Starflex Fabrication is a manufacturing company located in College Park, GA. The company strives to provide custom, precision fabricated parts, and assemblies to their customers. Starflex uses a 4,000-watt Mazak Laser to cut metal sheets as large as 5' x 10' and up to 1” thickness. The laser is continuously being used throughout each work day cutting various metals for different jobs. The Mazak laser is an imperative machine in the shop and must be maintained to ensure an efficient workday.

### Data Collection

- A Wyze Cam was set up in the shop to observe the use of the Mazak Laser.
- 36 time trials were taken and evaluated below.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser Bed Unloading Time</td>
<td>2.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Laser Bed Cleaning Time</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Machine Down Time</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

- The Wyze Cam showed the time to remove slag from the slats on the laser bed is on average 2 ½ hours long weekly.
- The laser lens also needed to be cleaned on average of once a week that took 20-50 minutes.

### Solutions

- The ideal solution for the loading process is a crane with a vacuum lifter attachment.
- This solution is not feasible for Starflex because the minimal area of improvement of the loading process.

Feasible solution for the unloading process would be using a single/double/triple pallet forklift attachment that would mimic the unloading process of the Mazak laser unloading cell.
- The operator will be able to lift finished jobs from the laser bed and move to another area to be sorted.
- With the laser bed being cleared faster the operator will be able to continuously cut jobs with the Mazak laser, improving throughput.

The feasible solution for the cleaning process is to add new tools to the process and a slat protective.
- The air chisek vibrates the slag off of the slats that builds up from cutting.
- Slat Guard is a protective coating that helps prevent slag build up and increases slat lifespan.

The feasible solution to reduce the machine downtime during the laser cleaning would be to add an additional lens to the shop.
- Adding an additional laser would allow for one laser to be ready for use after taking the dirty lens out. Allowing the laser to continue the cutting process.

These changes to the process of laser operation and maintenance has a projected increase of 22% to shop production.

### Analysis

- The data collected from the Wyze Cam showed the critical area of improvement is the unloading process.
- Some jobs require parts to be removed on the laser bed before moving on to the next job. Some jobs are able to be removed with a forklift and parts can be sorted and separated in another area.

- A bottleneck that occurred during the maintenance of the laser was caused due to the tools being used.
- The operator was removing the slats individually and hammering the slag off of the slats.
- Sometimes causing damage to the slats which required future replacement.

- The laser lens maintenance took between 20-50 minutes because recalibration takes place after cleaning.
- One laser lens sits in storage while the operator reuses the same lens until it is damaged.

### Cost vs. Benefits

- The cost analysis of the Maintenance Solution showed:
  - Cost of Maintenance Solution: $X
  - Benefits of Maintenance Solution: $Y

- The cost analysis of the Unloading Solution with a Mazak Machine showed:
  - Cost of Unloading Solution w/ Mazak Machine: $Z
  - Benefits of Unloading Solution w/ Mazak Machine: $A

- The cost analysis of the Unloading Solution with Forklift Attachment showed:
  - Cost of Unloading Solution w/ Forklift Attachment: $B
  - Benefits of Unloading Solution w/ Forklift Attachment: $C

- The cost analysis of the Slat Guard/Air Chisel Solution showed:
  - Cost of Slat Guard/Air Chisel Solution: $D
  - Benefits of Slat Guard/Air Chisel Solution: $E

- The cost analysis of the Laser Lens Rotation Solution showed:
  - Cost of Laser Lens Rotation Solution: $F
  - Benefits of Laser Lens Rotation Solution: $G