Foreword

Scarce natural resources, legal requirements, and cost savings are some of the reasons why product recovery is given increased attention. Disassembly processes are obviously an essential aspect of product recovery and, therefore, the corresponding planning is crucial. It turns out that this planning can be applied not only to product recovery, but also to repair and maintenance. In this remarkable thesis, Christian Ullerich chooses a managerial economics perspective and concentrates on disassembly-to-order planning. He develops comprehensive mathematical models reflecting the disassembly process, in order to determine the optimal number of cores to be procured and to specify the optimal types and quantities of modules, items, and material to be sold.

The thesis is divided into two main parts: complete disassembly planning and flexible disassembly planning. In the first main part he develops a new consistent model which integrates e.g. conditions of cores, purity requirements for material recycling, and demand restrictions. In contrast to existing models, this linear model is extended by considering linear price-quantity dependencies, with the result, that a non-linear problem arises. To solve the problem Christian Ullerich combines modified non-linear methods and commercial solvers in an innovative and impressive manner. Moreover, the initial static model is extended to a dynamic approach by taking multiple periods into account. A newly developed rolling horizon planning is applied and the excellent solution quality is proven by a comparison with the solution gained from a total planning approach.

In the second main part a completely new disassembly model is presented. In contrast to the complete disassembly planning, several modules can be maintained. The question arises to what extent the cores have to be disassembled (disassembly depth) and which disassembly sequence has

to be taken. The already existing simultaneous approaches are significantly extended by Christian Ullerich. The new idea is that for each type of a core more than one disassembly state is allowed. That means that one type of a core could be disassembled in different ways which offers a completely new degree of freedom. Since this new approach includes different disassembly models as special cases, Christian Ullerich denotes this model as flexible planning. Further, he provides different recommendations to solve the problem heuristically in order to cope with the high model complexity.

Summarising the above, it should be noted that the disassembly research is considerably enriched by a lot of new and future-oriented ideas and methods. Therefore, I hope that Christian Ullerichs excellent dissertation finds large distribution.

Prof. Dr. Udo Buscher

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