

RANSFER OF KNOWLEDGE TO INCREASE THE OPERATING TIME OF THE STORM PUMPS FOR THE WASTEWATER SYSTEMS - "TANAGRA"

Goal of the project:

The storm pump blades were catastrophically destroyed due to clogging impeller. The fastening bolts of the blade broke fragile due to increased torque to the pump shaft. The project provides solutions to increase the operation time of the storm pumps. The solutions of the project cover three areas: (1) the hydrodynamic point of view to reduce the risk of clogging the impeller by analyzing the flow into the suction elbow geometry; (2) the mechanical point of view to increase the mechanical strength of the solution on fixing the impeller blades on pump hub; (3) an emergency shutdown procedure is targeted when the pump impeller is clogged with testing a technique of the impeller self-cleaning.

Short description of the project:

A strategy of urban sewage centralized management is implemented in Timișoara city. All wastewater is collected and conveyed to a central location for treatment or disposal. In urban area, storm water is considered in wastewater management. Seven storm pumps are installed in the wastewater treatment plant to protect it against floods. Several catastrophic events have occurred at the storm pumps taking them out of service after short operation period. The catastrophic events were investigated and several solutions have been proposed to increase the operation time of the storm pumps installed in water treatment plant.

Project implemented by

- Politehnica University Timișoara (UPT) together with AQUATIM Timișoara

Implementation period:

September 2016 – November 2018

Main activities:

The main activities were focused on: (1) investigation and analysis the technical solutions associated to the storm pumps available in situ; (2) numerical investigation of the flow into the pump; (3) experimental investigation of the waste and debris collected from wastewater; (4) analysis of the material and mechanical solution implemented in situ; (5) experimental investigations performed in situ to measure the electrical parameters of the pump; (6) assessment of the technical solutions implemented in situ. Also, several undergraduates and master students from UPT visited the sewage treatment plant understanding the new challenges faced by communities and authorities.

Results:

Micota D., Gălățanu S.V., Marșavina L. and Muntean S. (2018) *Evaluation of the mechanical properties and failure mechanism of fibres formed in municipal wastewater systems*, 7th Int. Conf. on Advanced Materials and Structures (AMS2018), 28–31 March 2018, Timișoara, Romania.

Hedeș A., Svoboda M., Anton L.E., Muntean S. and Vitan D., (2018) *In situ measurements on the axial pumps motors of a wastewater station*, 18th Int. Conf. on Environment and Electrical Engineering, 12–15 June 2018, Palermo, Italy.

Gălățanu S.V., Muntean S., Marșavina L., Micota D. and Drăghici I. (2018) *Integrity Analysis of the Rainwater Pump Impeller*, 5th Int. Conf. of Engineering Against Failure (ICEAF V), 20–22 June 2018, Chios, Greece.

Muntean S., Bosioc A.I., Marșavina L., Gălățanu S.V., Drăghici I. and Anton L. E. (2018) *Failure analysis of the rainwater axial pumps installed in a wastewater pumping station*, 29th IAHR Symposium on Hydraulic Machinery and Systems (IAHR2018), 16–21 September 2018, Kyoto, Japan.

Bosioc A.I., Moș D., Draghici I., Muntean S. and Anton L.E. (2018) *Experimental Analysis of a Pump Equipped with an Axial Rotor with Variable Speed*, 29th IAHR Symposium on Hydraulic Machinery and Systems (IAHR2018), 16–21 September 2018, Kyoto, Japan.

Muntean S., Marșavina L., Hedeș A., Anton L.E. and Vlaicu I. (2018) *In situ investigations and failure analysis of the rainwater pumps from a wastewater treatment plant*, 20th Int. Conf. on Hydropower Plants, 14–16 November 2018, Vienna, Austria.

Ognean D., Moș D.C. and Muntean S. (2018) *Technical solution to increase capacity of the centrifugal pumps operated in the protection system against flooding due to climate change*, 20th Int. Conf. on Hydropower Plants, 14–16 November 2018, Vienna, Austria.

Gălățanu S.V., Muntean S., Marșavina L., Ailinei I., and Micota D. (2019) *Rainwater propeller pumps structural integrity*, International Journal of Structural Integrity (accepted).

Applicability and transferability of the results:

Two technical solutions resulting from the research in the project were implemented in situ. First, the suction elbow installed to each pump inlet was removed in order to diminish the impeller clogging. Second, a new softstarter was installed to detect the clogging level of the pump impeller. A self-cleaning procedure is applied if the threshold clogging level is reached. Also, a mechanical solution to increase the mechanical strength of the solution on fixing the impeller blades on pump hub is proposed. However, this solution would be implemented in situ after the performances of the first two technical solutions already implemented are assessed.

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Research Center

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