Detroit Auto Scene®

OU Students Learn Efficient Work Habits At Chrysler's Manufacturing Academy

by Irena Granaas

"Okay, Tom, it's time to suit up!"

That was the word from Jeff Dobski of the Chrysler World Class Manufacturing Academy on a recent Tuesday night in April.

Tom Duchaine, a Fourecia Quality Department employee working at the Chrysler Sterling Heights Assembly Plant as a quality inspector, was one of about a dozen students from Bill Edwards' Human Factors Engineering & Ergonomics class, an elective for Industrial and Systems Engineering students in Oakland University's School of Engineering and Computer Science.

The students get an opportunity for hands-on learning at Chrysler's WCM Academy in Warren.

The "suit" in question was a black motion capture body suit equipped with tiny lights. Duchaine donned the special suit as he prepared to attempt the partial assembly of a toy bike. As he moved, Duchaine's every motion was monitored throughout the cycle time in a simulated work station.

"The 3D equipment captured the movement of Duchaine's body and of every joint with a fine degree of precision," Edwards said. "Even the pulse of his heartbeat could be noticed in his index finger."

After Duchaine went through the process once, the initial workstation layout and assembly were quantified. The motion capture equipment highlighted the "spaghetti path" the operator took with high reaches and low bending, and the work each hand was performing.

Edwards explained that the challenge for students who were tasked with analyzing the data and improving the process was to get all of the worker's movements in the "golden zone," which he defines as the best place for a worker to do work, with parts and tools two inches below the elbow ("make gravity your friend") and right in front of the operator.

"The suit generated Tom's path of motion . . . You don't want to reach, stoop and bend," Edwards explained. "You want to tighten the strands of spaghetti. The suit captured the length of motion, path of motion and his time to assemble."

Then it was the turn of competing teams of students to go to work. The students drew upon their knowledge learned from the HFE class and other lean process classes to optimize the assembly process, reducing the motions needed, have tools at the ready and the work piece properly positioned in the golden zone in front of the operator and limited the operator's need to fight against gravity.

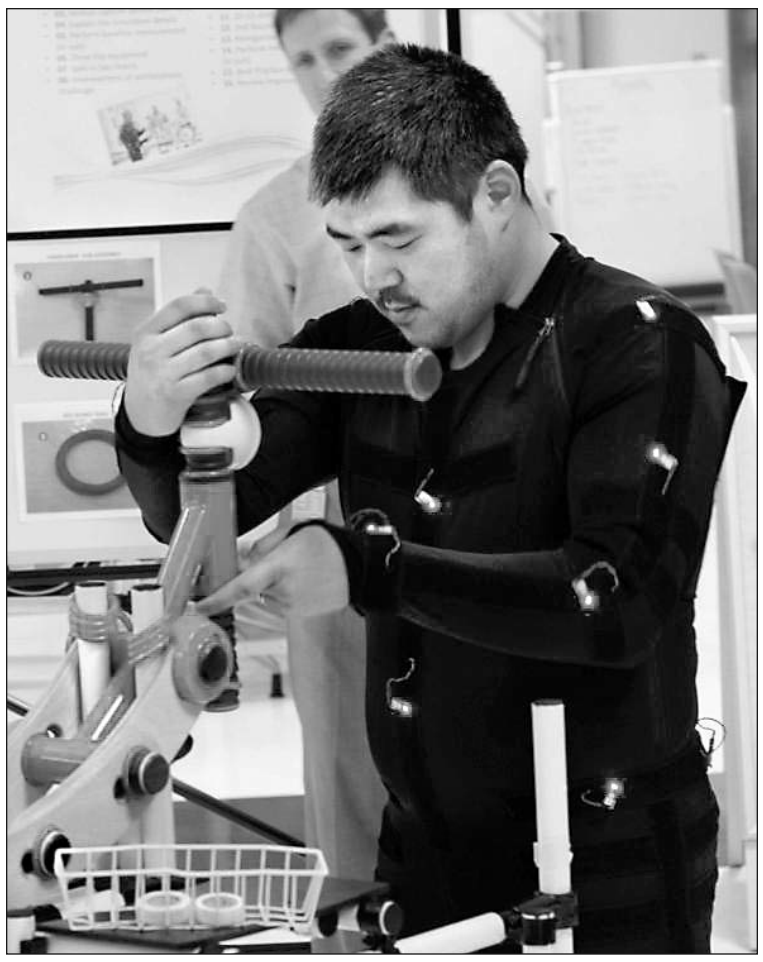
It's all part of the science of ergonomics, about which Edwards said, "It's all about designing the job to fit the person, not the other way around.

"Ergonomics was given secondary thought in the past, but the industry has really taken note of it for a couple of reasons," he said. "You get a better product out of it, worker fatigue and carpal tunnel issues are drastically improved based upon the science of ergonomics being given a higher priority.

"Some of the benefits are, you get a better quality of work, faster work, increased throughput, reduced waste and overall leaner efficiencies and systems, which is what we do here in Detroit and which has done a lot for manufacturing.

"These resulting increased efficiencies, quality improvements and higher productivity are a key part to Chrysler's comeback in recent years. Even some of the Chrysler employees have acknowledged going to the academy has made them more efficient, and it's why the automaker wants to eventually send nearly all their employees through the academy, from line workers to supervisors and even administration assistants."

Edwards, who spent 12 years with Chrysler and served as an engineering manager at the time he left the company for Oakland University, sees class trips of this type to Chrysler's WCM Academy as a chance to "marry" the industrial elements with the academics.



Tom Duchaine wears a "motion capture" suit while assembling a bike.

Duchaine said ergonomics is a valuable subject for engineers to have a working knowledge of, and was favorably impressed.

"I think it was a highly effective demonstration of technology and its use in the optimization of a production environment where there's an operator involved," he said. "Also from students' perspective, it reinforced what we learned in Dr. Edwards' class . . . Any engineer who has (the opportunity) available should take this course, in my opinion."

It Takes a Village for Successful Car Design These Days

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that each market has its own rules and regulations, and that vehicles must be designed and made to fit these rules, increasing the complexity of the whole process.

So for OEMs to stay competitive, they are relying more than ever on new technologies and softwares, he said, technologies they might not be that familiar with.

It's now possible to change the performance of new cars just by changing the software used to operate the vehicle, Przybylinski said. He has a friend who designs hydraulic brakes. When he last spoke with his friend, he was told that he's not a brake designer, he's a software designer.

But achieving quality isn't as simple as embracing the concept of quality, Przybylinski said, adding that OEMs must have systems in place throughout the entire design process and these systems must be embraced by everyone, from in-house engineers to contractors to suppliers who make the parts and design their own systems that they supply to car companies.

"PLM is a strategy that must support the product from ideation to the end of the life of the product," Przybylinski said. "That means when you design something, you have to know how the vehicle and its parts will be recycled at the end of the car's life."

That's part of "designing for everything." The batteries of electric cars just can't be thrown in a landfill. OEMs must have some sense of what to do with those batteries when designing electric cars.

Jim Staargaard, president of Plasan Carbon Composites, said his company is only a few years old. Its first plant is in Vermont and makes carbon fiber parts the traditional way, which takes them about 90 minutes to convert carbon fiber into parts like a hood or roof. On the other hand, their new Grand Rapids plant uses a new method that allows them to shorten that time to 17 minutes.

Staargaard said the company is working on making that time even shorter by coming up with new formulas for carbon fiber that will be easier to press and mold.

He said they didn't wait until they could reduce processing times of carbon fiber production further, because it's important to have revenue now while developing better materials and processes for the future.

With the emphasis on lightweighting by OEMs, suppliers will continue to work in improving substances like carbon fiber. The problem, Staargaard said, is that people don't know as much about carbon fiber as they do about steel or aluminum. It's easy to program the characteristics of steel into a computer so that engineers can design parts on computers.

They can't do that now with carbon fiber. So having a company like Dassault Systemes, with its processes helps companies like his, Staargaard said.

The future of the car business will depend on separate companies being on the same page when developing complicated vehicles that use more computer code than today's F-15 fighter.

"We're the Marines on the beach," Staargaard said. "We're educating the OEMs on just what can be done."

Michael LaLande, director of Transportation and Mobility for Dassault Systemes, said reaching a target of zero defects means starting at the beginning of the design process.

It's now possible to create 3D computer constructs that can accurately show how parts and vehicles will perform in real life without having to build expensive prototypes. That's done by all parties being connected at every stage of production. Dassault specializes in that, LaLande said.

By being connected in real time, OEMs and suppliers can communicate quickly and get the turnaround times they need to stay competitive in a global market that is constantly introducing new players, he said. That's the future and it's here now.