ABSTRACT FOR THE GENERAL PUBLIC IN ENGLISH

In 1987 the United Nations defined Sustainable development as "*Sustainable development conveys the idea of accomplishing the needs of the present without hampering the prospect of future generations to meet their own needs*." In all parts of our modern society, including the manufacturing industry, such type of development is needed.

Large amounts of cutting fluid are used to cool and lubricate the cutting zone in the metal cutting industry. Furthermore, in high-speed machining with flood cooling, an enormous amount of cutting fluid is consumed. The extravagant use of conventional cutting fluid affects the metal cutting industry in terms of its high volume and disposal cost. Moreover, **it creates environmental pollution due to its disposal**. Government regulations, environmental protection, public awareness, and subsequently, the need for cost-reduction have forced the industries to promote green and sustainable machining. Therefore, it is essential to develop the technique to restrict the extravagant consumption of conventional cutting fluid. Experiment based studies have reported that the Near Dry Machining (NDM), using Minimum Quantity Lubrication (MQL,) is a better alternative to flood cooling. In this technique, the cutting fluid spray over the tool-workpiece interface in an optimized manner. The thermos-physical properties of the conventional cutting fluid need to be improved to fulfill the need for green machining. It has been observed that the cooling and lubricating properties of cutting fluid can be enhanced by mixing nano-sized (less than 100nm) metallic/non-metallic materials. Nano-cutting fluid with MQL can be a potential alternative and a precursor to sustainable and eco-friendly machining. The Cost-effectiveness of MQL makes it attractive to bet on in the near future. Therefore, it is essential to carry out basic research in this field to improve the process further. It will help to develop an Eco-friendly and sustainable machining process.

In view of the above, the purpose of the project is to understand how nano-particle mixed cutting fluid when applied in spray (aerosol) forms improves the cutting process.

The result of this project will provide essential guidelines to other researchers to develop process simulation, analytical models, and hybrid techniques to observe the robustness of outcomes for different cutting scenarios and novel cutting fluid. It will help to establish a green and sustainable machining process.