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REGULAR PAPER

**Evaluation of Energy Efficiency and Material Removal Rate in Hybrid Manufacturing Processes (Title in English Here, Franklin Gothic Demi Cond 17pt, Bold)**

# John Green1 · Kil-Tong Park2 · Wei Chang3 (Name in English, Franklin Gothic Demi Cond 12pt)

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Abstract

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Keywords Deep reinforcement learning · Energy management strategy · Fuel cell hybrid bus · Smart manufacturing (4 to 6 keywords) (Times New Roman 10pt)

# List of Symbols

vw Workpiece Velocity

a Depth of Cut

Ft Tangential Forces per unit Width Fn Normal Forces per unit Width

R Distance between the Pin and Journal Rw Radius of Pin

Rs Radius of Grinding Wheel

P Grinding Point

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# Introduction (Franklin Gothic Demi Cond 12pt, Bold)

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# Extension of Two-Dimensional Model to the Turning Process (Franklin Gothic Demi Cond 12pt, Bold)

## Simulation (Franklin Gothic Demi Cond 11pt, Bold)

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Table 1 Comparison of measured roughness data

|  |  |
| --- | --- |
| Contents of Table |  |
| aaa | 0.97 (cc/rev) |
| bbb | 1 (mm) |
| ccc | 100 (bar) |
| ddd | 1.5 × 109 (Pa) |

Fig. 1 Block diagram of multi-modal chatter model of a high speed machining center (Times New Roman 9pt)



Fig. 2 Diagram of multi-modal chatter model:

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*R*

*cd* ≈ ----*m*---*W*---*s (Times New Roman 10pt, Italic)* (1)

*R eP*

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# Conclusions (Franklin Gothic Demi Cond 12pt, Bold)

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*eW*

where *RmW* is the mean cone distance of the wheel, and *RmW* is the outer cone distance of the wheel.

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*ab* = *cd* cos*βmW*

*WW* = *ab* – *hfmW*(tanα*cWX* + tanα*cWV*)

## Simulation (Franklin Gothic Demi Cond 11pt, Bold)

(2)

(3)

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