Drilling Burr Minimization and Energy Saving for PCB Production

Motivation

- The hole drilling step is important in the manufacturing of Printed Circuit Boards (PCB). It influences the shape of burrs and the deburring process. Minimizing drilling burr can reduce effort and time for deburring, and therefore decrease energy consumption for the whole process.

Background

- What is a printed circuit board (PCB)?
- Common drilling tool

- The importance of PCB drilling process

Experiment Setup

- Process parameters
  - Bit diameter: 400µm
  - Spindle speed: 90000 rpm
  - In-feed speed: 40 mm/sec
  - Hips: 190 Nm (200Hz)
  - Sampling frequency: 20 kHz (9 kHz)
  - Sampling time: 5 sec (x3)
  - Sensors: 3-axis dynamometer, 3-axis accelerometer
  - Stacks: 3 layer (recommended by Axis)
  - Entry board: Al
  - Backup board: wood

- Tool wear in PCB drilling

Drilling Burr Control Chart

- A DBCC is proposed as a tool to assist prediction and control of drilling burr under given drilling conditions.

Energy Saving

- Energy flow in PCB drilling machine
  - Energy lost at heating step
  - Energy lost due to electrical motor
  - Energy lost due to standby mode
  - Energy transferred to final product

To achieve energy saving, our strategy are:
- Minimizing the size of drilling burrs
- Reducing tool wear
- Reducing PCB drilling lead time

Future Work

- Developing the drilling burr control chart for PCB
- Analyzing relationships among process parameters and energy
- Reducing PCB drilling lead time
- Constructing energy saving knowledge
- Increasing the energy efficiency for drilling
- Constructing information database of PCB drilling

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