

"A Feedback Strategy for a Closed Loop End-of-Life Process"

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ABSTRACT

This paper focuses on the need for creation of a closed loop system integrating research in the highly intertwined areas of design for disassembly and end of life cycle equipment disposition. Design for disassembly techniques are driven by equipment disposition, recycling/reuse technology. Practical design for disassembly guidelines and trade-off analysis methodologies can only be formulated within the framework of state of the art equipment demanufacturing techniques and the economic realities of these techniques. The interdependence of design for the environment, and more specifically design for disassembly, with end of life cycle equipment disposition techniques requires companies in the forefront of these design methodologies to formulate training materials and techniques within a dynamic environment. Thus, thorough technical analysis of a full scale, demanufacturing operation(s) operating under the implications of the regulatory and competitive pressures in the recycling industry is an integral element in the creation of any design for disassembly techniques or training materials. An overview of the closed loop, team approach to reuse and recycling is presented in this paper. This paper not only discusses the obvious merits of this closed loop system but emphasizes the need for feedback from the demanufacturing process with specific case study examples.

A framework is provided that highlights the key areas of feedback that can be provided from the recycling operation to the design process. Four areas of data collection are proposed and examples of data from each area are provided. The four areas of data collection are cost in the form of complexity and time, revenues provided in respect to the materials that can be liberated, environmental impact in the form of residual material disposal, and technical difficulty in the form of special tools, material handling, material identification,... The feedback mechanisms are explored in the context of both closed loop and open loop recycling plans.

This data collection framework is demonstrated through the examination of a telephone switch recycling project. The project involves elements of electronics recycling that can be applied to a broad range of telephony and computer equipment. This particular recycling project is selected because of the overall economic return and the tradeoffs that are necessary to generate the best economic return. Information is provided on materials that are liberated during the recycling process, costs incurred in the recycling process, environmental impact of waste materials, and cost tradeoffs associated with further material liberation. In addition, this example highlights areas of design feedback that result from an analysis of the recycling operation data collection process. Although the cards and frames involved in this example are specific to older telephony technology, a considerable portion of the design information gathered in the example can be generalized and applied to other technologies such as computers and office equipment. A proposed team approach to review of the data between the recycler and the design community could be used to refine the data and generate broader principles to be applied

within a DFE program. Design feedback also results from a review of the material handling techniques that are selected for this project and the costs of demanufacture that result from issues specific to the equipment design.

Consulting Information

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