

**Eco-friendly and energy efficient sewage SLUDGE deWaTeRing through
novEl nanomAterials and elecTro-osmotic process**

SLUDGEtreat

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Project Coordinator organisation name: **Politecnico di Milano**

Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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1. Introduction

Several dissemination activities have been planned along the SLUDGETREAT Project period.

During the **first year** of the project, dissemination has been focused in the web pages of the different partners' institutions and some technological magazines. Moreover, during the visits of some wastewater treatment plants around the area of Milan (ITALY), the partners introduced the SLUDGETreat Project showing some detailed explanations and indications about sludge electro-dewatering. Later on, during the **second year**, when the first scientific results have been achieved, the partners have shown some of the preliminary results and attended some conferences. During the **third year**, partners have attended other conferences in Europe and published papers in some scientific journals.

2. DISSEMINATION ACTIVITIES: 2014/2016

3.1 Year 2014/2015

1. **Web page** of the SLUDGEtreat project was released some months after the starting of the Project. The web page explains the project from a scientific point of view and shows the workplan of each partner of the consortium. Moreover, dissemination activities, calls for recruitments of new researchers and contacts of the partner coordinators are reported.

LINK: <http://sludgetreat.eu/>

2. **Press notes** were released.

AIN-boletín: Technological magazine from AIN. *Boletín Tecnológico 66*, June 2015, Pages 16-17.

LINK: http://www.ain.es/wp-content/archivos/boletin-AIN_TECH-20151.pdf

3. Links of the different **partners' institutions websites** where SLUDGEtreat Project is published:

- A.S.T: <http://www.astautomation.it/>
- FLUBETECH: <http://www.flubetech.com/flubetech-colabora-con-el-politecnico-de-milano/>
- POLIMI: <http://www.polimi.it/>
- AIN: <http://www.ain.es/tech/boletines-tecnologicos/>

4. **Links for the recruitment to AIN:**

<http://seleccion.ain.es/detalle.asp?referencia=15027>

<http://rseq.org/empleo/ofertas-de-empleo/item/703-phd-experienced-technologist>

5. **Linkedin and other social networks of the partners and scientific people involved in the Project.**

<http://www.fabiodisconzi.com/open-fp7/projects/191799/index.html>

<https://www.linkedin.com/in/robertocanziani>

<https://www.linkedin.com/in/carles-colominas-464a0326>

<https://www.linkedin.com/in/aristide-stradi-026a8565>

<https://www.linkedin.com/in/cdiazjimenez>

<https://www.linkedin.com/in/ggfuentes>

3.2 Year 2015

1. Scientific communications and attended conferences

Meeting name: SMT 30 The 30th International Conference on Surface Modification Technologies

Where: Milan - Politecnico di Milano, ITALY

When: 29th June – 1st July, 2016

Main topic: Surface treatment

Charged on: Politecnico di Milano - CMIC/DICA

Internet site: www.smt30.org

Communication: Evaluation of electrode surface treatments in sludge electro-osmosis dewatering.

Abstract: The drying of sludge produced by Wastewater Treatment Plants (WWTPs) is a very hard process due to the presence of the colloid fraction. Electro-osmosis could be a suitable technique to reduce the water content of the final sludge. Electric fields of 10 V/cm, 15 V/cm and 20 V/cm have been studied for electro-osmosis tests in a static or dynamic apparatus, obtaining a dry solids content up to 40-45%, with respect to 25-30% obtained by mechanical methods. In order to optimise the apparatus, the corrosion behaviour of the anodic material appears the main critical aspect, due to the high circulating current density. Moreover, wear may be detrimental for the surface of rotating electrodes. We then investigated the behaviour of materials used as electrodes mainly by evaluating the efficiency of the process and their surface aspect after treatment. The full understandings of the electrochemical reactions developed at the anode are a key factor for the material choice. We compared the efficiency and the corrosion resistance of anodes made of titanium MMO with respect to bare stainless steel (AISI 304) and stainless steel coated by PVD technique with TiN, AlTiN and DLC. Characterization of the anodes samples by roughness tests and by SEM, AFM and potentiodynamic tests, show that corrosion resistance of the DSA was the most suitable for our application. However, efficiencies of the electro-osmosis process for all the materials used have been found comparable, in terms of developed current densities and total energy consumptions, for short-test duration.

Current status: Attended with oral presentation

3.3 Year 2016

1. Scientific communications and attended conferences

Meeting name: *Tecnologie ambientali innovative: rassegna ed esempi applicativi concreti*

Where: LIUC, Castellanza - ITALY

When: April 2016

Charged on: Politecnico di Milano - DICA

Communication: La disidratazione elettro-assistita dei fanghi di depurazione

Current status: Attended with oral presentation

Meeting name: *MM-Recupero di risorse negli impianti di disidratazione*

Where: San Rocco WWTP, MILANO - ITALY

When: September 2016

Charged on: Politecnico di Milano - DICA

Communication: La disidratazione elettro-assistita dei fanghi di depurazione

Current status: Attended with oral presentation; a summary authored by Visigalli S., Gronchi P. and Canziani R., has been published on the Magazine "Servizi a Rete", issue Maggio-Giugno 2017, pages 91-92, Tecneditedizioni, Milan, Italy

Meeting name: *5th INTERNATIONAL CONFERENCE ON ADVANCES IN SUSTAINABLE SEWAGE SLUDGE MANAGEMENT*, The biodegradable waste in circular economy.

Where: Cracow, POLAND

When: 18th – 21st September 2016

Main Topics: Management of biowaste and other biodegradable waste according circular economy – resource recovery and by-products management; innovative technologies (wastewater, sewage sludge and biowaste); sustainability (energy balance, energy savings)

Internet site: www.assm2016.pl

Charged on: DICA/Flubetech/AIN

Communication: Electro-osmotic dewatering of anaerobically and aerobically stabilised sludge

Abstract: Dewaterability of sludge produced by Wastewater Treatment Plants (WWTPs) is often poor, reaching less than 25% dry solids (DS). Electro-dewatering could be a suitable technique to reduce water content of the sludge by up to 20%. We investigated the parameters affecting pressure-driven electro-dewatering of anaerobically and aerobically stabilised, mechanically dewatered, sludge samples. The applied electrical fields have been set at 10, 15 and 20 V/cm in order to evaluate total energy consumption and final DS.

Current status: Attended with oral presentation

Meeting name: *FILTECH The Filtration Event 2016*

Where: Cologne - GERMANY

When: 11th – 13th October 2016

Main topic: Filtration & Separation tech. - All

Internet site: www.filtech.de/

Charged on: Politecnico di Milano - DICA/CMIC

Communication: Electro-osmotic dewatering of sewage sludge: preliminary results

Current status: Attended with oral presentation

3.4 Year 2017

1. Scientific journals

Journal name: *Materials and Manufacturing Processes*

Title: Electrode surface treatments in sludge electro-osmosis dewatering

When: JANUARY 2017

DOI: 10.1080/10426914.2017.1279313

Charged on: Politecnico di Milano/FLUBETECH/AIN

Current status: Published

Journal name: *Environmental Research*

Title: Performance of electro-osmotic dewatering on different types of sewage sludge

When: MAY 2017

DOI: 10.1016/j.envres.2017.05.015

Charged on: Politecnico di Milano

Current status: Published

Journal name: *Journal of Environmental Chemical Engineering*

Title: Assessment of pressure-driven electro-dewatering as a single-stage treatment for stabilized sewage sludge

When: NOVEMBER 2017

DOI: 10.1016/j.jece.2017.11.034

Charged on: Politecnico di Milano

Current status: Published

2. Attended conferences

Meeting name: *SLUDGETECH 2017*

Where: London, UNITED KINGDOM

When: 9-13th JULY 2017

Internet site: <https://www.sludgetech.com/>

Charged on: Politecnico di Milano – DICA

Communication: Influence of sludge characteristics on pressure-driven electro-dewatering of stabilized sewage sludge

Abstract: The feasibility of the pressure-driven electro-dewatering (EDW) on aerobically and anaerobically stabilised sludge samples, taken from four different wastewater treatment plants around the metropolitan area of Milan (Italy), has been assessed. First, sewage sludges were characterized by measuring DS content, VS/DS ratio, pH, conductivity, zeta potential and capillary suction time (CST) of the liquid fraction. Then, after a preliminary centrifugation of the sludge samples in the laboratory, pressure-driven EDW tests have been performed in a lab-scale device, under the application of 300 kPa of pressure and an applied voltage of 15 V. The DS content increased up to 18.4-31.1%, (with an increase of 8.6% to 23.0% from the initial DS value) depending on the characteristics of the sludge samples and the polymer dosage. If compared with EDW tests, the increase due to the sole effect of pressure ranged from 3 to 10% and strictly depended on polymer dosage.

The characteristics of sludge that affect the increase of the DS content were investigated during both the pressure-driven stage and the EDW stage. Polyelectrolyte addition (4 and 8 g/kgDS) mainly affected the pressure-driven phase of the tests. However, the VS/DS ratio was the main factor affecting the pressure-driven stage on the unconditioned aerobically stabilised samples. CST values could also reliably predict the efficiency of this stage during experiments.

Current status: Attended with oral and poster presentation

- 3. Web page** of the SLUDGEtreat project was updated with the new partner of the Consortium X2 Solutions and the calls for the researchers recruitments of FLUBETECH and AIN.

LINK: <http://sludgetreat.eu/>

- 4. ResearchGate** Project web page: <https://www.researchgate.net/project/Sludgetreat>

3.5 FUTURE ACTIVITIES

1. Scientific communications and conferences

Journal name: *Ingegneria dell'Ambiente*

Title: La disidratazione elettro-assistita dei fanghi: influenza del dosaggio di polielettrolita e dei parametri operativi

When: December 2017

Charged on: Politecnico di Milano

Current status: Under Review

Journal name: *Chemical Engineering Journal*

Title: Technical and economic assessment of electro-dewatering system for sewage sludge: towards an innovative industrial application

When: February 2018

Charged on: Politecnico di Milano

Current status: Under Review

Meeting name: *Sludge Management in Circular Economy – SMICE 2018*

Where: Rome, ITALY

When: 23-25th May 2018

Charged on: Politecnico di Milano - DICA

Communication: Pressure-driven electro-dewatering applied for sludge: Economic & environmental life cycle assessment

Current status: Accepted for oral presentation

Meeting name: *EcoSTP 2018*

Where: London, Ontario, CANADA

When: 25-27th June 2018

Charged on: Politecnico di Milano - DICA

Communication: The electro-dewatering of sludge: influence of the polyelectrolyte dosage and the operating conditions

Current status: Accepted for oral presentation

Meeting name: *IFAT 2018*

Where: Messe München, GERMANY

When: 14-18th May 2018

Charged on: X2 Solutions Srl

Communication: Exhibitions of the EDW machine prototype

Current status: Subscribed and accepted in hall A.401

The partner of the consortium are planning a detailed dissemination activity for the future months.