

CASE STUDY

Life Cycle Assessment Verifies Competitive Advantage of Remanufacturing Business Model

Davies Office Inc. is a leader in green manufacturing and sustainable product solutions that specializes in remanufacturing office workspace systems from several major original equipment manufacturer (OEM) product lines. Headquartered in Albany, NY, Davies goes beyond conventional remanufacturing to like-new condition, offering custom design options, ergonomic enhancements, and modern styling upgrades typically not available from other remanufacturers. From remanufactured brand name furniture, to asset recovery and re-deployment services, and novel value-creation programs Davies provides innovative offerings in pursuit of an affordable, more environmentally benign workspace.

Client Challenge

Remanufacturing has long been a viable method to preserve the value of durable products and reduce the costs associated with primary materials and manufacturing. In an era of increasing environmental consciousness amongst both industrial and consumer populations, Davies recognized that in addition to material use, remanufacturing could also serve as a means to minimize energy consumption, greenhouse gas (GHG) emissions, and industrial waste—all while maximizing the value that can be extracted from a widely available stream of end-of-use products. Leveraging these benefits, Davies saw opportunity to carve a unique space in the office system market by offering products that were of both high economic value and verifiably low environmental impact. This approach forged a competitive advantage suited to meet the emerging demand for modern office systems that are more environmentally sustainable.



Original office workspace products (left) vs. Davies remanufactured systems (right)

In this pursuit, Davies sought to compare the environmental impacts associated with the production of their remanufactured office workspace product systems to those generated in the production of a new OEM alternative. Such a comparison was critical to both verify the perceived environmental benefits of remanufacturing and validate the claim that remanufactured office furniture would contribute to creating a more sustainable workspace. In order to provide a meaningful comparison that would stand up to customer scrutiny, however, Davies recognized that a rigorous, independent, and data-driven analysis of both the OEM and remanufactured systems would be required. To meet this need, Davies

CLIENT CHALLENGE

- Davies recognized the value of environmental benefits created through remanufacturing, but needed a way to verify them
- Environmental product claims are regulated, and can be a risky marketing tactic if not fully transparent
- Davies needed a way to compare the environmental impacts a remanufactured office workspace system to the OEM new system from which it was derived

COE-ASM WORK PERFORMED

- Davies leverages COE-ASM expertise in conducting a focused Life Cycle Assessment (LCA)
- A team of engineers collected product and process data onsite at Davies, covering everything from material use and recycling to energy consumption
- Published literature provided product and process data for the OEM counterpart that could not be measured
- Using specialized SimaPro LCA software, engineers leveraged the Ecoinvent database of manufacturing data models to fill in any gaps
- With this software, the environmental impacts of Davies' remanufacturing process were compared to those of virgin OEM production

RESULTS

- The study verified that Davies' remanufactured products offered significant environmental benefits over the alternative, using 82% less energy in production
- LCA modeling also revealed that using multiple remanufacturing cycles continues to lower the net environmental impact of a product over its entire lifecycle
- Provided verification of concept and validation of claims, creating a competitive advantage in a unique market

approached the COE-ASM at RIT to lend its expertise in comparative life cycle assessment (LCA), a standardized methodology used to quantify and compare the environmental impacts associated with a product, from the procurement of its constituent materials to its final disposition at the end of useful life.

COE-ASM Work Performed

In order to conduct an effective and meaningful LCA, the COE-ASM first defined the specific products to be compared and established a system boundary that would provide a logical basis for comparison. In order to best represent their product line, Davies chose remanufactured products based on the Steelcase Avenir® system. Similarly, the COE-ASM recognized that while energy consumption during the use phase is often a major consideration in product LCAs, office workspace products do not consume energy in use; therefore, only material acquisition and product manufacturing processes were studied in this case.

With these boundaries in place, a team of engineers from the COE-ASM worked to catalogue material and energy flows for each product and manufacturing process using real-world data. To this end, COE-ASM engineers worked onsite at Davies' production facility to characterize both the component makeup of the office system and the material makeup of each component. Through these site visits, the COE-ASM team also observed each step of Davies' remanufacturing process, measuring the actual levels of energy consumption, material use, re-use, and waste generation. Because the OEM was not involved in this project, however, the COE-ASM team did not have access to Steelcase production facilities. Instead, an LCA on OEM Steelcase products published by the University of Michigan's Center for Sustainable Systems was used to model the OEM product and process.¹

After collecting available real-world data, the COE-ASM filled any remaining gaps using specialized LCA computer software known as SimaPro. Through this program, the team was able to access the Ecoinvent database of manufacturing process models, a collection based on years of real-world data from other studies. Combining measured data with these process model libraries, the COE-ASM was able to model the production of both the OEM and remanufactured office systems. These models represented not only virgin (new) and remanufactured products, but also remanufactured products built from a core system that had been remanufactured at least once previously. This extra step allowed Davies to understand the environmental impacts of multiple remanufacturing cycles—a space where few market players are able to compete today. Using these models, the COE-ASM leveraged the capabilities of SimaPro to estimate the overall environmental impacts—from energy use to carbon emissions—for each production process.

Results

As a result of these analyses, the COE-ASM found that when considered independently, remanufacturing an office workspace system at Davies uses 82 percent less energy than manufacturing a new product at the OEM. Further, the models suggested that creating a product from a previously remanufactured core would increase the energy demand of that remanufacturing cycle by less than one percent relative to remanufacturing from a virgin core. In addition, when considering the total energy embodied within the product over all its manufacturing and remanufacturing cycles, the LCA results showed a 23 percent reduction in combined lifecycle energy demand by remanufacturing a second time, suggesting that over the entire life of the product, remanufacturing multiple times actually continues to lower the total energy impacts. Together, these results mean that Davies' processes can be used to extend the life of its products over multiple cycles with repeated and compounding savings relative to buying new.

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In addition to energy, the results of this LCA offered a comprehensive view of environmental impacts that could be compared between the two systems. From material use and recycling impacts to ozone depletion and ecotoxicity, the COE-ASM's analysis demonstrated significant benefits of remanufacturing across the board. This information not only verified Davies' concept of improving environmental sustainability through remanufacturing, but also validated the notion that multiple remanufacturing cycles could offer additional improvement.

Equipped with this information, Davies is now able to confidently market the environmental benefits of remanufactured office workspace systems using data backed up by rigorous independent study. In addition, Davies is able to use the LCA results to identify hotspots in their process in which further improvement might be possible, offering the potential to create even greater economic savings and environmental benefits through continuous process improvement.

¹Deitz, A. (2005). *Life Cycle Assessment of Office Furniture Products*. University of Michigan. Report No. CSS05-08.

"COE-ASM was able to quantify the environmental impacts of our remanufactured workspaces versus OEM workspaces. We can now feel confident informing our clients on the positive effects remanufacturing has on the environment."

- William Davies, President,
Davies Office Inc.

The Center of Excellence in Advance & Sustainable Manufacturing (COE-ASM) is a specialized applied research and development center dedicated to helping emerging and existing NYS manufacturers to enhance productivity and become more competitive through innovation and technology in sustainable products and processes. COE-ASM is located at the Golisano Institute for Sustainability and is a New York State Center of Excellence, a NYSTAR partnership.

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