**The Team:**

- Evan Quaas
  - Project Manager
  - Mechanical Engineer
- Nick Krouse
  - Mechanical Engineer
- Alex Williamson
  - Industrial Engineer
- Jordan Murphy
  - Mechanical Engineer
- Nick Beduhn
  - Mechanical Engineer

**Mission Statement:**

Northern Lights Engineering will innovate the boom seam table drive system at Altec Industries’ Duluth facility by improving worker safety conditions and increasing overall ergonomics of the mandrel and carriage system by at least 10% while maintaining overall productivity of the workstation expected to be implemented by May 2017.

**Objectives:**

The main focus of this project was to increase worker safety and ergonomics at the boom seam table workstation by at least 10%. The Team focused on ensuring safety standards of the new design met Minnesota OSHA and ASTMS regulations. More specifically, the new design eliminated root causes of near misses worker injuries involving mandrel jerk, mandrel misalignment, and chain slack. The Team worked to design a new system that implemented into the plant in less than two days downtime.

**Key Design Requirements:**

- Synchronized and independent motion of mandrel and carriage.
- Freewheel and reverse drum motion of winches.
- Variable line speed of cable.
- Safety guarding of pinch points.
- Fairlead of cable being wound on winch in order to avoid birdnesting.
- Overload safety.

**Design**

**Tiered Winch Table**

**Hydraulic Manifold**

**Electrical Circuit**

** Implemented System**

The final design solution enables the operator to better control the boom seam table process by allowing for either independent or simultaneous pulling of the carriage and mandrel through the utilization of two winches. The system also allows for variable speed control of both winches as an added safety feature. The operator is able to control the drive system via a new wireless transmitter. This hydraulic drive system increases safety by eliminating chains and pendent cords from the workstation.

**Economic & Safety Impact**

<table>
<thead>
<tr>
<th>Level of Risk</th>
<th>Score</th>
<th>Safety/Ergonomic Criteria</th>
<th>Old System</th>
<th>New System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible risk</td>
<td>1-2</td>
<td>Routing and attaching of chains/cable</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Low risk</td>
<td>3-4</td>
<td>System control and operator mobility</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Medium risk</td>
<td>5-6</td>
<td>Winch linear line speed</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>High risk</td>
<td>6+</td>
<td>Relief valve setting</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Average Level of Risk</td>
<td>4.5</td>
<td>2.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 50% increase in safety and ergonomics
- Total cost of project: $6,133.00
- Preventing even one accident for the process can save Altec Industries as much as $24,000