

# Implementation of the Single Minute Exchange of Dies method for reducing changeover time in a hygiene production company

M. Malindzakova<sup>a\*</sup>, D. Malindzak<sup>b</sup> and P. Garaj<sup>a</sup>

<sup>a</sup> Technical University of Kosice, Institute of Logistics and Transport, Kosice, Slovakia;

<sup>b</sup> U. S. Steel Kosice, Ltd., Kosice, Slovakia

## References

- [1] N. Horňáková, L. Jurík, H. Hrablík Chovanová, D. Cagaňová, and D. Babčanová, "AHP method application in selection of appropriate material handling equipment in selected industrial enterprise," *Wireless Networks*, June 2019, doi: 10.1007/s11276-019-02050-2.
- [2] L. Jurík, N. Horňáková, V. Domčeková, "The application of smed method in the industrial enterprise," *Acta Logistica*, vol. 7, no. 4, pp. 269-281, 2020.
- [3] R. Şahin, "A Case Study on Reducing Setup Time using SMED on a Turning Line," *Gazi University Journal of Science*, April 2021, doi: 10.35378/gujs.735969
- [4] S. Palanisamy, S. Siddiqui, "Changeover time reduction and productivity improvement by integrating conventional SMED method with implementation of MES for better production planning and control," *International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)*, vol. 2, no. 12, pp. 7961-7974, 2013.
- [5] M. Malindzakova, M. Mudry, "Management of chemical stocks by implementing statistical methods," *Przemysł Chemiczny = Chemical Industry*, vol. 99, no. 5, pp. 780-784, 2020, doi: 10.15199/62.2020.5.20.
- [6] M. L. Mulla, S. G. Bhatwadekar, S. V. Pandit, "Implementation of Lean Manufacturing through the technique of Single Minute Exchange Oo Die (SMED) to reduce change Over time," *International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)*, vol. 3, no. 6, pp. 13039-13076, 2014.
- [7] D. Guzel, A. S. Asiabi, "Improvement set-up time by using SMED and 5S an application in SME," *International Journal of Scientific & Technology Research (IJSTR)*, vol. 9, no. 1, pp. 3727-3732, 2020.
- [8] A. Winatie, B. P. Maharani, V. H. Riksa, S. Hasibuan, "Increasing time efficiency of change over process on solid product using SMED (Single Minute Exchange of Dies) method in pharmaceutical industry," *International Journal of Innovative Science and Research Technology*, vol. 4, no. 6, pp. 639-644, 2019.
- [9] E. Sousa, F. J. Silva, L. P. Ferreira, M. T. Pereira, R. Gouveia, R. P. Silva, "Applying SMED methodology in cork stoppers production," *Procedia Manufacturing*, vol. 17, 2018, pp. 611-622.
- [10] D. Zimon, T. Gajewska, M. Malindzakova, "Implementing the requirements of ISO 9001 and improvement logistics processes in SMES which operate in the textile industry," *Autex Research Journal*, vol. 18, no. 4, pp. 392-397, 2018, doi: 10.1515/aut-2018-0020.
- [11] M. V. N. Pinjar, S. Shivakumar, G. V. Patil, "Productivity improvement through Single Minute Exchange of Die (SMED) technique," *International Journal of Scientific and Research Publications (IJSRP)*, vol. 5, no. 7, pp. 1-9, 2015.
- [12] R. Assaf, T. Haddad, "An application of Single Minute Exchange of Die approach in an aluminium profiles extrusion production system: Case Study," *International Journal of Scientific Research and Innovative Technology*, vol. 4, no. 7, pp. 14-22, 2017.
- [13] S. Shingo, "Quick changeover for operator: The SMED System," Eds. New York, NY, USA: CRC Press, 2018, pp. 76-82.
- [14] D. Agung, H. Hasbullah, "Reducing the product changeover time using SMED & 5S methods in the injection molding industry," *SINERGI*, vol. 23, no. 3, pp. 199-212, 2019.
- [15] M. Konieczna, B. Mrugalska, M. K. Wyrwicka, "The application of Single Minute Exchange of Die in the production process improvement," *Logistics*, vol. 3, no. 39, pp. 31-38, 2018, doi: 10.26411/83-1734-2015-3-39-7-18.
- [16] V. Kumar, A. Bajaj, "The Implementation of Single Minute Exchange of Die with 5S in Machining Processes for reduction of Setup Time," *International Journal on Recent Technologies in Mechanical and Electrical Engineering (IJRMEE)*, vol. 2, no. 2, 32-39, 2015.

- [17] M. Wani, S. Risbud, S. Chaudhary, S. Gadgil, A. Bugade, "Reduction in engine changeover time using SMED methodology," *IJSRD - International Journal for Scientific Research & Development*, vol. 4, no. 1, pp. 514–517, 2016.
- [18] S. Pellegrini, D. Shetty, L. Manzione, "Study and implementation of Single Minute Exchange of Die (SMED) methodology in a set-up reduction Kaizen," in *Proceedings of the 2012 International Conference on Industrial Engineering and Operations Management*, Istanbul, Turkey, 2012, pp. 2353–2363.
- [19] A. C. Moreira, P. M. T. Garcez, Implementation of the Single Minute Exchange of Die (SMED) methodology in small to medium-sized enterprises: A Portuguese case study, *International Journal of Management*, vol. 30, no. 1, pp. 66–87, 2013.
- [20] A. Abraham, K. N. Ganapathi, K. Motwani, "Set-up time reduction through SMED technique in a stamping production line," *SASTech Journal*, vol. 11, no. 2, pp. 47–52, 2012.
- [21] D. Ribeiro, "An application of the SMED Methodology in an electric power controls company," *Proceedings of International Conference On Innovations, Recent Trends and Challenges in Mechatronics, MECAHITECH11*, Bucharest, Romania, 2011, pp. 47–55.
- [22] B. Strickland, "Quick Changeover for Operators: The SMED System," *Journal of Manufacturing Systems*, vol. 16, no. 3, pp. 233–234, 1997.
- [23] D. Maurya, Y. Yadav, D. Pandey, "Change Over time reduction using SMED: An industrial case study," *International Journal of Scientific & Engineering Research (IJSER)*, vol. 9, no. 3, pp. 13–17, 2018.
- [24] P. Balon, J. Buchtova, "The SMED system - case study in the metal working industry," in *METAL Conference, 25th Anniversary International Conference on Metallurgy and Materials*, Brno, Czech Republic, 2016, pp. 1736–1741.
- [25] A. Karwasz, P. Chabowski, "Productivity increase through reduced changeover time," *Journal of Machine Engineering*, vol. 16, no. 2, pp. 61–70, 2016.
- [26] R. Natholia, H. K. Gupta, P. Mishra, Y. Mishra, "Study of SMED methodology and its systematic procedure of implementation," *International Journal of Interdisciplinary Research*, vol. 3, no. 1, pp. 1–5, 2017.
- [27] I. Pawłyszyn, A. Stachowiak, Ł. Hadaś, "Application of SMED methodology in a printing-house," *Journal Research in Logistics & Production*, vol. 4, no. 4, pp. 357–368, 2014.
- [28] M. M. Maalouf, M. Zaduminska, "A case study of VSM and SMED in the food processing industry," *Management and Production Engineering Review*, vol. 10, no. 2, pp. 60–68, 2019.
- [29] K. Antosz, A. Pacana, "Comparative analysis of the implementation of the SMED method on selected production stands," *Technical Gazette*, vol. 25, no. 2, pp. 276–282, 2018, doi: 10.17559/TV-20160411095705.
- [30] "SMED - Metoda zkracování času přetypování výrobných zařízení." [Online]. Available: [https://www.qmprofi.cz/33/smed-metoda-zkracovani-casu-pretypovani-vyrobnich-zarizeni-uniqueidgOke4NvrWuOKaQDKuox\\_Z1R\(TEXmaxdI9s-4764yV7U/](https://www.qmprofi.cz/33/smed-metoda-zkracovani-casu-pretypovani-vyrobnich-zarizeni-uniqueidgOke4NvrWuOKaQDKuox_Z1R(TEXmaxdI9s-4764yV7U/). [Accessed: 18-June-2020].
- [31] E. Costa, S. Bragança, R. Sousa, A. Alves, "Benefits from a SMED application in a punching machine," *International Journal of Industrial and Manufacturing Engineering*, vol. 7, no. 5, pp. 951–957, 2013.
- [32] D. Kumaravel, R. S. Bharathi, M. Kavinandini, "Enhancing the production through SMED methodology," *International Journal of Engineering & Technology (IJET)*, vol. 7, no. 2.8, pp. 382–385, 2018.
- [33] E. Otero, I. Lopes, "Productivity improvement of a production line through Quick Changeover Concept - A Case Study," *Advances in Transdisciplinary Engineering*, vol. 7, pp. 897–906, 2018, doi: 10.3233/978-1-61499-898-3-897.
- [34] J. R. Díaz-Reza, J. L. García-Alcaraz, J. R. Mendoza-Fong, V. Martínez-Loya, E. J. Macías, J. Blanco-Fernández, "Interrelations among SMED Stages: A Causal Model," *Complexity*, 2017, pp. 1–10, 2017, doi: 10.1155/2017/5912940.
- [35] P. G. Ferradás, K. Salonitis, "Improving changeover time: A tailored SMED approach for welding cells," in *Proceedings of the 46th CIRP Conference on Manufacturing Systems, CIRPCMS, Setubal, Portugal*, 2013, pp. 598–603.
- [36] P. C. Kulkarni, G. Lahiri, "Improving productivity using SMED," *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, vol. 9, no. 3, pp. 1889–1892, 2020, doi: 10.35940/ijitee.B6319.019320.
- [37] S. Kulkarni, "Reducing Change-over time using SMED process in automotive wheel rim manufacturing industry," *International Journal of Scientific Research and Engineering Development (IJSRED)*, vol. 2, no. 6, pp. 822–827, 2019.
- [38] R. Sundar, A. N. Balaji, R. M. Satheesh Kumar, "A review on lean manufacturing implementation techniques," in *Proceedings of the 12th Global Congress on Manufacturing and Management, GCMM 2014, Vellore, India*, 2014, pp. 1875–1885.
- [39] S. Shinde, S. Jahagirdar, S. Shriram Sane, V. Karandikar, "Set-up time reduction of a manufacturing line using SMED technique," *International Journal of Advance Industrial Engineering*, vol. 2, no. 2, pp. 50–53, 2014.
- [40] Y. R. Mali, K. H. Inamdar, "Changeover time reduction using SMED technique of lean manufacturing," *International Journal of Engineering Research and Applications*, vol. 2, no. 3, pp. 2441–2445, 2012.
- [41] M. Kuczyńska-Chaładą, Implementation of the SMED method in a production enterprise, "in *International Conference Multidisciplinary Aspects of Production Engineering MAPE, Serock, Poland*, 2019, pp. 224–233.
- [42] T. Bidarra, R. Godina, J. C. O. Matias, S. G. Azevedo, "SMED methodology implementation in an automotive industry using a case study method," *Int. J. Ind. Eng. Manag.*, vol. 9, no. 1, pp. 1–16, 2018.