

## UNC Charlotte – Lee College of Engineering Senior Design Program

### Senior Design Project Description

<b>Company Name</b>	<i>Huesker Inc.</i>	<b>Date Submitted</b>	<i>11/27/2019</i>
<b>Project Title</b>	<i>Design and Fabrication of Raw Material Handling System (HUES_SYS)</i>	<b>Planned Starting Semester</b>	Spring 2020

#### Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

<b>Discipline</b>	<b>Number</b>	<b>Discipline</b>	<b>Number</b>
Mechanical	5	Electrical	
Computer		Systems	1
Other ( )			

#### Company and Project Overview:

Huesker is a global player in the development of multi-functional geotextiles and the design of sophisticated combined applications for separation, filtration and drainage.

Committed to replacing conventional construction methods with providing ingenious and sustainable solutions applying state of the art and highly effective technical textiles.

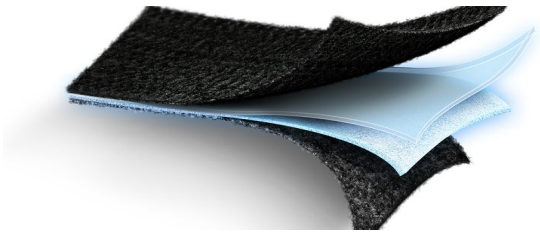
Huesker products are used in a wide variety of applications, including roads and pavements, environmental engineering, hydraulic engineering, agriculture, industry, and mining.

Examples of a few of our products are shown below:



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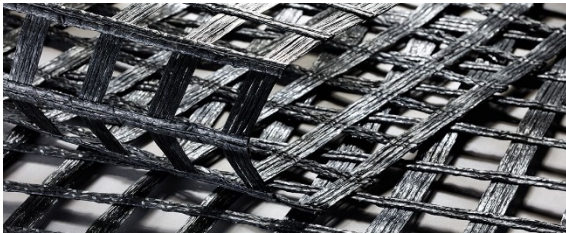
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A geosynthetic composite, combines properties of multiple different fabrics for specialized applications



Ultimat TGS is a geocomposite absorbent nonwoven used primarily for its water retention properties in green roof



High-strength geogrid for road base and sub-base reinforcement.



The World's Strongest Woven Reinforcement Fabric -- Strengths of up to 2,800 kN/m



The high-tensile geogrid, which is polymer-coated to protect against UV radiation and installation damage, provides



A Flexible, high-strength, temperature-resistant grid for effective reinforcement of asphalt layers.



Since 1994, Minegrid has been used to recover longwalls, support ribs, and reinforce highwalls in mines and quarries around the world. Minegrid has proven itself in the most extreme conditions and has always been the industry standard for quality.



Installation of a Minegrid.



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## **Project Requirements:**

Needle-punching composite fabrics is a huge part of Huesker's production facility here in Shelby, NC. The needling machinery has been in this plant since its creation and when it was bought by Huesker over 20 years ago, the machines stayed. In those 20 years, we have begun to produce a much wider and more complex range of products.

These machines were not built for managing so many types of different types of material (size, weight, type). When a composite fabric is needled together, the properties of the different fabrics are combined to achieve a singular composite with the desired traits.

Currently at least 3 different materials are fed on rolls through the back of the machine, these rolls of fabric are placed onto "A" frames and aligned to create a uniform final product. Since the composite specs call for such large widths, usually multiple rolls of the same material are placed side by side to achieve that result.

This method is not dynamic, when rolls need to be changed or the material on the roll runs out, it is a labor and time intensive process to get the machine started again with new material. This creates inefficiencies in our process as well as the risk of producing off-standard material.

***The goal of this project*** is to design and fabricate a system to ensure easier and quicker raw material changes, less variation in the final product and a safer working environment.

Pictures of current system and machinery shown below:



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*Side view of entire machine 1: Material sits in-between two needle punching lines. Shown is three different material layered together*



*Side view of entire machine 2: Material sits in-between needling line and material hopper. Multiple rolls side by side to get desired width.*



*Material Feeding into Machine: Different materials, lengths and sizes of rolls. All being pulled through the machine*

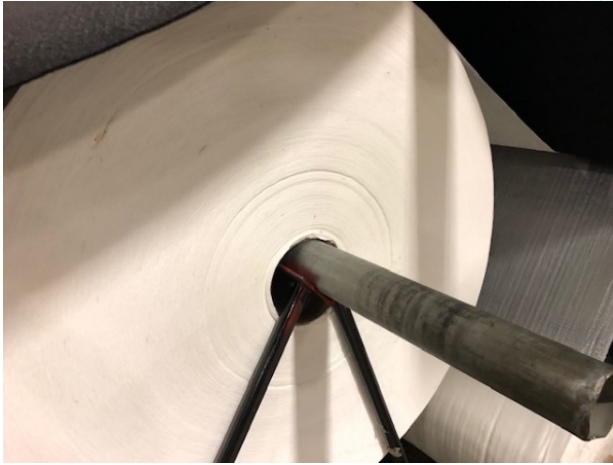


*Material Set Up in Machine: Rolls are close together causing issues when changes occur and when replenishing material.*

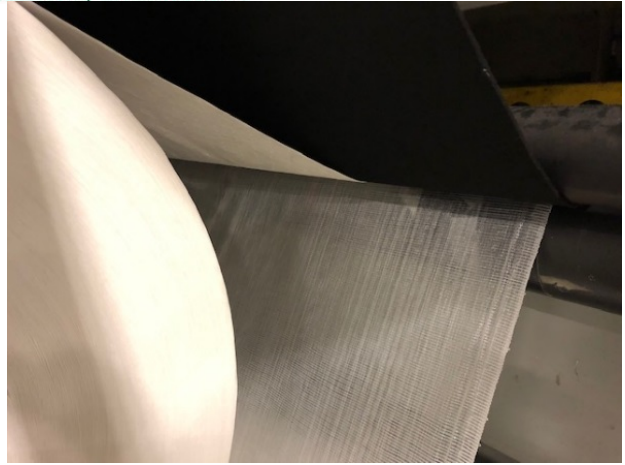


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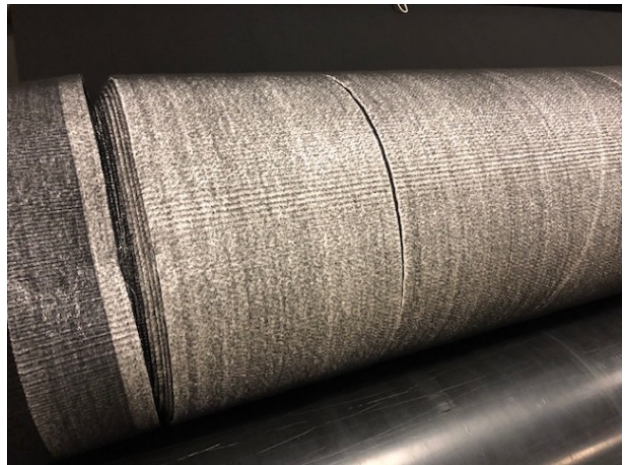
*Current Material Stands:* Rolls are situated on a metal rod that is held by two movable A-frames, with wheels.



*Material Feeding directly into machine:* Fabrics are pulled into machine in a single sheet where needles puncture through all layers to intertwine fibers. Alignment is important.



*Front of machine/finished material take up:* The composite material consisting of multiple fabrics is rolled onto the batch device where it is cut to specifications.



*Finished Product:* Finished composite consisting of 3 different fabrics. The black backing fabric has fibers connected through all layers to keep material together.

**Expected Deliverables/Results:**

- Prototype drawings, equipment and fixtures that can be integrated with the existing machinery.
- SOPs (Standard Operating Procedures) for installation of new system, operation, and maintenance.
- Since this project may require large fabrication, due to limitations, accurate design documents and proof of concept are acceptable.
- An analysis of possible cost saving, material usage, and safety improvements.

**Disposition of Deliverables at the End of the Project:**

The work product is displayed at the last Expo then immediately handed over to the supporter. Transportation, if necessary, will be provided by Huesker Inc.

**List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):**

- Will need to travel to Huesker facility in Shelby NC as required to understand the current system and gather data for analysis and design phase. Testing of solution will need to be done as well at the Shelby facility.