Oil Field Spill Containment System

Overview
Fluids associated with Oil and Gas drilling and fracturing operations must be contained at well sites. Currently, there are only two companies on the market manufacturing and leasing mat systems to contain spills but their mats are very expensive, difficult to install, and most importantly, not leak-proof. Our sponsor, Polymics Ltd., specializes in making high strength polymers and is the supporter of our project both financially and professionally.

Objectives
Our objective for this project was to design, model, and prototype a leak-proof interlocking joint mechanism for large mats to be deployed on oilfield well sites. The team’s goal was to surpass any company in the industry in both quality of product and professionalism of business by ultimately delivering to our sponsor a ¼” scale working prototype and intensive finite element analysis models.

Approach
- The first thing we accomplished to get the project rolling was to meet with our sponsor and clearly define the project objective. We determine their expectations so we could meet and exceed them.
- The team carried out an intense patent search where our future design would be developed from.
- A field visit to an Anadarko owned well site in Williamsport PA was attended by group members and from this nine critical needs were determined ranging from sealing capabilities to shape of the mat.
- Ranking of these customer needs determined sealing capabilities to be number one, field usable two, and safety number three.
- For each need determined from internal/external searching, engineering specifications were set based primarily on sponsor requirements and existing product (NewPark) benchmarks.
- The team generated four concepts and selected the threshold design to pursue into detailed design.
- Next, to scale Solid works models of our prototype were created to aid in the manufacturing phase.
- The team manufactured the entire prototype from polymer mats supplied by sponsor and materials ordered from McMaster-Carr.
- Sealing capabilities of the prototype were tested in detail and design changes were made every iteration.
- The patented Polymics material was created in Solid works and significant FEA stress and bending models confirmed our testing results.

Outcomes
Below are the results of our prototype testing and the team’s recommendations for further development.
- Current assembly successfully prevents leakage up to 1 minute under a ½” of hydrostatic pressure.
- The sponsor can lease mats for less than $14/day allowing them to dominate the market in this industry.
- Prototype reduces current use of $150,000/well site liner cost and satisfies all customers’ requests.
- Taking into account recommendations outlined in the final report, the mat assembly and curb design are ready for full scale production and testing. All project deliverables have been satisfied.