Metal Additive Manufacturing Capabilities for Footwear Prototyping and Product Creation

BUSINESS PROBLEM

The business seeks to enhance the efficiency of its footwear product creation timeline, as accelerating the product creation process improves the alignment of product supply with forecasted consumer demand. Specifically, the company aims to integrate Metal Additive Manufacturing (MAM) into its onsite prototyping facility to expedite the creation of physical footwear samples from a proposed product brief. By incorporating MAM, the business can streamline the prototyping process, enabling more effective design iteration and bolstering its market responsiveness and competitive edge.

APPROACH

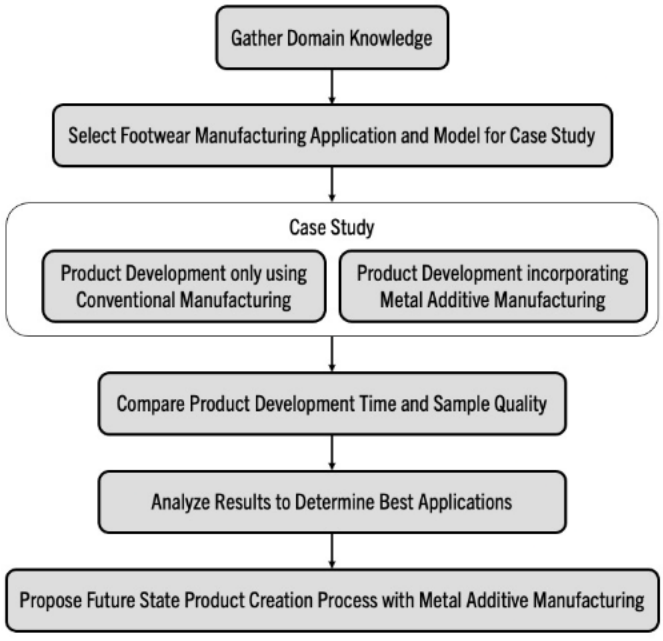
A case study approach on rubber outsole development was used to address the business problem. The study examined the impact of MAM on the speed and quality of footwear sample development. By comparing conventional manufacturing and MAM processes, the study evaluated time reduction and sample quality, focusing on rubber outsole mold fabrication and incorporating textures directly into the molds.

DATA SOURCES

Information about MAM was obtained from literature review, exploring existing internal knowledge capture, and educational materials from the vendor. Information about footwear specific applications of MAM also came from the company's manufacturing partners. Three-dimensional part files, engineering drawings, and visual inspection standards were obtained from company and manufacturing partner datab

Data Types and Format

Process standard operating procedures and parameters, machine manuals, three-dimensional files, two-dimensional drawings, photographs, traction testing results, development time study, photographs



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IMPACT

Incorporating MAM into the product creation process was found to have an impact on the footwear product creation timeline. By reducing the time required for mold design and fabrication by 32%, the solution accelerates the overall product development timeline, allowing the company to bring innovative footwear designs to market more rapidly. This speed advantage is particularly valuable for projects involving textured outsoles, as MAM enables the direct fabrication of detailed textures, eliminating the need for outsourced etching processes. Although the visual quality of samples produced using MAM is not production-equivalent, it is adequate for product development purposes. The traction properties of the MAM-produced samples are comparable to those of the manufacturing partner's samples, indicating that the functional quality is sufficient for wear-testing. The integration of MAM capabilities enhances the business's prototyping facility's ability to serve as an accelerator for high-complexity or novel products, enabling quicker design revision cycles and more efficient product development. This improvement in speed and efficiency helps the company better align supply with consumer demand, reducing the risk of mismatched supply and demand due to changing consumer preferences over time. The solution contributes to the company's competitive edge in the fast-paced footwear industry by enabling faster market responsiveness and innovation.

DRIVERS

The catalyst for the solution was the need to accelerate the product creation process in the fast-paced athletic footwear industry. The company faces challenges with long timelines for developing novel products, especially with overseas manufacturing partners. Incorporating MAM aimed to reduce these timelines, improve efficiency, and better align supply with consumer demand.

BARRIERS

Communication challenges arose from navigating a matrix organizational structure alongside organizational changes and requesting information from overseas manufacturing partners. Technical issues, such as corrupted texture files and difficulties with mold alignment and part removal, also posed challenges. Additionally, resource limitations, including the availability of raw materials and suitable software, affected the project's progress.

ENABLERS

Close relationships with manufacturing partners facilitated knowledge sharing and collaboration. I had total support of the department director and all the engineering managers, and the collaborative nature of the daily work helped remove barriers and prioritize the project. A departmental and company-wide culture in investment of new technologies and innovations, such as the MAM machine, boosted support for the project.

ACTIONS

I explored the possible applications and context around the project. I conducted a case study that involved developing and making physical parts to obtain learnings and propose a solution. The current and proposed manufacturing processes were mapped and designed. The points of assessment were chosen for the case study and the results communicated to the organization to guide implementation of the technology.

INNOVATION

Some innovative aspects of the solution include the use of MAM to directly fabricate detailed textures into molds, reducing prototyping development time and eliminating the need for etching, and the hybrid and modular design approach of combining subtractive and additive manufacturing techniques for footwear prototyping molds.

IMPROVEMENT

The final improvement provided by the solution is a potential 32% reduction in the time required for mold design and fabrication by incorporating MAM. This speed advantage is primarily due to the ability to directly fabricate detailed textures into the mold, eliminating the need for outsourced etching and streamlining the overall product creation process.

BEST PRACTICES

To replicate the solution, ensure close collaboration with manufacturing partners as well as other internal departments for knowledge sharing. Spend time understanding any evolutions in the needs and goals of the organization to deliver value-adding solutions. Ensure proper understanding of the work of each individual contributor to get a comprehensive understanding of potential improvement points.

OTHER APPLICATIONS

Other potential applications of the solution include creating textured molds for pressurized bladder cushioning units, foam midsole molds, and plastic injection molds for cleated footwear. The approach used could also be used by organizations in other industries that aim to understand how MAM can affect their prototyping and manufacturing processes.