Mazak Laser Optimization
Team Flex

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Background

- 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

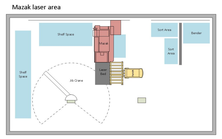
- A Wyze Cam was set up in the shop to observe the use of the Mazak Laser.
- 36 time trials were taken and evaluated below.

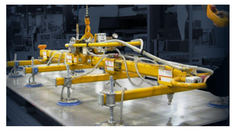
Statistics	Unload	Load
Total	4:54:12	1:03:44
Trials	36	36
Min	0:02:41	0:00:47
Max	0:15:47	0:05:00
Average	0:08:10	0:01:46
Std Dev	0:03:58	0:00:52
Average load/unload difference		0:06:24
Standard Dev		0:03:49

- 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.

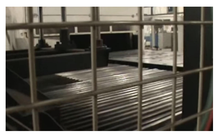
Solutions

- 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.

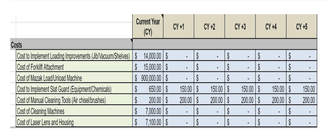
Analysis

- 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.

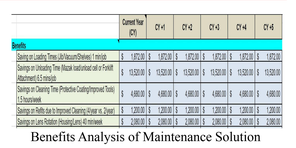
- The laser lens maintenance took between 20-50 minutes because recalibration takes place after cleaning.
- One laser lens sits in storage while the operator reuses the same lens until it is damaged.

Cost vs. Benefits



	Current Year (CY)	CY+1	CY+2	CY+3	CY+4	CY+5
Costs						
Cost to Implement Loading Improvements (JIB/Vacuum/Shelves)	$ 14,000.00	$ -	$ -	$ -	$ -	$ -
Cost of Forklift Attachment	$ 15,000.00	$ -	$ -	$ -	$ -	$ -
Cost of Mazak Load/Unload Machine	$ 900,000.00	$ -	$ -	$ -	$ -	$ -
Cost to Implement Slat Guard (Equipment/Chemicals)	$ 650.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00
Cost of Manual Cleaning Tools (Air chisel/brushes)	$ 200.00	$ 200.00	$ 200.00	$ 200.00	$ 200.00	$ 200.00
Cost of Cleaning Machines	$ 7,000.00	$ -	$ -	$ -	$ -	$ -
Cost of Laser Lens and Housing	$ 7,100.00	$ -	$ -	$ -	$ -	$ -

Cost Analysis of Maintenance Solution



	Current Year (CY)	CY+1	CY+2	CY+3	CY+4	CY+5
Benefits						
Savings on Loading Time (JIB/Vacuum/Shelves) 1 min/job	$ 1,872.00	$ 1,872.00	$ 1,872.00	$ 1,872.00	$ 1,872.00	$ 1,872.00
Savings on Unloading Time (Mazak load/unload cell or Forklift Attachment) 0.5 min/job	$ 15,520.00	$ 15,520.00	$ 15,520.00	$ 15,520.00	$ 15,520.00	$ 15,520.00
Savings on Cleaning Time (Protective Coating/Improved Tools) 1.5 hours/week	$ 4,680.00	$ 4,680.00	$ 4,680.00	$ 4,680.00	$ 4,680.00	$ 4,680.00
Savings on Refits due to Improved Cleaning (Kwax or Zircon	$ 1,200.00	$ 1,200.00	$ 1,200.00	$ 1,200.00	$ 1,200.00	$ 1,200.00
Savings on Less Rotator Housing/Lens) All renewals	$ 2,580.00	$ 2,580.00	$ 2,580.00	$ 2,580.00	$ 2,580.00	$ 2,580.00

Benefits Analysis of Maintenance Solution

Cost Benefit Analysis	
Total PV Benefits	$ 9,547.57
Total PV Costs	$ 14,000.00
NET BENEFIT	(4,452.43)

Cost/Benefit Analysis of Loading Solution

Cost Benefit Analysis	
Total PV Benefits	$ 68,954.67
Total PV Costs	$ 900,000.00
NET BENEFIT	(831,045.33)

Cost/Benefit of Unloading Solution w/ Mazak Machine

Cost Benefit Analysis	
Total PV Benefits	$ 68,954.67
Total PV Costs	$ 15,000.00
NET BENEFIT	53,954.67

Cost/Benefits of Unloading Solution w/ Forklift Attachment

Cost Benefit Analysis	
Total PV Benefits	$ 29,989.16
Total PV Costs	$ 2,285.07
NET BENEFIT	27,704.09

Cost/Benefit of Slat Guard/Air Chisel Solution

Cost Benefit Analysis	
Total PV Benefits	$ 10,608.41
Total PV Costs	$ 7,100.00
NET BENEFIT	3,508.41

Cost/Benefit of Laser Lens Rotation Solution