



A model for productivity improvement on machining of components for stamping dies

J. Silva ^a, F. J. G. Silva ^{a,b*}, R. D. S. G. Campilho ^{a,b}, J. C. Sá ^{a,b,c}, L. P. Ferreira ^{a,b}

^a ISEP - School of Engineering, Polytechnic of Porto, Porto, Portugal;

^b INEGI - Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial, Porto, Portugal;

^c IPVC - Instituto Politécnico de Viana do Castelo, Viana do Castelo, Portugal

References

- [1] Schützer, K., Helleno, A. L., Pereira, S. C., "The influence of the manufacturing strategy on the production of molds and dies", Journal of Materials Processing Technology, Vol. 179(1-3), pp. 172-177, 2006.
- [2] Dalavi, A. M., Pawar, P. J., Singh, T. P., Warke, A. S., Paliwal, P. D., "Review on Optimization of Hole-Making Operations for Injection Mould Using Non-Traditional Algorithms", International Journal of Industrial Engineering and Management, Vol. 7(1), pp. 9-14, 2016.
- [3] Castro, T. A. M., Silva, F. J. G. and Campilho, R. D. S. G., "Optimising a specific tool for electrical terminals crimping process", Procedia Manufacturing, Vol. 11, pp. 1438-1447, 2017.
- [4] Yun, S., Kwon, J., Cho, W., Lee, D. C. and Kim, Y., "Performance improvement of hot stamping die for patchwork blank using mixed cooling channel designs with straight and conformal channels", Applied Thermal Engineering, Vol. 165, 114562, 2020.
- [5] Maeno, T., Mori, K.-I. and Fujimoto, M., "Improvements in productivity and formability by water and die quenching in hot stamping of ultra-high strength steel parts", CIRP Annals, Vol. 64, No. 1, pp. 281-284, 2015.
- [6] Otsuka, A., Miyoshi, N., Nagata, F., "Generation method of skin model shapes with features of machining marks using dual-tree complex wavelet transform", Procedia CIRP, Vol. 92, pp. 224-229, 2020.
- [7] Tapie, L., Mawussi, B., Bernard, A., "Topological model for machining of parts with complex shapes", Computers in Industry, Vol. 63(5), pp. 528-541, 2012.
- [8] Silva, C. R. M., Silva, F. J. G. and Gouveia, R. M., "Investigations on the edge crack defects in dual phase steel stamping process", Procedia Manufacturing, Vol. 17, pp. 737-745, 2018.
- [9] Béres, G., Lukács, Z., Tisza, M., "Springback Evaluation of Tailor Welded Blanks at V-die Bending made of DP Steels", Procedia Manufacturing, Vol. 47, pp. 1366-1373, 2020.
- [10] Gomes, T., Silva, F. J. G., Campilho and R. D. G. S., "Reducing the simulation cost on dual-phase steel stamping process", Procedia Manufacturing, Vol. 11, pp. 474-481, 2017.
- [11] Fernandes L., Silva, F.J.G., Andrade, M.F., Alexandre, R., Baptista, A.P.M. and Rodrigues, C., "Increasing the stamping tools lifespan by using Mo and B4C PVD coatings", Surface and Coatings Technology, Vol. 325, pp. 107-119, 2017.
- [12] Fernandes, L., Silva, F.J.G., Paiva, O. C., Baptista, A. and Pinto, G., "Minimizing the adhesion effects in food package forming by the use of advanced coatings", Procedia Manufacturing, Vol. 17, pp. 886-894, 2018.
- [13] Fernandes, L., Silva, F. J. G. and Alexandre, R., "Study of TiAlN PVD Coating on stamping dies used in tinplate food package production", Micromachines, Vol. 10, No. 3, pp. 182-198, 2019.
- [14] Nunes, V., Silva, F.J.G., Andrade, M.F., Alexandre, R. and Baptista, A.P.M., "Increasing the lifespan of high-pressure die cast molds subjected to severe wear", Surface and Coatings Technology, Vol. 332, pp. 319-331, 2017.
- [15] Silva, F., Martinho, R., Andrade, M., Baptista, A. and Alexandre, R., "Improving the wear resistance of moulds for the injection of glass fibre-reinforced plastics using PVD coatings: a comparative study", Coatings, Vol. 7, No. 2, pp. 28-39, 2017.
- [16] Martinho, R. P., Silva, F. J. G., Alexandre, R. J. D. and Baptista, A. P. M., "TiB₂ nanostructured coating for GFRP injection moulds", Journal of Nanoscience and Nanotechnology, Vol. 11, No. 6, pp. 5374-5382, 2011.
- [17] Moreira, A., Silva, F. J. G., Correia, A. I., Pereira, T., Ferreira, L. P. and Almeida F. de, "Cost reduction and quality improvements in the printing industry", Procedia Manufacturing, Vol. 17, pp. 623-630, 2018.
- [18] Hasani, A., Hosseini, S. M. H., "bi-objective flexible flow shop scheduling problem with machine-dependent processing stages: Trade-off between production costs and energy consumption", Applied Mathematics and Computation, Vol. 386, 125533, 2020.

- [19] Li, L., Li, C., Tang, Y. and Li, L., "An integrated approach of process planning and cutting parameter optimization for energy-aware CNC machining", *Journal of Cleaner Production*, Vol. 162, pp. 458-473, 2017.
- [20] Gouveia, R. M., Silva, F. J. G., Reis, P. and Baptista, A. P. M., "Machining duplex stainless steel: comparative study regarding end mill coated tools", *Coatings*, Vol. 6, No. 4, pp. 51-81, 2016.
- [21] Costa, C., Silva, F. J. G., Gouveia, R. M. and Martinho, R. P., "Development of hydraulic clamping tools for the machining of complex shape mechanical components", *Procedia Manufacturing*, Vol. 17, pp. 563-570, 2018.
- [22] Kumar, S., Campilho, R. D. S. G. and Silva, F. J. G., "Rethinking modular jigs' design regarding the optimization of machining times", *Procedia Manufacturing*, Vol. 38, pp. 876-883, 2019.
- [23] Sousa, V. F. C. and Silva, F. J. G., "Recent advances in turning processes using coated tools—a comprehensive review", *Metals*, Vol. 10, No. 2, pp. 170-198, 2020.
- [24] Sousa, V. F. C. and Silva, F. J. G., "Recent advances on coated milling Tool technology—a comprehensive review", *Coatings*, Vol. 10, No. 3, pp. 235-261, 2020.
- [25] Resende, V., Alves, A. C., Batista, A., Silva, A., "Financial and Human Benefits of Lean Production in the Plastic Injection Industry: an Action Research Study", *International Journal of Industrial Engineering and Management*, Vol. 5(2), pp. 61-75, 2014.
- [26] Yuik, C. J., Puvanasvaran, P., "Development of Lean Manufacturing Implementation Framework in Machinery and Equipment SMEs", *International Journal of Industrial Engineering and Management*, Vol. 11(3), pp. 157-169, 2020.
- [27] Monteiro, C., Ferreira, L. P., Fernandes, N. O., Sá, C., Ribeiro, M. T. and Silva, F. J. G., "Improving the machining process of the metalworking industry using the lean tool SMED", *Procedia Manufacturing*, Vol. 41, pp. 555-562, 2019.
- [28] Seifermann, S., Böllhoff, J., Schaede, C., Kutzen, M. and Metternich, J., "Novel method to systematically implement lean production in machining areas", *Procedia CIRP*, Vol. 78, pp. 61-66, 2018.
- [29] Leong, W. D., Teng, S. Y., How, B. S., Ngan, S. L., Lam, H. L., Tan, C. P. and Ponnambalam S. G., "Adaptive analytical approach to lean and green operations", *Journal of Cleaner Production*, Vol. 235, pp. 190-209, 2019.
- [30] Leme, R. D., Nunes, A. O., Costa, L. B. M. and Silva, D. A. L., "Creating value with less impact: Lean, green and eco-efficiency in a metalworking industry towards a cleaner production", *Journal of Cleaner Production*, Vol. 196, pp. 517-534, 2018.
- [31] Rodrigues, J., Sá, J. C.V. de, Ferreira, L. P., Silva, F. J.G. and Santos, G., "Lean Management "Quick-Wins": Results of Implementation. A Case Study", *Quality Innovation Prosperity*, Vol. 23, No. 3, pp. 3-21, 2019.
- [32] Oh, Y., Witherell, P., Lu, Y., Srock, T., "Nesting and scheduling problems for additive manufacturing: A taxonomy and review", *Additive Manufacturing*, Vol. 36, 101492, 2020.
- [33] Sormaz, D., "Distributed Modeling of Manufacturing Activities using Integrative Manufacturing Process Model", *International Journal of Industrial Engineering and Management*, Vol. 1(1), pp. 9-18, 2010.
- [34] Bhale, S., Baki, M. F., Azab, A., "Grouping and Sequencing of Machining Operations for High Volume Transfer Lines", *Procedia CIRP*, Vol. 17, pp 76-81, 2014.
- [35] Chan, F. T. S., Lau, K. W., Chan, P. L. Y., Choy, K. L., "Two-stage approach for machine-part grouping and cell layout problems", *Robotics and Computer-Integrated Manufacturing*, Vol. 22(3), pp. 217-238, 2006.
- [36] Ferreira, L. P., Gómez, E. A., Lourido, G. C. P., Quintas, J. D., Tjahjono, B., "Analysis and optimisation of a network of closed-loop automobile assembly line using simulation", *The International Journal of Advanced Manufacturing Technology*, Vol. 59, pp. 351-366, 2012.
- [37] Guariente, P., Antonioli, I., Ferreira, L. P., Pereira, T. and Silva, F.J.G., "Implementing autonomous maintenance in an automotive components manufacturer", *Procedia Manufacturing*, Vol. 13, pp. 1128-1134, 2017.
- [38] Antonioli, I., Guariente, P., Pereira, T., Ferreira, L. P. and Silva, F. J. G. (2017), "Standardization and optimization of an automotive components production line", *Procedia Manufacturing*, Vol. 13, pp. 1120-1127.
- [39] Pereira, J., Silva, F. J. G., Bastos, J. A., Ferreira, L. P. and Matias, J. C. O. (2019), "Application of the A3 methodology for the improvement of an assembly line". *Procedia Manufacturing*, Vol. 38, pp. 745-754.
- [40] Dias, P., Silva, F. J. G., Campilho, R. D. S. G., Ferreira, L. P. and Santos, T. (2019), "Analysis and improvement of an assembly Line in the automotive industry", *Procedia Manufacturing*, Vol. 38, pp. 1444-1452.