

Abstract

Against the backdrop of increasing regulatory requirements and more stringent sustainability targets, the remanufacturing of electronic components in the automotive industry is gaining growing importance. The objective of this thesis is to evaluate the environmental, technical, and economic performance of remanufacturing automotive control units for comfort functions in comparison to conventional new production. For this purpose, a life cycle assessment is conducted, complemented by a cost and break-even analysis as well as an evaluation of technical feasibility.

The results of the life cycle assessment indicate that remanufacturing offers significant environmental advantages over new production at the component level. Across almost all impact categories considered, reductions in environmental impacts of approximately 70% are achieved. These results apply to the product family under investigation and the defined system boundaries. However, due to the currently low expected return volumes, the overall impact on total production remains limited.

The economic analysis shows that, under the current investment and cost structures, remanufacturing of partial volumes is not yet cost-efficient compared to pure new production and only becomes economically advantageous at significantly higher remanufacturing volumes.

The technical assessment confirms the general feasibility of the remanufacturing process. While software-related faults can typically be resolved with relatively low effort, the refurbishment of hardware-related defects is generally possible but may require considerably higher effort. Mechanical damage often necessitates the replacement of individual components, meaning that in such cases the remanufacturing process is largely reduced to component substitution.