

Automotive enterprises flow production improvement based on the management process intellectualization

Makarova I., Buyvol P., Shubenkova K., Pashkevich A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2018 IEEE. The analysis of optimization methods of the flow organization of technological assembly processes, shows that the problem should be solved in a complex manner. The scheme of interaction of decision support system (DSS) modules for the automotive enterprise is presented. The simulation model of the process of installing a pre-starting liquid engine heater (PLEH) is developed. The adequacy assessment of the developed simulation model is carried out based on the average values of the model and system responses. The optimization of the simulation model based on the number of distributed workers in positions is made. The average installation time of one PLEH decreased by 12%, the maximum time - by 9.5%.

<http://dx.doi.org/10.1109/DISA.2018.8490602>

Keywords

Assembly line, Mass production, Optimization of technological processes, Simulation modeling

References

- [1] I. Makarova, V. Mavrin, K. Shubenkova, "System approach to the mass production improvement, " *Advances in Intelligent Systems and Computing*, vol. 644, pp. 95-102, 2018.
- [2] R. Khabibullin, I. Makarova, A. Pashkevich, V. Mavrin, K. Shubenkova, "Application of simulation modeling to improve management of technological processes during production of automotive components, " *Proceedings of the 2016 17th International Conference on Mechatronics-Mechatronika*, 2016.
- [3] D. Li, C. Zhang, X. Shao, and W. Lin, "A multi-objective TLBO algorithm for balancing two-sided assembly line with multiple constraints", *J Int Man*, vol. 27, is. 4, pp. 725-739, 2016.
- [4] Z. Li, M. Janardhanan, Q. Tang, and P. Nielsen, "Mathematical model and metaheuristics for simultaneous balancing and sequencing of a robotic mixed-model assembly line, " *Eng Opt*, pp. 1-17, 2017.
- [5] S. Akpınar, A. Baykasoğlu, "Modeling and solving mixed-model assembly line balancing problem with setups. Part I: A mixed integer linear programming model", *J Man Sys*, vol. 33, is. 1, pp. 177-187, 2014.
- [6] B. Sungur, Y. Yavuz, "Assembly line balancing with hierarchical worker assignment, " *J Man Sys*, vol. 37, part 1, pp. 290-298, 2015.
- [7] M. Moreira, K. Miralles, and A. Costac, "Model and heuristics for the Assembly Line Worker Integration and Balancing Problem", *Com & Op Res*, vol. 54, pp., 64-73, 2015.
- [8] L. Borba, M. Ritt, "A heuristic and a branch-and-bound algorithm for the Assembly Line Worker Assignment and Balancing Problem", *Com & Op*, vol. 45, pp. 87-96, 2014.
- [9] S. Akpınar, A. Baykasoğlu, "Modeling and solving mixed-model assembly line balancing problem with setups. Part II: A multiple colony hybrid bees algorithm", *J Man Sys*, vol. 33, is. 4, pp. 445-461, 2014.

- [10] O. Mutlu, O. Polat, and A. A. Supciller, "An iterative genetic algorithm for the assembly line worker assignment and balancing problem of type-II", *Com & Op Res*, vol. 40, is. 1, pp. 418-426, 2013.
- [11] Y. Zhang, X. Hu, and C. Wu, "A modified multi-objective genetic algorithm for two-sided assembly line re-balancing problem of a shovel loader", *Int J Prod Res*, pp. 1-21, 2017.
- [12] B. Bouslah, A. Gharbi, R. Pellerin, and A. Hajji, "Optimal production control policy in unreliable batch processing manufacturing systems with transportation delay", *Int J Prod Res*, vol. 51, pp. 264-280, 2013.
- [13] E. Gundogar, M. Sari, and A. H. Kokcam, "Dynamic bottleneck elimination in mattress manufacturing line using theory of constraints", *Springer plus*, vol. 5, 2016.
- [14] M. Lemessi, S. Rehbein, G. Rehn, and T. Schulze, "Semiautomatic simulation-based bottleneck detection approach", *Winter Simulation Conference*. Berlin, Germany, 2012.
- [15] L. Li, Q. Chang, J. Ni, G. Xiao, and S. Biller, "Bottleneck Detection of Manufacturing Systems Using Data Driven Method", *IEEE International Symposium*. Ann Arbor, MI, USA, is. date 22-25 July, 2007.
- [16] T. Volling, A. Matzke, M. Grunewald, and T. S. Spengler, "Planning of capacities and orders in build-to-order automobile production: A review", *Eur J Op Res*, vol. 224, is. 2, pp. 240-260, 2013.
- [17] P. Thomas, A. Thomas, "Multilayer perceptron for simulation models reduction: Application to a sawmill workshop", *Eng App Art Int*, vol. 24, pp. 646-657, 2011.
- [18] S. A. Mansouri, D. Gallear, and M. H. Askariazad, "Decision support for build-to-order supply chain management through multiobjective optimization", *Int J Prod Ec*, vol. 135, is. 1, pp. 24-36, 2012.
- [19] T. Volling, T. S. Spengler, "Modeling and simulation of orderdriven planning policies in build-to-order automobile production", *Int J Prod Ec*, vol. 131, is. 1, pp. 183-193, 2011.
- [20] O. Tang, R. W. Grubbstrom, "Planning and replanning the master production schedule under demand uncertainty", *Int J Prod Ec*, vol. 78, is. 3, pp. 323-334, 2002.
- [21] M. Gopalakrishnan, A. Skoogh, C. Laroque, "Simulation-based planning of maintenance activities by a shifting priority method", *Simulation Conference*, Savannah, GA, USA, is. date 7-10 Dec, 2014.
- [22] E. M. Goldratt, "Theory of Constraints", *The North River Press*, MA, USA, 1999, pp. 160.
- [23] I. Makarova, R. Khabibullin, E. Mukhametdinov, A. Pashkevich, K. Shubenkova, "Efficiency Management of Robotic Production Processes at Automotive Industry", *Proceedings of the 2016 17th International Conference on Mechatronics-Mechatronika*, 2016.