

Companies team up to bring high-tech, quality finishing to the truck and tractor market . . .

# Plastic Finishing Combines Prime and Finish Coats

**GENESIS tractor from Ford New Holland breaks new ground in the agricultural industry.**

**M**olded Fiber Glass Company (MFG), Ashtabula, Ohio, custom molds fiberglass parts for trucks and tractors. However, when the Genesis™ 70 Series tractor models from Ford New Holland rolled out, the evolution of agricultural equipment quietly took a step forward.

The no-compromise, high-hp tractor was designed from the ground up to compete globally. Marketed worldwide under the Ford and Fiat brand names, the tractor has many innovative features ranging from a small turnaround diameter to a comfortable, convenient moving console in the cab.

The Genesis tractor also shows that fiberglass-reinforced plastic (FRP) is becoming an increasingly significant material in agricultural equipment. MFG custom molds 17 composite parts for the tractor body. The company also introduced fiberglass hoppers to handle seed, fertilizers and insecticides. Use of lightweight, corrosion-resistant fiberglass has improved efficiency and durability.

Ford New Holland and MFG worked as partners to design the exterior body panels and other fiberglass-reinforced polyester parts. Concurrent engineering and the joint development program began in the prototype stage and significantly reduced the cost of body molding, assembly and painting and engineering.

MFG recommended the materials, molding processes and coating materials and process for each of the 17 parts. Recommendations were based

on the characteristics required, such as the best surface quality, mounting requirements and styling. The top hood and rear fenders are liquid-composite molded (LCM) using directed fiber preforms. The other 14 parts are molded using sheet molding compound (SMC).

The secondary operations are as complex as the molding processes. MFG is experienced in the use of high-tech adhesives and helped Ford New Holland determine how to bond several parts together into a rugged hood assembly. The operation involves the bonding of LCM to SCM and LCM to metal.

To reduce the cost of the two-color assembly, MFG teamed with its coating supplier, The Sherwin-Williams Co., to develop a special process that combined primer and topcoats, eliminating one station on the paint line. Packaging also required a special design for just-in-time shipping from MFG to Ford New Holland's assembly plant in Winnipeg, Canada.

**Material Selection.** Agricultural off-road machinery is typically marketed to customers desiring a tough, rugged, heavy-duty machine. Steel fits that image. For the Genesis tractor, however, precedent was set aside and materials were selected based on function, performance and aesthetics.

The tractor's exterior appearance is complex compared to traditional sheet metal bodies. Design engineers determined early on that steel could not produce the futuristic, functional styling desired for the tractor at a

**TRUCK HOODS** are coated with a two-component polyurethane that meets VOC requirements

ence in fiberglass reinforced plastics, MFG is responsible for many industry breakthroughs ranging from its pioneering work on the Corvette car body to the Wonder bread tray, the Avanti body, Mack truck hoods and Kevlar reinforced safety

reasonable cost. FRP was selected as the material that could best meet requirements for a Class "A" automotive-like finish and paintability, heat-sag resistance and both real and perceived toughness.

Ford New Holland visited several plastic suppliers before settling on MFG for advice, assistance and production of prototype and production parts. MFG operates two plants in Ashtabula, a 140,000-sq-ft and a 220,000-sq-ft plant. The company has 38 compression molding presses ranging up to 2,000 tons, eight preform machines with robotic fiber deposition, dedicated atmospherically controlled multi-station paint rooms and state-of-the-art SMC machines. As a custom shop, it changes molds five to 10 times per day.

With more than 40 years of experi-

helmets. The company offers a range of chemical formulas and compositions and product design, engineering and prototyping capability along with a comprehensive quality assurance program, including SPC.

A number of tests were run on prototype tractor parts to ensure that the FRP panels were tough and up to the challenge of long-term agricultural use. A key concern was the perception that plastic cracks, fractures or shatters when struck by a sharp or blunt object and loses impact resistance with age. A variety of in-house impact tests and field tests were developed by Ford New Holland to assure the reliability of the material and the design.

**Coating Selection.** Another key concern was the quality of the finish. It needed to be flexible, durable, high-

gloss and be applied cost effectively. MFG had experience using high-solids, two-component urethanes. MFG recommended a polyurethane enamel. It provided hardness, impact, mar and abrasion resistance as well as 2.8 lb/gal of VOC for regulatory compliance.

The coating is applied on two paint lines using Binks high-volume, low-pressure (HVLP) Mach I spray guns. About 80 of the plant's more than 400 employees work on the finishing line, an indication of the significance of the process to production. Painters paint in two-hr shifts to reduce fatigue and ensure fewer defects.

Parts first pass through a seven-stage surface pretreatment system. Thorough surface preparation helps to ensure adequate coating adhesion.

The plastic components undergo cleaning and degreasing through several wash cycles and are rinsed with deionized water. Following pretreatment, components pass through a dry-off oven. They are hand-wiped to remove contaminants, primed, dried off at 300F, hand sanded in a sanding booth, top coated and dried in the topcoat oven.

According to Greg Quirk, MFG engineering manager, the combination of HVLP spray equipment and a high-solids, low-VOC coating limits VOC emissions so MFG can coat more parts in a day and still comply with regulations.

Robert Ryder, paint department manager, said the highly efficient, low-VOC paint line is equipped with a waterfall-type paint spray booth

that collects excess paint particles.

MFG's new coating process reduced application costs by more than 40 pct. All parts are painted black using one coat. Sections of the part that must remain black are masked. Areas to be painted in Ford New Holland's signature blue or Fiat's signature terra cotta receive a color coat. The process eliminates an extra trip down the paint line because the topcoat system acts as a primer for the color coat.

At every stage of development of the Genesis 70 Series tractor, the expertise and assistance of suppliers was solicited. In most cases the suppliers' recommendations were implemented. OEM/supplier teamwork plowed the way in the tractor market. Cooperation, it appears, was the critical factor enabling Ford New Holland to successfully design, prototype and produce complex, state-of-the-art competitive products in less time and within budget. **PF**

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