PRODUCT BACKGROUND

Manufacturing industry involving high speed milling, productivity rate and profit is really crucial but machining process of high speed milling show that it always limited by tool failure and dynamic instabilities. In this project, chatter occurrence during machining is studied deeply and suppressed using spindle speed variation method with acoustic feedback PID controller. To suppress machining chatter, spindle speed is modulated and varied at high speed milling machining process.

PRODUCT CHARACTERISTICS

- By suppressing chatter using SSV method, High Speed Milling provides high efficiency, accuracy, quality of final workpieces and eliminate the secondary or semi-finishing process.
- Consequently, this phenomenon contributes for raw material consumption and prevent pollution due to waste materials and products.
- Utilization of SSV method in high speed milling also enables power energy consumption.

MARKETABILITY

- With microphone sensor, RS-485 Com, Amplifier, DAQ, VFD ready to be installed in the CNC machine
- The potential users of the invention is Sapura Machining
- With RM20,000, this systems ready to be used

PRODUCT CAPABILITIES

- This project succeeds in improving the surface roughness of the material up until 86.7% after spindle speed variation has been implemented.
- Less cost installation, less maintenance because of low cost components and small surface area needed for installation.

BENEFITS

- Spindle speed variation (SSV) is a well known technique to suppress regenerative machine tool vibrations usually considered to be effective only for low spindle speeds.
- Usage of microphone as acoustic sensor which can easily measure a signal without disturbing the system.
- A signal from the microphone provides a competitive, proper and consistent, and in many instances a superior, signal reliable chatter detection and control.
- Calibrating a PID controller is usually completed automatically as part of an auto-calibration technique.

NOVELTY

- This project succeeds in improving the surface roughness and surface topography of the material up until 86.7% after spindle speed variation has been implemented.
- Less cost installation, less maintenance because of low cost components and small surface area needed for installation.

ACHIEVEMENTS

Gold Medal research exhibition Citrex2016 and UMP Research Grant RM37 000

PUBLICATIONS

- M.V. Suparmaniam and A.R. Yusoff, Suppression of chatter in high speed milling machine using spindle speed variation method with acoustic feedback PID controller, Advances in Manufacturing Processing Technology (AMPT 2016), Scopus citation
- Madan Varmma and Ahmad Razlan Yusoff (2015), Investigation of surface roughness and tool wear length with varying depth of cut and feed rate of aluminium alloy and P20 steel machining, IOP Conference Series: Materials Science and Engineering 114 (1), 012141, Scopus citation