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ADDITIVE MANUFACTURING THROUGH 3D PRINTING OF THE LANDMARK NUT M60X2, USING ABS+ FILAMENT

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ABSTRACT

This paper deals with the additive manufacturing by 3D printing of the Dutch Nut-M60x2 landmark which is part of the subassembly Gas Reducer R2-Hose DN 2 in. This subassembly is a component part of the washing head of the light water well drilling installations FA 100, FA 125, FH 150 and FG 40. The generic name of the washing head will be FA 100.We use 3D printing technology because, on the one hand, it is technically possible to make the part and on the other hand, for economic reasons. It is approximately ten times cheaper to make the part through 3D printing than through conventional technologies

KEYWORDS: Dutch nut, 3D printing, Fused Deposition Modeling, water drilling installation

1. Introduction

Due to the common use of the washhead on light water well drilling rigs FA100, FA125, FH150 and FG40, its generic name will be "FA100 Washhead" [1-3].

The aim is to obtain the components of the washing head at water well drilling installations, through 3D printing additive manufacturing, both for technical and economic reasons [4-6]. From an economic point of view, it is approximately ten times cheaper to manufacture the parts of the washing head through 3D printing additive manufacturing than to manufacture them using conventional technologies. This issue represents a spectacular leap in work efficiency and productivity.

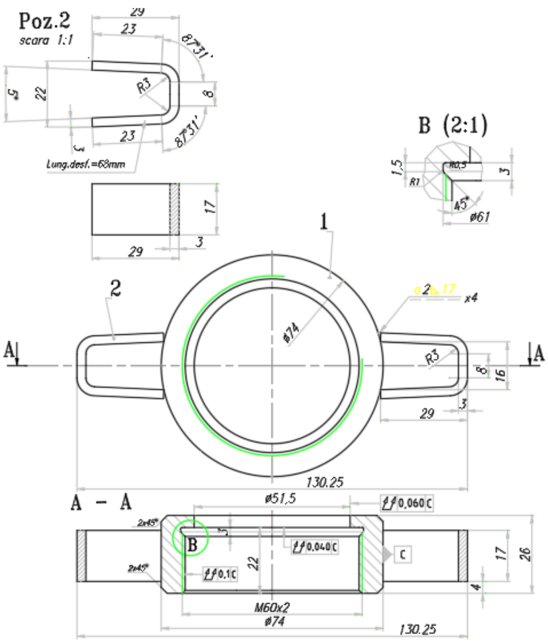

Fig. 1. *Execution drawing Dutch Nut M60x2*

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This paper deals with the additive manufacturing by 3D printing of the Dutch Nut-M60x2, a component part of the washing head of water well drilling installations, generically called FA 100.

The landmark M60x2 Dutch Nut, whose additive manufacturing through 3D printing is to be described, is part of the Gas Reducer R2-Pipe DN 2 subassembly.

The M60x2 Dutch Nut landmark was fabricated by FDM 3D printing with ABS+ filament according to the drawing in Figure 1.

2. Fabrication

Figure 2 shows the 3D modeling before slicing of the Dutch Nut M60x2, using the slicing program, Ultimaker Cura 4.13.1.

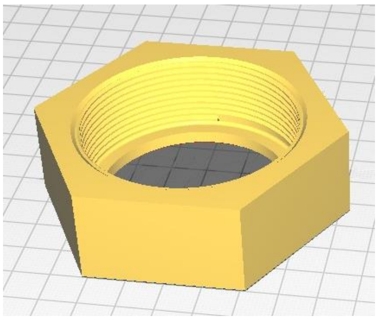

Fig. 2. *3D Modeling of the M60x2 Dutch Nut landmark before slicing, using the slicing program, Ultimaker Cura 4.13.1*

Figure 3 shows the 3D modeling after slicing of the M60x2 M60x2 Flat nut, using the slicing program, Ultimaker Cura 4.13.1.

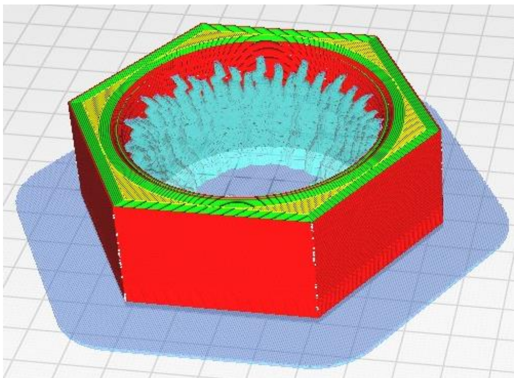

Fig. 3. *3D modeling after slicing of the M60x2 Dutch Nut landmark, using the slicing program, Ultimaker Cura 4.13.1*

Figure 4 shows some of the settings for slicing the landmark Nut M60x2.

Other settings made for slicing the M60x2 Dutch Nut Reduction benchmark are shown in Figure 5.

The third part of the settings made for slicing the mark Reduction Dutch Nut M60x2 are presented in Figure 6.

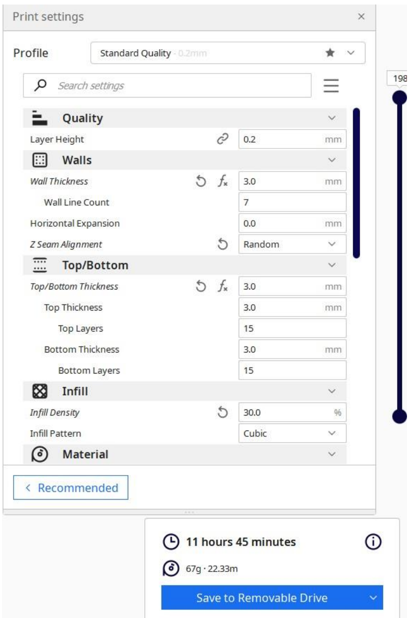

Fig. 4. *The first part of the settings for slicing the Dutch Nut landmark, using the Ultimaker Cura 4.13.1 program*

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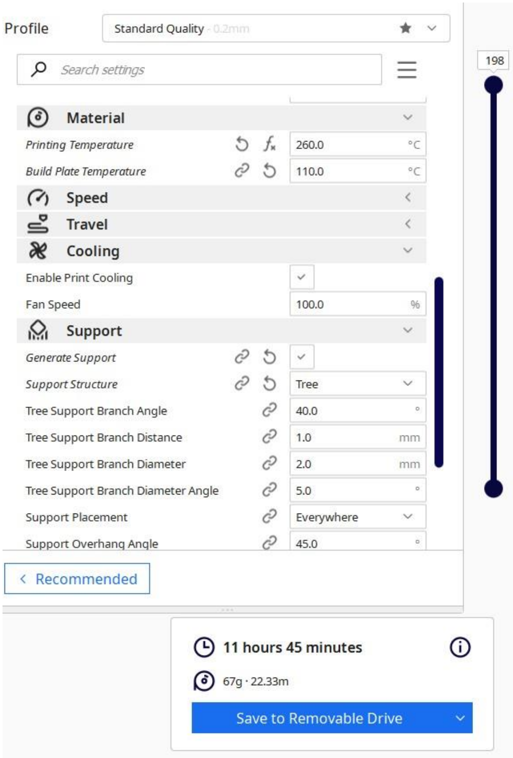

Fig. 5. *The second part of the settings for slicing the Dutch Nut landmark, using Ultimaker Cura 4.13.1*

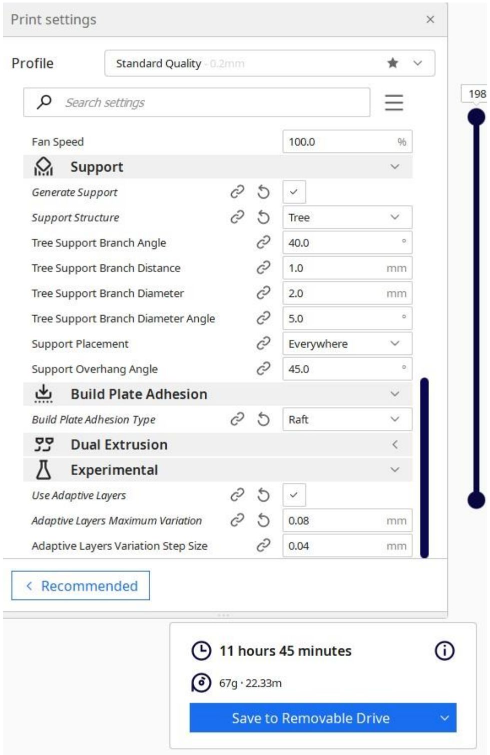

Fig. 6. *The third part of the settings for slicing the Dutch Nut landmark, using Ultimaker Cura 4.13.1*

The main slicing settings for the "Dutch Nut M60x2" feature, in Cura 4.13.1, were as follows: Layer heigh t= 0.2 mm; Wall thickness = 3 mm; Z-Seam Alignment = Random; Infill density = 30; Infill

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Pattern = Cubic; Material = ABS+; Printing Temperature = 260 ºC; Build Plate Temperature = 110 ºC; Generate Support = Yes; Support Structure = Tree; Tree Support Branch Angle = 40º; Support Placement = Everywhere; Support Overhang Angle = 39º; Build Plate Adhesion Type = Raft; Experimental; Use Adaptive Layers = Yes; Adaptive Layers Maximum Variation = 0.08 mm; Adaptive Layers Variation Step Size = 0.04 mm.

Dutch Nut M60x2 benchmark took 11 hours and 45 minutes to print. and consumed 67 g of ABS+ filament. The Slice command is given.

Figure 7 shows the Dutch Nut M60x2, 3D printed using ABS+ filament on the Creality 3D printer, Ender 3 V2.

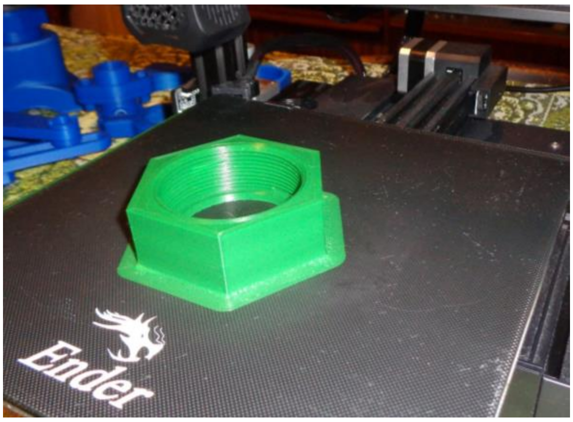

Fig. 7. *Landmark M60x2 Dutch Nut manufactured by additive 3D printing on the Creality Ender 3 V2 3D printer*

Conclusions

The manufacture of the Dutch nut-M60x2 landmark, through 3D printing, represented the optimal solution from a technical and economic point of view. In the conventional manufacturing version, a high manufacturing cost results and the labour productivity was low. In the 3D printed version made of ABS+ filament, the part costs approximately 10 times less, the labour being almost zero. This issue represents a spectacular leap in work efficiency and productivity.

This landmark is an integral part of the washing head from light water well drilling installations, type FA 100, FA 125, FH 150 and FG 40. The additive manufacturing by 3D printing of this landmark aims to reduce the manufacturing cost of light drilling installations water wells thus falling into the category of green projects and projects for the realization of industrial parts through additive methods.

The partial realization through additive manufacturing through 3D printing of some land-marks of light water well drilling installations has several advantages. On the one hand, from an economic point of view, the reduction of the manufacturing cost is obtained, and on the other hand, a modern, fast and relatively easy to implement technical solution is used.

Another objective pursued by the manufacture of light installations for drilling water wells at low costs and using modern technical solutions such as additive manufacturing through 3D printing, is the relaunch of irrigation in Romania. This is a requirement of the European commissioners in the National Recovery and Resilience Plan of Romania PNRR. The proposed solution is to make water wells with drilling installations, or a water well with a depth of 80 meters, on two hectares of land agricultural.

Romania's National Strategy on Climate Change requires the adoption of measures to mitigate the effects of global warming and the prolonged drought caused by global warming, and therefore the declaration of water as a strategic national reserve in Romania, and real-time monitoring of strategic water reserves is aimed at contained in the underground aquifers of Romania.

The water in the underground aquifer layers (which are porous geological layers made of gravel and sand) accumulates in the aquifer for thousands of years and the water in the aquifer has a very low circulation speed of 1 m/year. Of the world's fresh water resources, 68.3% are ice caps and glaciers, 31.4% are water from underground aquifers and only 0.3% are fresh surface water, so the most important fresh water resources that can be efficiently exploited they are those from the underground aquifers, which are proposed to be monitored and managed efficiently, intelligently and in real time through the topic at hand. Even if there are dry periods, the underground aquifer is replenished with water and the water is stored in the aquifer, without evaporating,

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during rainy periods. So now, there is sufficient water in the aquifers from the depth H = 80 m in the underground of Romania.

At the moment, water is a strategic resource in the European Union. In this context, knowing the disposition of the aquifers on the surface of Romania and at depth, it is proposed to create, by drilling with FH100 type installations, a network of intelligent IOT-Internet of Things type wells, for monitoring the underground water level at the depth H=80m, connected in real time via Arduino microcontrollers with WiFi transmission to the Internet Router, which will indicate in real time on the internet page of the water well the depth at which the underground water is located, for the respective area.

In this sense, the approach of manufacturing the components of light water well drilling installations, at the level of Romania, through additive methods such as 3D printing, is a perfectly justified technical-economic solution.

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