

Improvements of Bicycle Suspension Fork Production

Degree programme : BSc in Industrial Engineering and Management Science

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This thesis analyzes the manual assembly of bicycle damping units at DT Swiss in Poland. Eight efficiency increasement concepts were developed and evaluated by a cost–benefit analysis. One favored concept was selected and fully elaborated: A separate assembly line with two workplaces for a specific product with an optimized layout and material flow, was created.

Introduction and Objectives

As part of a preliminary study, various weak points were identified in the assembly of suspension fork damping units at DT Swiss in Poland. Efficiency, ergonomics and material flows showed potential for optimization. The production in DT Poland currently assembles three different damping unit types in one shared assembly, with rising production quantities and an already high utilization. The manual assembly remains essential due to the complexity of the product and the variant diversity. This work aims to develop a robust concept for subsequent implementation for increasing production efficiency based on time and cost analysis.

Research Design

Based on the preliminary study, eight conceptual solutions were developed to address the identified weaknesses. A two-stage utility analysis was used to evaluate the concepts. In the first stage, a score was determined for each concept to assess its potential to solve the identified weaknesses. In the second stage, the score together with eight predefined criteria (investment costs, implementation time, simplification, etc.) were combined in a utility analysis. The three top-ranked concepts were further analysed by a break-even analysis. Based on these results, a recommendation for action was formulated.

Results

In collaboration with DT Swiss, a dedicated assembly line for a specific damping unit was selected for detailed development. The refined concept includes an improved workplace organization based on five principles of workplace organization, a streamlined material flow and a dedicated workplace setup (Figure 2). The new layout was developed that the dedicated assembly line fit within the same production space (Figure 1). A comprehensive break-even analysis confirmed the area of profitability for the best-case scenario in Q3 2026 and for the worst-case scenario in Q1 2032 of the concept (Figure 3). It was further prepared for implementation, including resource and time requirements.



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Implications and Recommendations

The developed concept establishes a structured basis for future improvements in the assembly line at DT Swiss Poland. By optimizing workplace design and material flow within the existing production space. The concept supports flexible adjustments to future production and aligns with the strategy. These improvements provide a scalable and sustainable solution for DT Swiss, ensuring readiness for future production increases.

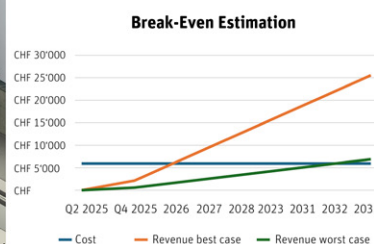


Figure 1: The current workplaces at DT Poland, Figure 2: The two new developed workplaces, Figure 3: The break-even estimation of the refined concept