

WMU engineering students find sustainable solutions

By Hannah Ball

A group of Western Michigan University engineering students search for a sustainable solution to Steelcase's wood waste, but a few students think they're looking in the wrong place.

When Industrial Engineering master's student Emilia Nunez enters a Steelcase Factory near Grand Rapids, she's adorned in her PPE, personal protection equipment: steel-toed boots, safety glasses and earplugs. She walks in the spacious area and sees the different units and a well-arranged factory. The workers have a great space to work, she said, and there's great lighting. It's loud. She's there to observe and report.

Her on-going mission: find ways for Steelcase to be more sustainable with the wood waste it produces.

A covering of wood, called veneer, has the biggest defect rate at Steelcase, said Marilyn Glass-Hedges, a project manager and WMU engineering graduate student. The veneer becomes loose when the core separates from the top and bottom layers. Eight undergraduate and graduate engineering students, including Nunez, have been working through the Green Manufacturing Industrial Consortium (GMIC) to find a solution to this problem since the last week of February.

The GMIC is a mix of Western Michigan University faculty and students from different departments such as chemical engineering, environmental studies, industrial and manufacturing engineering and other engineering programs who work with companies to improve their operations and make them more sustainable. These companies become members with the GMIC and pay an annual fee of \$25,000. Currently the GMIC has four members: Fabri-Kal, Landscape Forms, Ploy-Wood and Steelcase.

The students visit a factory two to three times a week to observe the workers, report on the problems, or flow interrupters, and then recommend solutions for how the company can reduce the amount of waste produced.

At Steelcase, the veneer passes through two hot-presses and a water mister before being painted. The students are trying to figure out the cause of the veneer separating.

Glass-Hedges said they started looking for the loose veneer problem at the hot-press because it's where Steelcase thought the problem occurred, and it's where the veneer is put together.

At Steelcase, the workers have a great place to work in the open space, Nunez said. However, during the first day of observing, the students noticed inconsistencies. The main problems were careless material placing and exposed cores, which result from being in the hot presses for the wrong amount of time.

"The big one is regarding how they arrange their material," Nunez said. "They have to put [on a] back material and then a top material. The materials, once they go in the top and in the back, are arranged according to the date of production." Nunez said sometimes workers don't use the correct backing, which is a big flow interrupter.

The hot presses have different settings for different materials. Lumineer goes in the hot press for 60 seconds and laminate for 50 seconds, Nunez explained, but the workers don't always change the setting based on the material.

Another flow interrupter is the mister.

After the veneers are assembled and go through the hot-press, they are sent through a small press where they are sprayed by a mister to relax the wood. The mister uses more compressed hot air than water, which is a waste of compressed air, Glass-Hedges explained.

A lot of GMIC projects focus on waste reduction, diverting waste going to the landfill, increasing recycling, and being more sustainable and green, Glass-Hedges said. The loose veneer project is the third issue the students are trying to solve at Steelcase.

Paul Van der Nat, a customer satisfaction Leader at Steelcase Inc., said the factory is “still having difficulty trying to control processes and the scrap rate.” He described the hot-press as a “high-volume area” because it’s where the veneer is put together.

Steelcase hasn’t implemented some of the students’ suggestions, Van der Nat said. The factory has to think about cost analysis to see what changes can be made.

“Sometimes we’re constrained by the footprint of the machine,” Van der Nat said, adding that it can be challenging to replace an entire machine, like the hot-press.

Van der Nat said Steelcase is “being as green as we can. We have to be stewards of the resources that we have.” The factory sends most of the leftover wood scrap to another supplier to make wood chips, and they separate the compostable trash from recyclables.

“We try to do whatever we do with a sustainable and green mindset,” said graduate student Michael Saldana, adding that optimizing the workspace is one of the things they look to do in this project. Steelcase can find newer machines and eliminate unnecessary processes to be more sustainable, Saldana said.

By being more sustainable, these companies can reduce the amount of energy they use, Saldana explained, which saves fossil fuels and costs less.

“Specially, by saving waste, which is wood, we can say we’re pursuing sustainability,” Saldana said.

The GMIC team met with Steelcase on March 23 to discuss improvements and progress. Glass-Hedges said the company made a few improvements. They changed the hot-press time to 60 seconds for lumineer and laminate, but they still hadn’t adjusted the misters.

The veneer separation problem may not occur where Steelcase initially thought. “We also have reason to believe that it’s happening but not necessarily at the hot press,” Glass-Hedges said. “That’s our recommendation that came from it. We need to start looking outside the hot press because we’re not seeing it here.”

Glass-Hedges said these projects have a need for objectivity so they don’t become biased.

In the future, Glass-Hedges said they still want to explore the exposed core issue because it’s the highest defect, and the material coordination issue.

Nunez and the other students will return to Steelcase in their steel-toed boots, safety glasses and earplugs to find the loose veneer problem to provide the company with sustainable solutions for their waste.