# ABSTRACT

Efficiency in manufacturing sector is one of the major challenge due to it has great impact on environment. Machining process is a vital part in manufacturing sector in term of product creation. In most of the cases, large amount of energy and resource consumed by machining process and it leads environment pollution. For the sustainable goals, it is important to reduce energy consumption in this process. At the same time, it is required to achieve product specifications objective. In addition, machining process extended beyond the regular practice. Natural material could have open the door for future product development. Bovine horn is one of the promising material that is environment friendly and sustainable. Therefore, in this study, a multi-objective optimization process has been employed in order to reduce energy consumption and surface roughness for bovine horns using Taguchi and Artificial Neural Networks (ANN). Face milling process has been performed for the data collection. There were 3 cutting parameters has been take into account for the optimization. The cutting parameters are depth of cut, spindle speed and feed rate. Firstly, the energy consumption data has been taken by using direct method with a watt meter. After that, the machined bovine horn part has been used for measuring surface roughness using surface tester. The results indicates the influence of cutting parameters in energy consumption and surface roughness. For the energy consumption spindle speed has the significant influence. For the surface roughness, mixed condition found that influence in the process. The optimum value of machining parameters were obtained by feed rate 155 mm/min., Spindle speed 1400 rpm and 2 mm for the depth of cut. In addition, a 3-25-2-2 ANN architecture provided the highest accuracy that was 95%. The output of this research can be utilized for further development of bovine horns industrial applications.



**Keywords:** Bovine horns, Natural Material, Artificial Neural Networks, Industrial Applications, Green Manufacturing.