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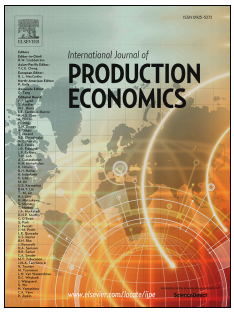

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PII: S0925-5273(17)30431-0

DOI: 10.1016/j.ijpe.2017.12.025

Reference: PROECO 6911

To appear in: *International Journal of Production Economics*

Received Date: 26 December 2016

Revised Date: 22 November 2017

Accepted Date: 26 December 2017

Please cite this article as: Shabtay, D., Zofi, M., Single machine scheduling with controllable processing times and an unavailability period to minimize the makespan, *International Journal of Production Economics* (2018), doi: 10.1016/j.ijpe.2017.12.025.

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Single Machine Scheduling with Controllable Processing Times and an Unavailability Period to Minimize the Makespan

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Abstract.

We study a single machine scheduling problem, where job processing times are controllable, and there is a fixed machine unavailability interval. We assume that the job processing time is a convex decreasing function of the amount of resource allocated to its processing operation. We further assume that there is a budget restriction on the total resource allocation cost. Our aim is to find a job schedule that minimizes the makespan. We prove that the problem is NP-hard and develop both a constant factor approximation algorithm and a fully polynomial time approximation scheme (FPTAS) for solving it. The FPTAS is obtained despite the fact that we could not design a pseudo-polynomial time algorithm for finding the optimal solution.

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