Supplementary Material

for

Performance indicators and maintenance management: scientific mapping

Rogerio Cabral dos Anjos, Ana Caroline Dzulinski and Lucas Schmidt Goecks*

Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Sul, Caxias do Sul–RS, Brazil.
*Corresponding author: lucs_goecks@hotmail.com

Table of contents

Table S1. Complete grouping table.

AUTHORS	ITEMS																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Abdul Samat et al. (2012) [1]	x	x								x										
Wudhikarn (2016) [2]	x	x	x	x																
Schindlerová et al. (2020) [3]		x			x	x														
Saleem et al. (2017) [4]		x				x	x	x												
Singh et al. (2019) [5]		x			x	x					x									
Kumar et al. (2014) [6]					x	x		x			x									x
Choudhary et al. (2019) [7]						x				x	x									x
Slaichová & Marsíková (2013) [8]	x	x								x										x
Hung et al. (2022) [9]					x	x						x								x
Tortorella et al. (2021) [10]					x	x						x								x
Mwanza & Mbohwa, (2015) [11]		x			x	x				x										
Oliveira et al. (2016) [12]					x	x				x										
Ferreira et al. (2020) [13]	x					x				x										x
Sukma et al. (2022) [14]		x				x	x													x
Tortorella.et al. (2022) [15]					x	x						x								x
Singh et al. (2021) [16]	x	x			x														x	
Chaurey et al. (2023) [17]	x				x															
Zhang & Chin (2021) [18]		x			x	x														x
Muthukumar & Thiruchitrambalam (2020) [19]		x				x				x										
Pinto et al. (2020) [20]					x	x				x									x	x
Cheah et al. (2020) [21]	x	x																		x
Singh & Singh (2019) [22]					x	x				x										
Lakho et al. (2020) [23]	x	x											x							x
Lundgren et al. (2021) [24]	x	x								x	x									
Dresch et al. (2019) [25]	x	x											x							x
Habidin et al. (2019) [26]					x	x														x
Aleš et al. (2019) [27]		x	x																	
Pačaiová & Ižaríková (2019) [28]	x				x														x	
Sharma (2019) [29]	x	x			x															x
Rukijkanpanich, & Pasuk (2018) [30]						x				x										

Gopalakrishnan & Skoogh (2018) [31]	x									x	x								
Stadnicka & Antosz (2018) [32]		x			x	x													
Makarova et al. (2016) [33]		x				x				x									
Kamaryt & Kleinova (2015) [34]	x	x								x									
Mbohwa & Mwanza (2016) [35]									x	x				x					
Kumar Sharma & Gopal Sharma (2014) [36]	x	x			x	x	x								x				x
Shinde & Prasad (2018) [37]				x							x							x	
Valério & Nunes (2017) [38]	x				x											x	x		
Oliveira et al. (2019) [39]	x	x	x																x
Hedman et al. (2016) [40]		x				x													x
Zlatić (2019) [41]	x				x								x	x	x				
Bataineh et al. (2019) [42]					x	x											x	x	
Eswaramurthi & Mohanram (2013) [43]		x	x																
Hernadewita et al. (2019) [44]		x			x				x										
Zubair et al. (2021) [45]		x		x		x			x										
Khamon (2018) [46]		x			x	x													x
Prabowo et al. (2018) [47]		x			x	x													
Krynke, M., Knop, K. and Mielczarek, K. (2014) [48]		x			x	x			x										
Shreelakshmi & Chatterjee (2020) [49]		x		x	x	x													
Chikwendu et al. (2020) [50]		x			x	x													x
Nallusamy & Majumdar (2017) [51]					x	x			x									x	x
Supriyati & Purba (2019) [52]	x	x			x														
Lanza et al. (2013) [53]	x	x	x		x														x
Kumar & Soni (2015) [54]		x				x													x
Almeida & Fabro (2019) [55]	x	x			x														
Nurprihatin et al. (2019) [56]		x			x	x												x	x
Kalbande & Thampi (2012)	x	x			x					x									
Basak et al. (2022) [57]	x	x		x															x
Aized, (2021) [58]					x	x													
Anusha & Umasankar (2020) [59]	x	x										x					x		
Farahani et al. (2020)		x															x		x
Abd Rahman et al. (2020) [60]		x				x											x		
Prabowo & Adesta (2019) [61]					x	x													x
Braglia et al. (2019) [62]		x	x										x						x
Wickramasinghe & Perera (2016) [63]					x	x													x
Nallusamy (2016) [64]		x			x													x	x
En-Nhaili et al. (2016) [65]		x			x								x						x
Chiarini (2015) [66]		x				x									x			x	x
Kwaso & Telukdarie (2018) [67]	x	x			x														
Hooda & Gupta (2019) [68]					x	x													
Stephani et al. (2016) [69]		x	x			x													
Tsarouhas (2013) [70]		x			x	x			x										x
TOTAL OCCURRENCES	25	48	7	5	41	40	3	2	6	16	6	4	5	2	3	1	2	3	9	33

1 – Framework; 2 – OEE; 3 – Alternatives to OEE; 4 – Six Big Losses; 5 – TPM; 6 – Case Study; 7 – FMEA; 8 – Bottleneck; 9 – Availability; 10 – Maintenance; 11 – Productivity; 12 – Industry 4.0; 13 – Lean; 14 – Reliability; 15 – Six Sigma; 16 – Ergonomics; 17 – Health and Safety; 18 – Mathematical model; 19 – 5S; 20 – Future studies.

References

[1] H. Abdul Samat, S. Kamaruddin, and I. Abdul Azid, "Integration of overall equipment effectiveness (OEE) and reliability method for measuring machine effectiveness," *South African J. Ind. Eng.*, vol. 23, no. 1, pp. 92–113, 2012, [Online]. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-84861984128&partnerID=40&md5=7e07bfefcb1392c4612531f3acbcff7d

[2] R. Wudhikarn, "Implementation of the overall equipment cost loss (OECL) methodology for comparison with overall equipment effectiveness (OEE)," *J. Qual. Maint. Eng.*, vol. 22, no. 1, pp. 81–93, 2016, doi: 10.1108/JQME-12-2011-0001.

[3] V. Schindlerova, I. Sajdlerova, V. Michalcik, J. Nevima, and L. Krejci, "Potential of Using TPM to Increase the Efficiency of Production Processes," *Teh. Vjesn.*, vol. 27, no. 3, pp. 737–743, 2020, doi: 10.17559/TV-20190328130749.

[4] F. Saleem, S. Nisar, M. A. Khan, S. Z. Khan, and M. A. Sheikh, "Overall equipment effectiveness of tyre curing press: a case study," *J. Qual. Maint. Eng.*, vol. 23, no. 1, pp. 39–56, 2017, doi: 10.1108/JQME-06-2015-0021.

[5] S. S. Sidhu, K. Singh, and I. S. Ahuja, "An empirical investigation of maintenance practices for enhancing manufacturing performance in small and medium enterprises of northern India," vol. 13, no. 1, pp. 132–153, doi: 10.1108/JSTPM-11-2019-0109.

[6] R. Kumar Sharma and R. Gopal Sharma, "Integrating six sigma culture and TPM framework to improve manufacturing performance in SMEs," vol. 30, no. 5, pp. 745–765, doi: 10.1002/qre.1525.

[7] D. Choudhary, M. Tripathi, and R. Shankar, "Reliability, availability and maintainability analysis of a cement plant: a case study," *Int. J. Qual. Reliab. Manag.*, vol. 36, no. 3, pp. 298–313, 2019, doi: 10.1108/IJQRM-10-2017-0215.

[8] E. Slaichova and K. Marsikova, "The Effect of Implementing a Maintenance Information System on the Efficiency of Production Facilities," *J. Compet.*, vol. 5, no. 3, pp. 60–75, 2013, doi: 10.7441/joc.2013.03.05.

[9] Y.-H. Hung, L. Y. O. Li, and T. C. E. Cheng, "Uncovering hidden capacity in overall equipment effectiveness management," vol. 248, p. 108494, doi: 10.1016/j.ijpe.2022.108494.

[10] G. L. Tortorella, F. S. Fogliatto, P. A. Cauchick-Miguel, S. Kurnia, and D. Jurburg, "Integration of Industry 4.0 technologies into Total Productive Maintenance practices," vol. 240, p. 108224, doi: 10.1016/j.ijpe.2021.108224.

[11] B. G. Mwanza and C. Mbohwa, "Design of a Total Productive Maintenance Model for Effective Implementation: Case Study of a Chemical Manufacturing Company," vol. 4, pp. 461–470, doi: 10.1016/j.promfg.2015.11.063.

[12] M. Oliveira, I. Lopes, and C. Rodrigues, "Use of Maintenance Performance Indicators by Companies of the Industrial Hub of Manaus," vol. 52, pp. 157–160, doi: 10.1016/j.procir.2016.07.071.

[13] S. Ferreira, L. Martins, F. J. G. Silva, R. B. Casais, R. D. S. G. Campilho, and J. C. Sá, "A novel approach to improve maintenance operations," *Procedia Manuf.*, vol. 51, pp. 1531–1537, 2020, doi: 10.1016/j.promfg.2020.10.213.

[14] D. I. Sukma, H. A. Prabowo, I. Setiawan, H. Kurnia, and I. M. Fahturizal, "Implementation of Total Productive Maintenance to Improve Overall Equipment Effectiveness of Linear Accelerator Synergy Platform Cancer Therapy," *Int. J. Eng. Trans. A Basics*, vol. 35, no. 7, pp. 1246–1256, 2022, doi: 10.5829/ije.2022.35.07a.04.

[15] G. Tortorella *et al.*, "The impact of Industry 4.0 on the relationship between TPM and maintenance performance," vol. 33, no. 3, pp. 489–520, doi: 10.1108/JMTM-10-2021-0399.

[16] S. Singh, J. S. Khamba, and D. Singh, "Analysis and directions of OEE and its integration with different strategic tools," vol. 235, no. 2, pp. 594–605, doi: 10.1177/0954408920952624.

[17] S. Chaurey, S. D. Kalpande, R. C. Gupta, and L. K. Toke, "A review on the identification of total productive maintenance critical success factors for effective implementation in the manufacturing sector," *Journal of Quality in Maintenance Engineering*. 2023. doi: 10.1108/JQME-11-2020-0118.

[18] T. X. Zhang and J. F. Chin, "Total Productive Maintenance in Small and Medium-Sized Enterprises: Literature Review," *Lecture Notes in Mechanical Engineering*. pp. 79–92, 2021. doi: 10.1007/978-981-16-3641-7_12.

[19] S. Muthukumar and M. Thiruchitrambalam, "Performance augmentation of machining centers by improving the overall equipment effectiveness in subsystems," doi: 10.1088/1757-899X/993/1/012024.

[20] G. Pinto, F. J. G. Silva, N. O. Fernandes, R. Casais, A. Baptista, and C. Carvalho, "Implementing a maintenance strategic plan using TPM methodology," vol. 11, no. WOS:000835272600003, pp. 192–204, doi: 10.24867/IJIEM-2020-3-26.

[21] C. K. Cheah, J. Prakash, and K. S. Ong, "An integrated OEE framework for structured productivity improvement in a semiconductor manufacturing facility," *Int. J. Product. Perform. Manag.*, vol. 69, no. 5, pp. 1081–1105, 2020, doi: 10.1108/IJPPM-04-2019-0176.

[22] J. Singh and H. Singh, "Justification of TPM pillars for enhancing the performance of manufacturing industry of Northern India," vol. 69, no. 1, pp. 109–133, doi: 10.1108/IJPPM-06-2018-0211.

[23] T. H. Lakho, M. A. Khan, S. I. Virk, and A. A. Indher, "Implementation of overall equipment effectiveness (Oee) in maintenance management," in *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 2020, pp. 3087–3098. [Online]. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85105551190&partnerID=40&md5=78ffb81c18e272eb240adf90d692c03f

[24] C. Lundgren, J. Bokrantz, and A. Skoogh, “Performance indicators for measuring the effects of Smart Maintenance,” *Int. J. Product. Perform. Manag.*, vol. 70, no. 6, pp. 1291–1316, Jun. 2021, doi: 10.1108/IJPPM-03-2019-0129.
[25] A. Dresch, D. R. Veit, P. N. de Lima, D. P. Lacerda, and D. C. Collatto, “Inducing Brazilian manufacturing SMEs productivity with Lean tools,” *Int. J. Product. Perform. Manag.*, vol. 68, no. 1, pp. 69–87, 2019, doi: 10.1108/IJPPM-10-2017-0248.
[26] N. F. Habidin, S. Hashim, N. M. Fuzi, M. I. Salleh, W. S. W. Mustaffa, and N. S. Hudin, “The Implemention of Total Productive Maintenance in Malaysia Automotive Industry,” *Res. World Econ.*, vol. 10, no. 5, p. 89, 2019, doi: 10.5430/rwe.v10n5p89.
[27] Z. Aleš, J. Pavlů, V. Legát, F. Mošna, and V. Jurča, “Methodology of overall equipment effectiveness calculation in the context of Industry 4.0 environment,” *Ekspolatacja i Niezawodn. - Maint. Reliab.*, vol. 21, no. 3, pp. 411–418, 2019, doi: 10.17531/ein.2019.3.7.
[28] H. Pačaiová and G. Ižaríková, “Base Principles and Practices for Implementation of Total Productive Maintenance in Automotive Industry,” *Qual. Innov. Prosper.*, vol. 23, no. 1, p. 45, 2019, doi: 10.12776/qip.v23i1.1203.
[29] R. Sharma, “Overall equipment effectiveness measurement of TPM manager model machines in flexible manufacturing environment: A case study of automobile sector,” vol. 26, no. 2, pp. 206–222, doi: 10.1504/IJPQM.2019.097767.
[30] J. Rukijkanpanich and P. Pasuk, “Maintenance management for transportation process in quarry industry,” vol. 24, no. 2, pp. 185–199, doi: 10.1108/JQME-04-2017-0024.
[31] M. Gopalakrishnan, A. Skoogh, A. Salonen, and M. Asp, “Machine criticality assessment for productivity improvement: Smart maintenance decision support,” vol. 68, no. 5, pp. 858–878, doi: 10.1108/IJPPM-03-2018-0091.
[32] D. Stadnicka and K. Antosz, “Overall Equipment Effectiveness: Analysis of Different Ways of Calculations and Improvements,” in *Lecture Notes in Mechanical Engineering*, vol. 0, no. 201519, 2018, pp. 45–55. doi: 10.1007/978-3-319-68619-6_5.
[33] I. Makarova, R. Khabibullin, E. Mukhametdinov, A. Pashkevich, and K. Shubenkova, “Efficiency management of robotic production processes at automotive industry,” in *Proceedings of the 2016 17th International Conference on Mechatronics - Mechatronika, ME 2016*, 2017.
[34] T. Kamaryt and J. Kleinová, “Handling equipment - The overall efficiency of supply processes,” pp. 2507–2515. [Online]. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-84976447987&partnerID=40&md5=3d2224c2957fc77d19cceca7e29169ca
[35] C. Mbohwa and B. Mwanza, “Evaluating maintenance strategies effectiveness on overall equipment utilization,” pp. 2323–2332. [Online]. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85018417847&partnerID=40&md5=563dc9d3c7dcc57d31a18f8261abbbac
[36] R. Kumar Sharma and R. Gopal Sharma, “Integrating Six Sigma Culture and TPM Framework to Improve Manufacturing Performance in SMEs,” *Qual. Reliab. Eng. Int.*, vol. 30, no. 5, pp. 745–765, Jul. 2014, doi: 10.1002/qre.1525.
[37] D. D. Shinde and R. Prasad, “Application of AHP for Ranking of Total Productive Maintenance Pillars,” *Wirel. Pers. Commun.*, vol. 100, no. 2, pp. 449–462, 2018, doi: 10.1007/s11277-017-5084-4.
[38] M. Valério and I. Nunes, “Total Productive Maintenance implementation. A way to improve working conditions,” in *Occupational Safety and Hygiene V*, CRC Press/Balkema P.O. Box 11320, 2301 EH Leiden, The Netherlands: CRC Press/Balkema, Mar. 2017, pp. 375–380. doi: 10.1201/9781315164809-69.
[39] R. Oliveira, S. A. Taki, S. Sousa, and M. A. Salimi, “Global Process Effectiveness: When Overall Equipment Effectiveness Meets Adherence to Schedule,” *Procedia Manuf.*, vol. 38, pp. 1615–1622, 2019, doi: 10.1016/j.promfg.2020.01.123.
[40] R. Hedman, M. Subramaniyan, and P. Almström, “Analysis of Critical Factors for Automatic Measurement of OEE,” *Procedia CIRP*, vol. 57, pp. 128–133, 2016, doi: 10.1016/j.procir.2016.11.023.
[41] M. Zlatić, “TPM - Total Productive Maintenance,” *Proc. Eng. Sci.*, vol. 1, no. 2, pp. 581–590, 2019, doi: 10.24874/PES01.02.057.
[42] O. Bataineh, T. Al-Hawari, H. Alshraideh, and D. Dalalah, “A sequential TPM-based scheme for improving production effectiveness presented with a case study,” vol. 25, no. 1, pp. 144–161, doi: 10.1108/JQME-07-2017-0045.
[43] K. G. Eswaramurthi and P. V. Mohanram, “IMPROVEMENT OF MANUFACTURING PERFORMANCE MEASUREMENT SYSTEM AND EVALUATION OF OVERALL RESOURCE EFFECTIVENESS,” vol. 10, no. 2, pp. 131–138, doi: 10.3844/ajassp.2013.131.138.
[44] Hernadewita, Hermiyetti, Hendra, Syukriah, R. A. Br. Surbakti, and D. A. Marizka, “Overall Equipment Effectiveness Analyse for Performance of CNC Milling Machine Operation,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 505, no. 1, p. 012052, 2019, doi: 10.1088/1757-899X/505/1/012052.
[45] M. Zubair *et al.*, “Manufacturing productivity analysis by applying overall equipment effectiveness metric in a pharmaceutical industry,” vol. 8, no. 1, doi: 10.1080/23311916.2021.1953681.
[46] B. Khamon, “The Usage of Overall Equipment Effectiveness in Measurement to Improve Efficiency and Increase Productivity of Process for Packaging Cigarettes,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 361, no. 1, p. 012023, 2018, doi: 10.1088/1757-899X/361/1/012023.

[47] H. A. Prabowo, Y. B. Suprapto, and F. Farida, “The evaluation of eight pillars total productive maintenance (TPM) implementation and their impact on overall equipment effectiveness (OEE) and waste,” *Sinergi*, vol. 22, no. 1, p. 13, 2018, doi: 10.22441/sinergi.2018.1.003.
[48] M. Krynke, K. Knop, and K. Mielczarek, “Using Overall Equipment Effectiveness indicator to measure the level of planned production time usage of sewing machine,” vol. 5/4(2014), pp. 6–9.
[49] S. Shreelakshmi and A. Chatterjee, “ANALYSIS OF THE OVERALL EQUIPMENT EFFECTIVENESS TO MINIMIZE SIX BIG LOSSES OF COOKIE CAPPER MACHINE-A CASE STUDY IN MANUFACTURING INDUSTRY,” vol. 2, no. 4, pp. 373–378, doi: 10.24874/PES0204.004.
[50] O. C. Chikwendu, A. S. Chima, and M. C. Edith, “The optimization of overall equipment effectiveness factors in a pharmaceutical company,” *Heliyon*, vol. 6, no. 4, p. e03796, 2020, doi: 10.1016/j.heliyon.2020.e03796.
[51] S. Nallusamy and G. Majumdar, “Enhancement of overall equipment effectiveness using total productive maintenance in a manufacturing industry,” *Int. J. Performability Eng.*, vol. 13, no. 2, pp. 173–188, 2017, doi: 10.23940/ijpe.17.02.p7.173188.
[52] Supriyati and H. Hardi Purba, “TPM Implementation in Automotive Component Manufacturing Companies to Analyze Efficiency Injection Machine,” *J. Appl. Res. Ind. Eng.*, 2019.
[53] G. Lanza, J. Stoll, N. Stricker, S. Peters, and C. Lorenz, “Measuring Global Production Effectiveness,” in *Procedia CIRP*, Elsevier B.V, 2013, pp. 31–36. doi: 10.1016/j.procir.2013.05.006.
[54] J. Kumar and V. K. Soni, “An Exploratory Study of OEE Implementation in Indian Manufacturing Companies,” *J. Inst. Eng. Ser. C*, vol. 96, no. 2, pp. 205–214, 2015, doi: 10.1007/s40032-014-0153-x.
[55] B. G. Almeida and E. Fabro, “Indústria 4.0 como ferramenta na engenharia de manutenção com base na metodologia TPM,” *Sci. cum Ind.*, vol. 7, no. 2, pp. 23–39, 2019, doi: 10.18226/23185279.v7iss2p23.
[56] N. Filscha, A. Meilily, and T. Hendy, “Total Productive Maintenance Policy to Increase Effectiveness and Maintenance Performance Using Overall Equipment Effectiveness,” *J. Appl. Res. Ind. Eng.*, vol. 6, no. 3, pp. 184–199, 2019, doi: 10.22105/JARIE.2019.199037.1104.
[57] S. Basak, M. Baumers, M. Holweg, R. Hague, and C. Tuck, “Reducing production losses in additive manufacturing using overall equipment effectiveness,” vol. 56, no. 102904, doi: 10.1016/j.addma.2022.102904.
[58] T. Aized, “Analysis and Implementation of TPM in Plastic Industry,” *Pakistan J. Eng. Appl. Sci.*, vol. 29, no. 2, pp. 64–71, 2021, [Online]. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85119434758&partnerID=40&md5=c94a82fde9e30505e05fd98cf2a5494b
[59] C. Anusha and V. Umasankar, “Performance Prediction through OEE-Model,” *Int. J. Ind. Eng. Manag.*, vol. 11, no. 2, pp. 93–104, 2020, doi: 10.24867/IJIEM-2020-2-256.
[60] M. S. Abd Rahman, E. Mohamad, and A. A. Abdul Rahman, “Enhancement of overall equipment effectiveness (OEE) data by using simulation as decision making tools for line balancing,” vol. 18, no. 2, pp. 1040–1047, doi: 10.11591/ijeecs.v18.i2.pp1040-1047.
[61] H. A. Prabowo and E. Y. T. Adesta, “A study of total productive maintenance (TPM) and lean manufacturing tools and their impact on manufacturing performance,” *Int. J. Recent Technol. Eng.*, vol. 7, no. 6, pp. 39–43, 2019, [Online]. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85065190380&partnerID=40&md5=fe97f5965aafe0ddfa98e0c22ec1fa95
[62] M. Braglia, D. Castellano, and M. Gallo, “A novel operational approach to equipment maintenance: TPM and RCM jointly at work,” vol. 25, no. 4, pp. 612–634, doi: 10.1108/JQME-05-2016-0018.
[63] “Review on China’s Automotive Engineering Research Progress: 2023; [中国汽车工程学术研究综述!!#: 2023],” *Zhongguo Gonglu Xuebao/China J. Highw. Transp.*, vol. 36, no. 11, pp. 150 – 192, 2023, doi: 10.19721/j.cnki.1001-7372.2023.11.001.
[64] S. Nallusamy, “Enhancement of Productivity and Efficiency of CNC Machines in a Small Scale Industry Using Total Productive Maintenance,” *Int. J. Eng. Res. Africa*, vol. 25, pp. 119–126, Aug. 2016, doi: 10.4028/www.scientific.net/JERA.25.119.
[65] A. En-Nhaili, A. Meddaoui, and D. Bouami, “Effectiveness improvement approach basing on oee and lean maintenance tools,” vol. 6, no. 2, pp. 147–169, doi: 10.1504/IJPMB.2016.075599.
[66] A. Chiarini, “Improvement of OEE performance using a Lean Six Sigma approach: an Italian manufacturing case study,” *Int. J. Product. Qual. Manag.*, vol. 16, no. 4, p. 416, 2015, doi: 10.1504/IJPQM.2015.072414.
[67] M. J. Kwaso and A. Telukdarie, “Evaluating the impact of Total Productive Maintenance elements on a manufacturing process,” in *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 2018, pp. 546–557. [Online]. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85066944335&partnerID=40&md5=22c28f755415ba8f26024dd32ce061b4
[68] A. Hooda and P. Gupta, “Manufacturing excellence through total productive maintenance implementation in an Indian industry: A case study,” vol. 9, no. 3, pp. 1593–1604, doi: 10.24247/ijmperdjun2019168.
[69] M. C. Stephani, L. D. Valentina, M. A. Duarte, and K. Hatakeyama, “Analysis of the impact of the overall efficiency of the equipment in the revenues of a metal company,” *Espacios*, vol. 37, no. 15, p. 18, 2016, [Online]. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-

84974530603&partnerID=40&md5=91df9faab79c94887abeab37bac5a78e
[70] P. H. Tsarouhas, “Equipment performance evaluation in a production plant of traditional Italian cheese,” vol. 51, no. WOS:000325069700016, pp. 5897–5907, doi: 10.1080/00207543.2013.807373.