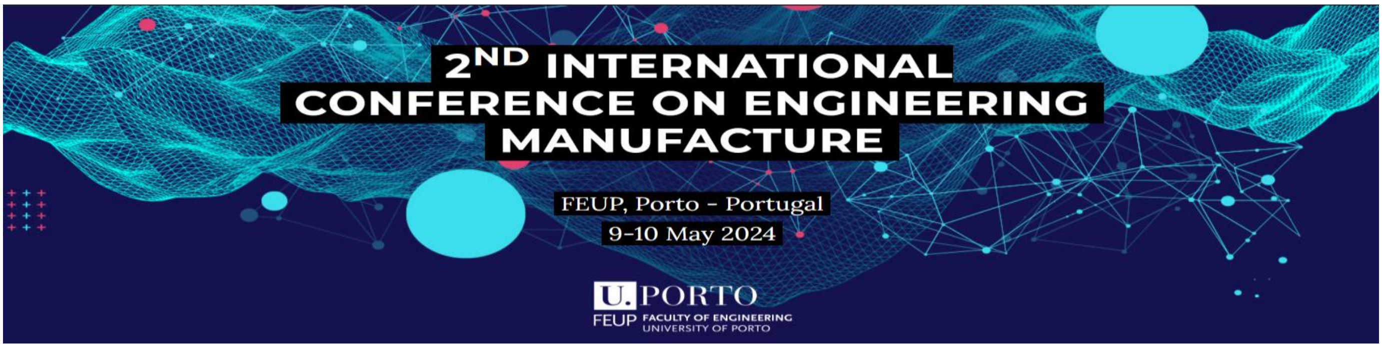


Authors: LP Silva (Pontifical Catholic University of Minas Gerais, Brazil), GC Silva, Y Pacheco

STUDY OF SURFACE FINISHING IN THE LONGITUDINAL TURNING PROCESS BY VIBRATION ANALYSIS ON AISI 4340 STEEL ANNEALED

1. INTRODUCTION

The turning machining process is prominent in the production of various products with different applicability around the world. The surface quality obtained in the finishing stage is of fundamental importance in the surface integrity of the final product. The micro geometric deviations known as roughness are the result of the action of the tool on the material during cutting.

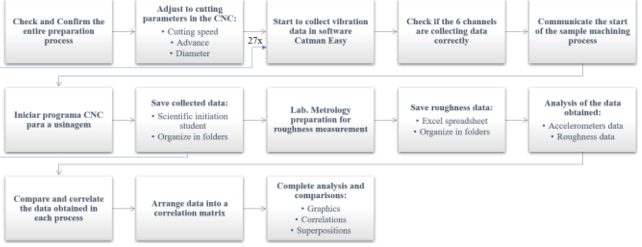
This study improves interdisciplinary knowledge, promoting vibration analysis of the machining process and its use to predict or control the process, surface finish and even tool life. It is understood that the accelerometer can perhaps be used in the process as a method of prior or constant measurement of surface roughness during machining.

2. OBJECTIVES

Analyze and correlate the surface finish in the turning process through the frequency and amplitude of vibration during the longitudinal cutting process. The feed (f) and cutting speed (υ_c) are varied when machining the AISI 4340 steel annealed.

3. METODOLOGY

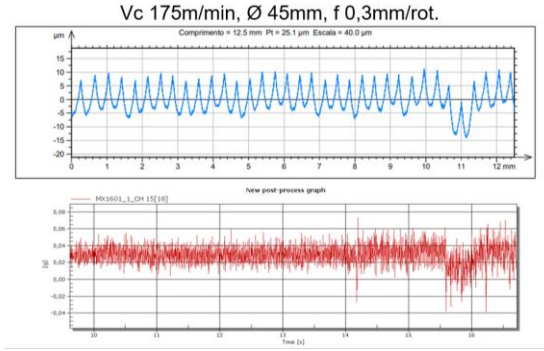
The metodology using for collect the vibrations and roughness data is shown in flowchart bellow:



Fonte: Próprio Autor

4. RESULTS

In the 27 tests carried out, it was possible to find the appearance of two vibration peaks between the 2nd and 3rd harmonics of the rotation, linked to the cutting speed of the process. The best representation of the roughness profile is linked to the Y axis of the accelerometer, referring to the direction of progress in the cutting process. The curves of the roughness profile and vibrations in the time domain have similar profiles.



Fonte: Próprio Autor (2023)

5. CONCLUSION

Parameters Rt and Rz vary according to f (49.5% and 61%), Vc (22.9% and 19.5%) and diameter (27.6% and 19.5%).

The combinations, Vc of 175m/min and f of 0.15mm/rev., presented the lowest values of Ra, Rq, Rt and Rz.

The combinations, Vc of 150m/min and f of 0.3mm/rev., present the highest values of Ra, Rq, Rt and Rz.

Roughness profile curve and vibration in the time domain showed considerable similarities.

6. REFERENCES

ALMEIDA, Izabella Luiza Santos et. al. Numerical and experimental analysis of SAE 1010 thin steel sheets formability with and without galvanizing (GI-85). **Journal of the Brazilian Society of Mechanical Sciences and Engineering**, v. 45, n. 2, p. 101, 2023.

MUSTAFA, Ghulam; LI, Binxun; ZHANG, Song. Critical Review. **Cutting condition efects on microstructure and mechanical characteristics of Ni-based superalloys—a review**, [s. l.], 5 jan. 2024. Disponível em: https://link.springer.com/article/10.1007/s00170-023-12910-z. Acesso em: 17 jan. 2024.

SILVA, Gilmar Cordeiro da; SARAIVA, Querlem Martins; CARNEIRO, José Rubens Gonçalves; SANTOS, Izabela Ângela; JOSÉ, Anderson Silva. New milling methodology for sealing planes in AlSi9Cu3(Fe) alloy machined with PCD tool. **The International Journal of Avances Manufacturing Technology.** (2021) 113:3211–3223