# Improving the performance of production line 4 at Mars

Bachelor thesis 'Industrial Engineering and Management'

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## Preface

This thesis is written to complete my bachelor 'Industrial Engineering and Management' at the University of Twente. The thesis has been realized through a research internship at Mars Veghel.

From the start of my research, I had contact with many people with different backgrounds and ideas. At the beginning it was hard to understand the production process, because the production line is very complex and there was no clear overview. Through the helpfulness of everyone within Mars Veghel I was able to deliver this report. Hopefully my thesis allows Mars Veghel to fulfill the demand from the segment of mini-bars within Continental Europe.

I thank everyone who helped me during my thesis. Marius Tielemans and Guido Thijs thanks for the opportunity to perform my thesis at Mars Veghel and the help during the whole process. From Ergo-Design, Menno Hoeksema was a great help with my simulation. From the University of Twente, I thank Martijn Mes for guiding me during the whole process and his constructive feedback to improve my research. During my research, I have been able to spend the nights with my uncle and aunt, I want to thank them for that. Also, I thank Marjon Pol for helping me to write this thesis and making my simulation model. Finally, I thank Rick Frenken for his support during this process and for helping me to write my thesis in English.

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## Management summary

The growing segment of mini-bars in Continental Europe is the motivation of this research. At the moment, Mars Veghel cannot fulfill the demand, while the expectations are that the growth for mini-bars will increase even more. Line 4 is the only production line for this type of product in Continental Europe, this is not sufficient to handle the expected growth and because of that additional capacity must be created. In addition, the number of failures on the line should be reduced in order to increase the utilization, which will allow for more effective capacity utilization.

In this research, we concentrate on the packaging room of line 4. We formulate the research question as follows: "*In what way can the utilization be increased and the number of disruptions be reduced on line 4 of Mars Veghel, so that the current demand and the forecasted future growth can be fulfilled?*"

In response to the research question, we formulated three goals. The first goal is to get a clear overview of the production line and to create a model for this, in this case a simulation model. This is done because there is no clear overview of line 4, at the moment. The second goal is to utilize existing capacity more efficiently and realize less disruptions on the production line. Finally, we analyze how the changes influence the planned simplification project of the production process.

After analyzing the results we saw a set of 8 interventions: enlarge throughput FW, enlarge buffer 11, enlarge availability bulk 15, enlarge input bulk 15, reduce MTTR Bosch machines 11 and 12, reduce amount of changeovers, and simplification project. However, not all interventions can be used in the model, because of different limitations. Finally, we created 8 experiments:

- Current situation.
- Enlarge buffer 11.
- Enlarge input bulk 15.
- Enlarge input Bosch machines 11 and 12.
- Enlarge buffer 11, and enlarge input bulk 15.
- Enlarge buffer 11, and enlarge input Bosch machines 11 and 12.
- Enlarge input bulk 15, and enlarge input Bosch machines 11 and 12.
- Enlarge buffer 11, enlarge input bulk 15, and enlarge input Bosch machines 11 and 12.

Subsequently, we advise Mars to use this model as a first step, and continue to build a more detailed model. In addition, improvements can be realized from various points in the packaging room. For example, between buffer 12 and the Bosch machines 11 and 12, and about the throughput per FW. We advise to conduct more research on the use of buffers, and on the (re)design of production line 4.