Case New Holland Tractors Use Virtual Modeling to Reduce Design Time and Costs

Case Study

CLIENT PROFILE

With facilities located on every continent, CNH Case New Holland has a worldwide presence in the agricultural and construction equipment businesses. CNH products are sold by 10,800 dealers in 160 countries and have been supporting the agricultural industry since the mid-1800s.

BUSINESS CHALLENGE

Large tractors require complex cooling systems which consist of five separate modules. Each cooling module is dedicated to one of the engine's five different fluid systems, includes its own heat exchanger, and is additionally cooled by the main engine fan. Since the primary goal of the tractor is to support itself and the added extra load of any attachments it has, be it a mower or a plow, part of the design effort focuses on dedicating as much of the engine capacity to that load as possible. New design improvements typically include:

- Maximizing engine power output, which usually means an increase in engine size and reduces the space available for the cooling package
- Maximizing efficiency of the cooling package, which minimizes the space and power requirements for cooling
- Optimizing the locations of all the components within the engine compartment in order to provide enough air to both the engine and the cooling system modules.

For CNH, this design process often has only included an in-depth analysis of the individual components, for example each of the cooling modules. There was no simple way to include the effect of component layout within the engine compartment and the distribution of airflow to each module over the entire system. The alternative used by CNH, though expensive and time-consuming, was to develop and test several prototypes in order to balance cooling with space requirements.

ENGINEERING SOLUTION

Rather than develop several prototypes, CNH used flow modeling software to simulate the flow of air in and around engine compartment components, allowing the entire system to be examined at once as opposed to the previous piece-by-piece approach. This analysis enabled CNH to:

- Analyze the overall cooling system and its capacity
- Minimize power used by the cooling system
- Optimize the cooling module position

RESULTS ACHIEVED

By using flow modeling tools, CNH was able to:

- Eliminate the fabrication and testing of multiple, costly prototypes
- Define the best prototype, as predicted by FLUENT software, with very good agreement between experimental measurements and computer simulated values
- Reduce the amount of power drawn by the cooling system compared to the initial design, increasing the amount of power the engine can dedicate to operating other implements, such as mowers, plows, buckets, etc.
- Meet all cooling module thermal and packaging requirements

Case New Holland

COMPANY

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INDUSTRY

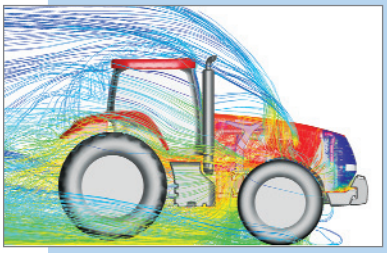
Construction and agricultural equipment

SOLUTION

FLUENT CFD Software + TGrid Preprocessing Software

KEY IMPACTS

- Significantly reduced prototype fabrication and testing costs
- Reduced the product time-to-market
- Evaluated far more design alternatives than would have been possible using a prototype-based design and development approach



Airflow pathlines emitted from the hood grille of the virtual model

CS104

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