COMPOSITETECHBRIEF

Engineering & Design Technologies

- Digital Geometry Capture (Scanning)
- Virtual Product Design-CAD/CAM (CATIA v5) integrated with tooling construction/machining
- Analysis (FE, analytical, process simulation, dynamics)
- Composite Design and Analysis (FiberSIM Integrated with ply cutting and pre-forming
- Documentation (Electronic, and Fabrication Drawings)

Re-Engineering Technology

The "re-engineering" work cell incorporates several key capabilities that are critical to allowing rapid design of composite replacement components to displace existing metallic designs/components. These capabilities include the ability to capture part geometry, either through existing computer-aided design (CAD) or drawing data, or through three-dimensional (3-D) scanning of components. The 3-D scanning technologies are critical since, in many cases, accurate or detailed drawings or CAD information are not available.

In addition to the capture of the component geometry, UD-CCM has the expertise to revise or modify a design and develop a composite architecture which meets or exceeds the requirements for the specific component. The goal of "re-engineering" is to be able to accomplish a redesign of a steel (or other metallic) part in composites via a combination of integrated software tools and application of these tools and experience to the re-engineering process. These software tools can include finite element analysis, integrated custom design tools (for components with similar geometries or loading), integrated material databases with in situ properties, and custom empirically and/or analytically based design tools for localized joint and attachment details.

Development and Application

The re-engineering system has been extensively applied as part of our Composite Replacement Parts program for Wheeled Tactical Vehicles, a collaborative effort with the US Army TARDEC. To date, the re-engineering technology including digital scanning, detailed FEA, CAD/CAM capability (for geometry definition and mold/tool building), preforming technology including design with FiberSIM, as well as preform fabrication using the Solectria Diaphorm process have been applied to various composite vehicle components including HMMWV hoods, M35A3 Truck Hoods, M939 Truck Fenders, a lightweight advanced trailer technology demonstrator and a large, thick section lower hull for an FCS prototype test article.

As these programs move forward, these technologies will be further applied, developed, and integrated to achieve the overall integrated work-cell goals. In addition, the individual or combined capabilities utilized in these (Re)engineering efforts can be applied to other projects and solutions for both military and industrial partners.

Conclusions

Utilizing UD-CCM expertise allows our industrial partners "cradle to grave" development from design to manufacturing, without the typical associated high cost of prototyping. The extensive investment of the government in UD-CCM to implement a unique combination of engineering expertise and equipment allows leveraging of these resources.

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