

INTISARI

Sektor industri manufaktur di Indonesia mengalami perkembangan pesat, memberikan kontribusi signifikan terhadap PDB nasional. Teknologi mesin CNC *milling 5 axis*, yang menawarkan akurasi dan efisiensi tinggi, semakin banyak digunakan dalam berbagai industri. Namun, kendala dalam proses *clamping* sering menghambat kinerja optimal mesin ini. Penelitian ini menganalisis dampak penerapan *Zero Point Clamping System* terhadap efektivitas mesin CNC *milling 5 axis* dengan menggunakan metode *Overall Equipment Effectiveness* (OEE). Hasil penelitian menunjukkan peningkatan signifikan pada nilai *Availability* yang meningkat sebesar 10,7% dari 80,3% menjadi 91% dan *Performance Rate* sebesar 2,9% dari 93,4% menjadi 96,3%, sementara nilai *Quality Ratio* tidak berubah. Peningkatan ini mengakibatkan nilai OEE meningkat dari 75% menjadi 87,5%, menunjukkan peningkatan efektivitas sebesar 12,5%. Penerapan *Zero Point Clamping System* secara signifikan mengurangi waktu *Setup and Adjustment* dari 13,8% menjadi 4,7% dan waktu *Idling and Minor Stoppage* dari 5,9% menjadi 4,4%. Serta mengurangi *Reduce Speed Losses* dari 5,25% menjadi 3,5%. Hasil ini membuktikan bahwa penerapan *Zero Point Clamping System* dapat meningkatkan efektivitas mesin CNC *milling 5 axis* dengan cara mengurangi *downtime* dan meningkatkan kecepatan mesin sehingga terjadi peningkatan nilai ketersediaan dan meningkatkan performa produktivitas mesin tersebut. Dengan demikian, inovasi ini memberikan kontribusi nyata dalam meningkatkan efisiensi operasional dan daya saing industri manufaktur Indonesia.

Kata Kunci: CNC *milling 5 axis*, Efektivitas, *Overall Equipment Effectiveness*, *Zero Point Clamping System*

ABSTRACT

The manufacturing industry sector in Indonesia is experiencing rapid development, significantly contributing to the national GDP. CNC milling 5-axis technology, offering high accuracy and efficiency, is increasingly being used across various industries. However, clamping process issues often hinder the optimal performance of these machines. This study analyzes the impact of implementing the Zero Point Clamping System on the effectiveness of CNC milling 5-axis machines using the Overall Equipment Effectiveness (OEE) method. The study results show a significant increase in the Availability value, which rose by 10,7% from 80,3% to 91%, and the Performance Rate, which increased by 2,9% from 93,4% to 96,3%, while the Quality Ratio remained unchanged. This improvement led to the OEE value increasing from 75% to 87,5%, indicating a 12,5% increase in effectiveness. The implementation of the Zero Point Clamping System significantly reduced Setup and Adjustment time from 13,8% to 4,7% and Idling and Minor Stoppage time from 5,9% to 4,4%, as well as reducing Reduced Speed Losses from 5,25% to 3,5%. These results demonstrate that the application of the Zero Point Clamping System can enhance the effectiveness of CNC milling 5-axis machines by reducing downtime and increasing machine speed, resulting in higher availability and improved machine performance. Consequently, this innovation makes a tangible contribution to improving operational efficiency and the competitiveness of Indonesia's manufacturing industry.

Keywords: CNC milling 5 axis, Effectiveness, Overall Equipment Effectiveness, Zero Point Clamping System