

Building a better piece of equipment

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For the Capital Press

When a sparkling new combine, tractor or sprayer debuts with big fanfare in equipment dealers' lots, chances are it took years and many millions of dollars to develop and build.

Companies typically start by gauging the needs and interests of customers, then they often develop and test several generations of prototypes in the field and in the laboratory before the final product is ready for launch, executives told the Capital Press.

For instance, AGCO's new IDEAL combine, which it introduced in September with a promise to "revolutionize" harvests, took more than four years of meticulous planning and roughly \$200 million to develop, said Eric Hansotia, the company's senior vice president of Global Crop Cycle and Fuse Connected Services.

The company started by meeting with farmers around the world and writing a specification that was 1,400 lines long, then went through a concept generation phase, a development process with nearly 50 prototypes that underwent hours of testing and use before engineers settled on the final design, Hansotia said.

"This is the most complicated product in the industry," he said. "Nobody's done a clean-sheet-of-paper new combine in the last 30 years. ... People are very cautious to make big changes on a combine. This is the biggest program in AGCO's history."

Customer input

Likewise, Case IH's new Trident 5550 combination liquid and dry fertilizer applicator was designed after detailed discussions with customers and took about three years to get to market, said Eric Shuman, the senior director of the company's harvesting product line.

"We use a process called customer-driven product development," Shuman said. "We look to the customers to identify what's needed as far as particular issues they have or concerns they have and ways to address those needs."

Once prototypes are available, they are placed with customers on their farms so the company can continue to gather information and make improve-



AGCO
An AGCO employee uses Google Glasses in a factory to design equipment.

ments, he said.

The result is an applicator that can handle both liquid and dry fertilizers, enabling the grower to switch from one to the other in about 45 minutes, he said.

"We're replacing the need to have two pieces of equipment," Shuman said.

The process has likely repeated itself often lately as equipment companies have come out with new products that increase automation — a strong desire for growers as labor costs rise and availability decreases.

New products

In recent years, John Deere has added new models to its Self-Propelled Forage Harvester lineup and introduced a new high-horsepower 4-track tractor. New Holland in August announced a methane-powered concept tractor that "imagines the farm of the future" as being largely automated and completely energy independent, according to the company.

"At the level we're describing, (the process) is fundamentally the same" for each company, said Hansotia, a former John Deere senior vice president. "Each group has its own nuances that they try to focus on and do a better job, but the general strategy for both construction equipment and agricultural equipment generally follows this approach."

Given the complexities and challenges of farming, listening to and understanding producers' needs — whether articulated or not — is an

important early step in developing products, said Mike Park, a John Deere regional product marketing director.

"Today, that has resulted in products and solutions that focus on how we make the execution of in-field jobs easier, smarter and more precise," Park said in an email. "Along with innovation, quality is also a critical deliverable and an expectation of our customers. Delivering on both areas factors into the overall development process."

Within John Deere, cross-discipline teams collaborate and translate what they hear from customers into specifications and features for future designs, making the process a "team sport," Park said.

"This is especially true as you look at precision agriculture, where we are combining equipment and technology and dealer support," he said. "Our development processes not only consider what the solution should be, but also how we can 'go to market' in a way that John Deere dealers are committed to providing the best experience and support."

This is done through training and investment in people, resources and tools, Park said.

For the IDEAL combine, AGCO started by "embedding" its professionals in the operations of farmers, shadowing them and listening to them



AGCO
The IDEAL combine. It took years and \$200 million to design it from the ground up.

describe the problems and issues they face, Hansotia said.

The company then drew up a specification and started mapping out different scenarios for the new combine on paper to develop a "wish list" of features the new machine should have, he said.

Then engineers started designing the machine on computer, creating virtual prototypes in a lab and testing their functions in various conditions. In the meantime, the company starts to plan supply management, customer support and what has to be in the design to make it possible to manufacture, Hansotia said.

Once the plan is set, a "cross-functional team" designs specific elements such as the tracks, the gear box and other features, he said. The company went through several iterations of virtual prototypes before putting the first machines in fields, he said.

From there, "waves of prototypes" tackled "corner conditions" — the most difficult conditions the engineers could think of — and underwent numerous durability tests, and problems that were discovered in the field were solved in the lab, he said.

Performance key

"In the field, it's about performance — making sure the machine performs well with every crop in every condition," Hansotia said, adding that teams compared the new combine with competitors' machines in the same fields.

While these physical tests were going on, other teams did six different virtual builds to make sure all the components fit together and the machine could be serviced easily, Hansotia said.

When the new combine was nearly

ready, the company started planning its rollout, including a social media campaign to generate buzz and an event for dealers and media to introduce the new model.

"The amount of intelligence on this combine is 5 million lines of code," Hansotia said. "The first space shuttle that went up had a half-million lines of code. This machine steers for itself, gears for itself and ... is automatically adjusting itself in real time based on sensors and software intelligence."

Depending on the features a buyer chooses, the new combine and head could list for as much as \$500,000, Hansotia said. The company's goal is to sell 2,500 a year, he said.

"Interestingly enough, many of the big professional farmers ... sometimes buy a new one every one or two years," he said. "Then they sell it to another farmer. (Combines can) go through five different farmers' hands over 17 years."

Updates common

Similarly, Case IH gathered extensive input from customer focus groups and translated it into technical specifications, Shuman said. Once the product was defined, the first step was to "build a functional mule to prove the concept," he said. Then additional prototypes were built and tested "to really iron out the product performance and reliability," he said.

Totally new products like the IDEAL combine or Trident combination sprayer are rare, however, as the industry mainly focuses on updating equipment, the executives said.

"For sure the highest percentage (of projects) is improvements to current products," Shuman said.

But even some of the improvements can involve a two- or three-year process, Hansotia said.