Engineers Use Advanced Technology To Achieve More Precise Manufacturing

LOUISVILLE, Ky. — With the launch of the new Kenworth T680, Kenworth further enhances its already strong focus on producing quality trucks supported by the innovative use of technology to increase efficiency and achieve even more precise manufacturing.

“Our manufacturing process for the Kenworth T680 represents a leap forward in building world class, quality trucks,” said Scott Blue, plant manager at the Chillicothe, Ohio-based Kenworth assembly plant, a production facility for the aerodynamic T680. “Involving manufacturing personnel in the T680 design process enabled Kenworth to deliver a new truck that takes into consideration, within the assembly process, all of the little things that make the T680 so unique. And by leveraging advanced technology, we’ve been able to greatly enhance the T680’s quality while further enhancing the efficiency of our manufacturing process.”

The new Kenworth T680 door is one example of how Kenworth design and manufacturing engineers achieved a new level of manufacturing precision and quality. “We wanted a world class door that was larger, more robust and easier to assemble,” said Robert Culwell, Kenworth’s division manufacturing engineering manager in Kirkland, Wash. “Our engineers utilized advanced three-dimensional computer imaging to design a door frame and door that closes tightly with a degree of consistency and high precision.”

Manufacturing and design engineers worked closely together during the T680’s design and development process. “We first brought together employees from our cab trim, cab assembly and paint areas to review customer comments and pages of data. We then developed a manufacturing book of wishes that we all wanted to see in the T680, and reviewed it with the design engineers as they created the new truck,” Culwell said. “Based on customer wants and our professional experience, we compiled a list of components and features that the truck should have. Working together with the design engineers, we determined how manufacturing could contribute to build a world class truck.”

This interaction between design and manufacturing allowed the engineers from both disciplines to learn from each other. The process resulted in efficiencies in the manufacturing, not only of the T680, but also of other Kenworth models. For example, engineers quickly discovered that the T680 could be made stronger and the assembly process more efficient by using the Henrob™ self-penetrating fastener as the standard for all joint and installation needs.

The T680’s stamped aluminum door is 30 percent larger, yet lightweight and extremely stiff, making for excellent seal integrity. A pressure relief valve equalizes interior and exterior air pressure to make the door easy to open and close with little effort. Once the door is closed, the T680’s triple seal design minimizes sound transmission. “All the contours and the shape match perfectly,” Culwell said. “A tight-fitting cab creates a quieter, more comfortable work environment for drivers.”

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Using this fastener allowed us to standardize our tools and assembly processes, and that had some benefits for product enhancement, not only with the T680 but across all of our vehicles,” Culwell said. “Since the Henrob fastener is self-penetrating, it doesn’t require holes. This allows us to install the stamped aluminum panels on the T680 cab, eliminating the step of pre-punching holes. We have provided customers with a cab structure that is stiff and much more resistant to water, noise, and vibration.”

With the T680, Kenworth also standardized the placement of many different components, including harnesses, noted Culwell. “To increase efficiency, we established new manufacturing standards eliminating variations in where components are placed. That makes the trucks easier to assemble and improved efficiency.”

The manufacturing of the T680 also takes advantage of technology developed for building other Kenworth trucks. Take electrostatic painting, for example. With this technique, electrically charged paint particles are magnetically attracted to the truck’s surface when the vehicle is grounded, Culwell said. This method creates a uniform and durable undercoat for better adhesion of the topcoat for a quality finish.

There are also techniques developed for the T680 that will benefit how other Kenworth trucks are made. Prior to the T680, waterproof urethane was applied robotically before the Kenworth truck windshield was installed, noted Lex Tisdale, Chillicothe plant manufacturing engineering manager. This installation process made it easier for the windshield to be replaced later. The opportunity presented was to find a way to further improve windshield installation efficiency.

“We asked the design engineers to come up with a quick-drying adhesive urethane that would make the T680 windshield leak-free and could also be used on other Kenworth vehicles,” Tisdale said. “The process ultimately resulted in a one-piece bonded-in panoramic windshield for the T680 that offers a leak-free design, a 27-degree rake angle for improved aerodynamics and thicker glass for greater rock chip resistance. We also found that the T680’s windshield takes about a quarter of the time to replace.”

The Kenworth - Chillicothe plant must be flexible to handle the assembly of Kenworth’s different Class 8 trucks with various day cab and sleeper configurations. Plant engineers designed new robotic cells and assembly lines for the Kenworth T680 to work within the existing facility. For example, the robotic cell that applies adhesive and installs the T680’s panoramic windshield can be switched out with a robotic cell that does similar work on the T700 cab trim assembly line. Multi-tasking robots also perform hundreds of programmed steps required to build the T680 cab.

To make the manufacturing process on the Kenworth T680 more efficient, manufacturing teams at the Chillicothe plant developed a two-step plan to adapt the plant for the manufacturing of the Kenworth T680. “It was a big undertaking,” Culwell said. “We started by manually assembling the T680 cab to prove the assembly process. This first step allowed us to videotape the assembly, which could be used to perfect the manufacturing process.”

The entire process took two years. Since product and manufacturing designs happened on parallel tracks, changes were being made right up to the production of the first line units to take full advantage of the latest technology, noted Tisdale.

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“New engineering software combined with simultaneous manufacturing and design engineering enables us to produce the T680’s features more efficiently,” he added.

“Product design has to be part of the manufacturing design, and manufacturing design has to be part of the product design for a new product like the T680 to be successful. The days of designing a new product and then handing it to manufacturing are over. It really must be done simultaneously because of the complex nature of building an aerodynamic truck as well-designed and engineered as the Kenworth T680,” concluded Tisdale.

Kenworth Truck Company is the manufacturer of The World’s Best® heavy and medium duty trucks. Kenworth is an industry leader in providing fuel-saving technology solutions that help increase fuel efficiency and reduce emissions. The company’s dedication to the green fleet includes aerodynamic trucks, compressed and liquefied natural gas trucks, and medium duty diesel-electric hybrids. Kenworth is the only truck manufacturer to receive the Environmental Protection Agency’s Clean Air Excellence award in recognition of its environmentally friendly products. In addition, the fuel-efficient Kenworth T700 equipped with the low-emission PACCAR MX engine was named the 2011 Heavy Duty Commercial Truck of the Year by the American Truck Dealers. Kenworth is also the recipient of the 2011 J.D. Power and Associates award for Highest in Customer Satisfaction for Heavy Duty Truck Dealer Service. Kenworth’s Internet home page is at www.kenworth.com. Kenworth. A PACCAR Company.