΤΟΥΡΓΙΑ ΤΗΣ ΓΡΑΜΜΗΣ ΙΛΥΟΣ, ΔΙΑΧΕΙΡΙΣΗ & ΔΙΑΘΕΣΗ ΤΗΣ ΠΑΡΑΓΟΜΕΝΗΣ ΛΥΜΑΤΟΛΑΣΠΗΣ ΤΟΥ ΒΙΟΛΟΓΙΚΟΥ ΚΑΘΑΡΙΣΜΟΥ ΒΕΡΟΙΑΣ»
3. Τα στοιχεία που βρίσκονται στην υπηρεσία μας

ΒΕΒΑΙΩΝΩ

Ότι η εταιρία Γ.ΓΚΑΝΑΤΣΙΟΣ Ε.Δ.Ε. έχει σε ισχύ σύμβαση για την *«ΛΕΙΤΟΥΡΓΙΑ ΤΗΣ ΓΡΑΜΜΗΣ ΙΛΥΟΣ, ΔΙΑΧΕΙΡΙΣΗ & ΔΙΑΘΕΣΗ ΤΗΣ ΠΑΡΑΓΟΜΕΝΗΣ ΛΥΜΑΤΟΛΑΣΠΗΣ ΤΟΥ ΒΙΟΛΟΓΙΚΟΥ ΚΑΘΑΡΙΣΜΟΥ ΒΕΡΟΙΑΣ»* η οποία λήγει την 20/07/2017.
Η εν λόγω εταιρία εκτελεί την σύμβαση κανονικά και σύμφωνα με τις τεχνικές προδιαγραφές και τις συμβατικές της υποχρεώσεις.
Επιπλέον από τις 15/03/2013 έως και σήμερα, στην Εγκατάσταση Επεξεργασίας Λυμάτων (ΕΕΛ), συνεχίζεται η εφαρμογή της μεθόδου της βιοεξυγίανσης (Bioaugmentation) δηλ. προσθήκη μικροοργανισμών, προμηθευτής της οποίας είναι η εταιρία «Α.ΓΚΑΝΑΤΣΙΟΣ & ΣΙΑ Ε.Ε.».
Κατά το χρονικό αυτό διάστημα διαπιστώθηκε:

- αυξημένη κατανάλωση οργανικού φορτίου στο βιολογικό στάδιο (δεξαμενές αερισμού)
- μή παραγωγή αφυδατωμένης ιλύος (κωδικός ΕΚΑ 19 08 05)

Η παρούσα βεβαίωση χορηγείται σε δύο (2) αντίγραφα για κάθε νόμιμη χρήση.

Ο ΓΕΝΙΚΟΣ Δ/ΝΤΗΣ
ΑΧΤΣΗΣ ΘΩΜΑΣ
Πολιτικός Μηχανικός

9. OVERALL FINANCIAL BENEFIT

The overall financial benefits of the implementation of the Ydro Process® are shown below:

Saving	Daily (€/day)	Annually (€/yr)	Per 1.000 m^3 treated (€/1000m^3)
Sludge elimination	1.150€	420.000€	96 – 115€
Electricity reduction	385€	140.000€	32 – 38,5€
Carbon credits from electricity reduction	32€	11.680€	2,6 – 3,2€
TOTAL	**1.570€**	**571.680€**	**130,6 – 156,7€**

Further to the above savings there is also the cleaning of the sewer grid and the elimination of the odours that has ceased the complaints of the surrounding residents which cannot be accounted for in terms of savings.

Finally, it must be mentioned that the cost of the implementation of the Ydro Process® at the wastewater treatment of Veria is only a fraction of the above stated financial benefits. Therefore it is definitely the most cost effective and environmentally friendly solution to the overall optimization of treatment plants allowing the minimal footprint to the environment.

Thessaloniki, 22/09/2020

Dr. George Ganatsios

Chemical Engineer

Capital Trade Center – 22 Laertou Str., P.O.Box: 8711, Thermi 570 01 Thessaloniki, GREECE
Phone - Fax: +30 2310 545-706, 515-804 // **Website:** www.wastewater.gr // **e-mail:** ggana@tee.gr