# *ABSTRACT*

In the manufacturing industry, there is a lathe or Conventional Turning is a manufacturing machine tool that can be used to cut or turn for various types of materials. In the machining process to produce a smooth surface, there are parameters that need to be adjusted, namely: spindle speed, feed rate, and depth of cut. The use of Aluminum 6061 is widely used because it has an excellent strength to weight ratio, strength, and corrosion resistance and crack resistance in adverse environments. Every production process requires a design before starting that takes into account the parameters needed for the process to get smooth results, not high temperatures, and excessive pressure due to excessive parameters. Therefore the design process requires time and cost in its implementation in order to get optimal results. Optimizing lathe machining with the times has created a new technology, namely Ultrasonic Vibration Assisted Turning (UVAT) where the function of reducing heat on the workpiece and cutting chisel can be damped. To obtain a good surface, appropriate input parameters are needed, constrained by trial and error to get good results. But it takes time and materials to test it first. In this research, a special tool holder was obtained for this applied technology. From this tool holder, the results of the UVAT cutting dataset are obtained with the Full Factorial Method (FFM) method which produces a lot of output from the UVAT cutting results, but to obtain results outside of the parameters specified in FFM, it is necessary to re-experiment which requires time, materials, operators. , and energy which will increase the cost of production. With the development of computerized technology, it can be used to predict the results of this UVAT cutting using a Machine Learning system. This Machine Learning implementation is carried out to study the results of the dataset that can produce output from various desired parameters with the aim of knowing the cutting temperature, surface roughness, and cutting force or resultant force that you want to know and also being able to find out the optimal parameter combination value from the best dataset. . The average result of the error difference generated on each target is a cutting temperature of 0.03, surface roughness of 0.1, radial force x-axis 0.15, feed force y-axis of 0.1, tangential force z-axis of 0.1. The score results for the data obtained before the machine learning process for cutting temperature is 88.73%, surface roughness is 90.44%, radial force x-axis is 78.02%, y-axis feed force is 95.12%, tangential z-axis force is 92.54%. From application verification sampling by experiment, the error for cutting temperature is 3.27%, surface roughness is 9.49%, resultant force is 6.82%. The optimal parameters obtained from machine learning results are spindle speed = 855 rpm, feed rate = 0.05 mm/rev, depth of cut = 0.25 mm, and frequency = 20kHz. With the predicted error seen from table 4.4 for this optimal parameter, the cutting temperature is 2.41%, surface roughness is 7.58%, resultant force is 0.14%. The design of this application can reduce production costs and can optimize production results without doing a lot of direct experiments by replacing it by simulating the prediction of cutting results. With the simulation of machining results, it is expected to be able to easily find out the description or prediction of how the results will be obtained. And it can be applied to Artificial Intelligence (AI) in determining machine parameters in the future.

***Key Word: — Conventional Turning, 2DUVAT, Machine Learning, Surface Roughness, Cutting Temperature, Cutting Force***