3D PRINTING
SOLUTIONS
BY ARKEMA

CASE STUDY

Printing large pieces in small series for drinking water application with Rilsan® PA11

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INTRODUCTION

Novall is a French company specialized in mechanics, mechatronics engineering and industrial product design. The company has an entity dedicated to additive manufacturing that designs and produces small series adapted to exceed the stringent demands of their customers. Novall aims to develop tailor-made solutions for highly demanding applications by using cutting-edge technology and engineering expertise. Novall partnered with Save Innovations, a family sized business that designs, manufactures and markets innovative solutions to meet the energy challenges of the future. Save Innovations aims to provide solutions that bring intelligence to drinking water networks by supplying electric power to real-time data collection devices. Energy is the cornerstone of all systems and energy demands are growing constantly. Alternative and renewable sources are a solution to this problem. Together, Novall and Save Innovations developed small series parts for the turbine used in the Pico-generators which enable the efficient operation of these intelligent drinking water systems.

SUMMARY

Objective

Creating complex large parts can be costly for small series production. Novall opted for additive manufacturing to reduce production costs. They also needed a material to produce these parts that met the challenging mechanical requirements as well as the necessary regulatory approvals for direct contact with drinking water.

Partner

Novall www.novall.fr

Industry

Water management

Application

Body of turbine for pico-generators in water supply systems

Printing technology

Laser sintering

Material

Rilsan® Polyamide 11

RILSAN® PA11

CHALLENGE

Small series equal high costs

Small series production is associated with high manufacturing costs in conventional manufacturing processes such as injection molding or extrusion. The turbine body design is extremely intricate. This required a tailor-made solution that would be too expensive if conventional processes were used. With the goal to produce locally and reduce production time, Novall invested in a 3D printing machine.

Direct contact with drinking water

Save Innovations designed their patented Picogen® generators in order to optimize water flow which improves efficiency and production of electricity for water networks. The part produced through additive manufacturing is the body of the pico-generator which consists of a turbine and regulator. Given the nature of the application, it was necessary that the material be compatible for use in contact with drinking water. The part must receive ACS certification, a French certificate of sanitary compliance that is issued by a laboratory authorized by the French health service. To achieve this, the material must pass rigorous screening of its formulation to be suitable for direct contact with drinking water.

High performance material

The material selected for the creation of the turbine body had to meet certain chemical and mechanical requirements due to the challenging operating environment of the pico-generator. The high-performance material would also need to be compatible with additive manufacturing processing standards. The material of choice was Rilsan® PA11 – a 100% bio-based high performance polyamide made from castor oil. Due to its low water absorption and excellent mechanical properties, Rilsan® PA11 is ideal for this application. This polyamide is ductile and has tremendous impact resistance, two key properties needed for this solution. Most importantly it can be used in direct contact with drinking water contrary to other materials such as PA12 that may require further processing which may impair performance.

Ronald Bosch, CEO of Novall, explained: «We were hesitating between PA12 and PA11, but in various tests we found that PA11 performs better in water. A material that proved to be ideal for the series production of a connected pico-turbine."

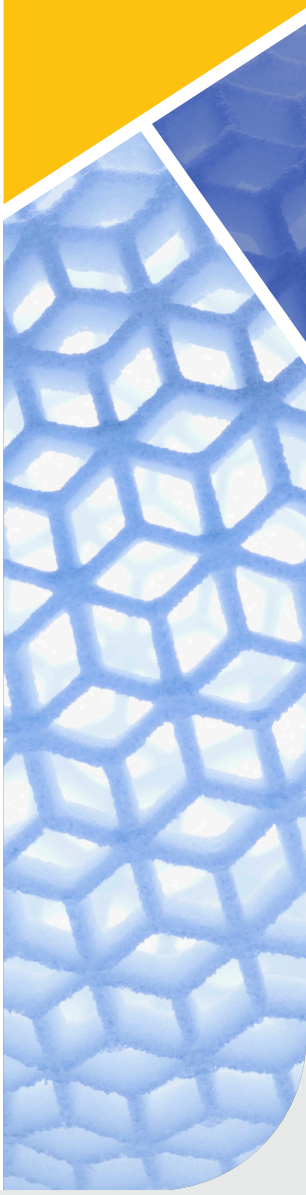
Ronald Bosch concludes: «We were able to develop a manufacturing process with a specific material that meets our application needs in the aquatic field. We have thus obtained ACS certification, a key market advantage that enables our end customers to use our innovative products in complex drinking water systems."

In contact with drinking water

Save Innovations designed patented Picogen® generators to make the most of the water flow for the efficient operation and optimize the electricity production. The 3D printed part is the body of the pico-generator that consist of turbine and regulator. Given the functionality of the piece, this application requires the material that is compatible for use in contact with drinking water.

SOLUTION / OUTCOME

Novall produced the turbine body through laser sintering, one of several additive manufacturing technologies. The turbine body was created using a glass-bead filled grade of Rilsan® PA11. The finished part measures 350 x 400 mm weighs 8 kilos, and is ACS certified. The pico-generator was installed in 2018 on the Eau de Paris water network located in Paris, France. This network is about 50 years old and has a 20% leakage rate, making it a perfect candidate for this new solution. The installation of the pico-generator is a project that fits perfectly with the city's climate energy plan. The climate energy plan is an environmental strategy which aims to reduce the city's energy consumption, reduce greenhouse emissions and also develop the production of renewable energy. The pico-generator is installed on the drinking water pipe and the water passes through its propellers. This flow of water charges an alternator which then produces electricity. The real innovation behind this solution is the fact that the pico-generator is able to do this with very low water flow and doesn't require its own independent energy source. This supplies energy to sensors that help measure water quality, flow rates, and pressure which are necessary for the proper operation of the Parisian drinking water supply network. Not only does this innovative solution have a positive impact on the end-users but most importantly on the environment.



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