

RATIONALE FOR THE PROSPECTS OF OBTAINING AND USING HYDROPHOBIC SURFACES FOR TECHNICAL OBJECTS

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The constant search for technical solutions to improve mechanical engineering, automotive, aerospace, and other industries is the main tool for technical progress. Among promising technical solutions are technologies for creating hydrophobic surfaces that can protect the surfaces of critical machine parts from corrosion, oxidation and wear. The essence of these surfaces is that the surface tension between treated material and fluids decreases, preventing water and other fluids from sticking to the treated hydrophobic surface. In addition, hydrophobicity can ensure excellent lubrication in sliding contact of rough elastic bodies and a non-slip surface with increased wear resistance.

Of particular interest today is the study of machining methods capable of achieving a high-quality surface finish and at the same time achieving hydrophobicity.

Researchers such as Dr. Ahmed Touhami and Prof. Mark Campbell have conducted experiments to understand how micro-milling and hydrophobic coating techniques can be used in the manufacturing of components. Additionally, other researchers like Dr. Jamie Vidotto have examined the effectiveness of laser treatments to improve the tribological properties of hardened steel surfaces.

In the presented work, a study has been carried out on the prospect of creating hydrophobic surfaces using micro-milling versus laser treatment. Among other things, it was found that both micro-milling and laser machining can be used to achieve hydrophobic surfaces on hardened steel. Micro-milling is faster, and more precise and allows the creation of complex shapes with small parts with relatively small machining volumes. Laser exposure provides a better surface finish with a higher level of precision. The choice of method to achieve hydrophobicity must be economically justified in each application.

It has been found that micro-milling can be used to create a hydrophobic surface by manipulating the size and shape of the micro-relief on the material. By creating an uneven surface with small bumps and grooves, the contact area between the water droplet and the material is reduced, causing it to roll off the surface. In addition, additional changes can be made to the micro-relief's geometry, density and location to achieve a hydrophobic surface.

The interesting thing is that it is possible to generate electricity through what is known as hydrophobic surface charge separation. This type of technology takes advantage of the differences in electrical charges between two materials, usually water and a hydrophobic material, to create an electrical voltage. This voltage can then be used to generate electricity.

Such an effect is planned to investigate the possibility of creating an alternative energy source by turbines with blade surfaces treated by micro-milling.