OREGON TOOL

# 2022 MECOP

# Manufacturing Engineering Internship

## Phuong Tran

Internal Use Only

12/08/2023

# About Me

1. Phuong Tran - Boone
2. 3rd year Mechanical – Manufacturing Engineering major @OSU
3. 1st MECOP Internship
4. Oregon Tool in Portland, OR
5. Work was a blend of Mechanical & Manufacturing Engineering

# Agenda

1. Company Overview
    - Company History
    - Wage and Benefits
    - Reporting Structure
2. Projects
3. Helpful Courses
4. Overall Impression of Internship

# COMPANY OVERVIEW

# Company History

- 1947 – An avid inventor, Joe Cox designed the modern saw chain after witnessing a timber beetle larvae chewing through some timber in a Pacific Northwest forest.
- 1965 – Manufacturing plant established in Portland, OR.
- 2021 – Blount, Inc. renamed to Oregon Tool to remind us of our origins.
- Present – Oregon Tool is the #1 chainsaw manufacturer in the world.
    - Produce enough chainsaw in a year to circle the globe 1.5 times

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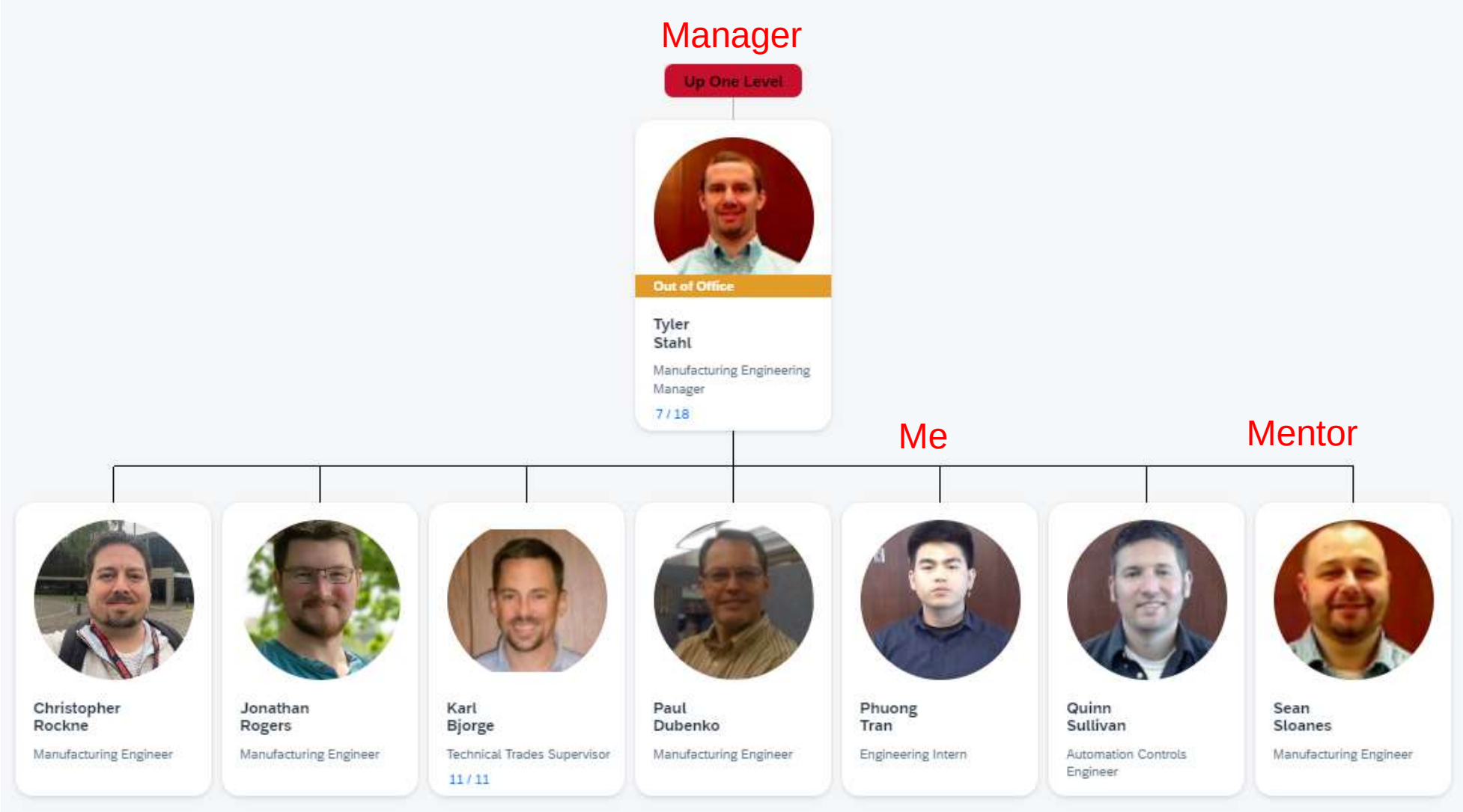
ICS® Diamond Tools and Equipment

BLOUNT INTERNATIONAL

# Wage and Benefits

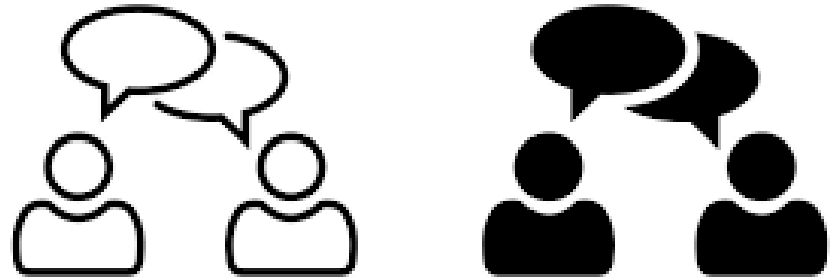
- Working Hours – 7:30 AM to 4:00 PM
- 40 hours per week, $25 per hour
- Benefit options for healthcare, life insurance, and disability insurance
- 401(k) match options
- Onsite gym
- Free snacks in the morning

# Reporting Structure



# PROJECT

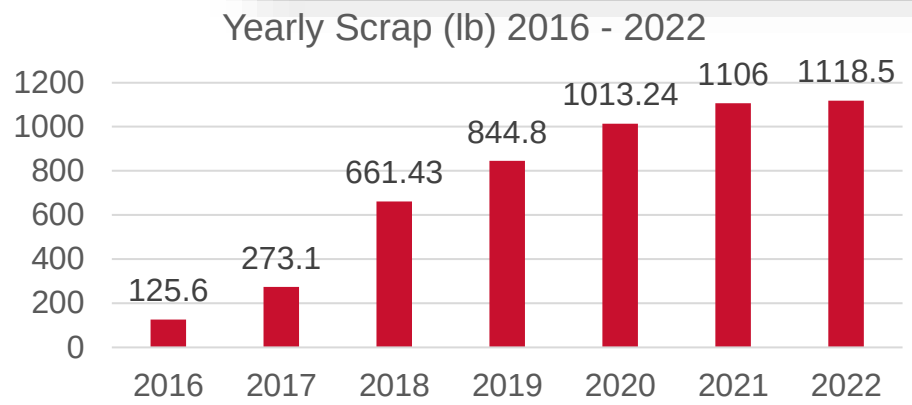
# Project Overview



- 10 total projects
- 6 Major projects (~ Months)
  - Data Collections, Test / Experiment, Root Cause Analysis
  - Idea Review I → Idea Review II → …
  - Prototype → Test / Experiment → Adjustments → Fabricate → Document Solution using Company ECR (Engineering Change Request) System
- 4 Minor projects ( ~ Weeks)
  - Small tasks + Urgency
- Departmental Interaction
  - Assembly
  - Part Processing / Heat Treat
  - Blanking
  - Cutter Grinder
  - Continuous Improvement (CI)
  - Manufacturing Department (MFGE)
  - Die Maintenance
  - CAD Design
  - Machine Build
  - Production Maintenance

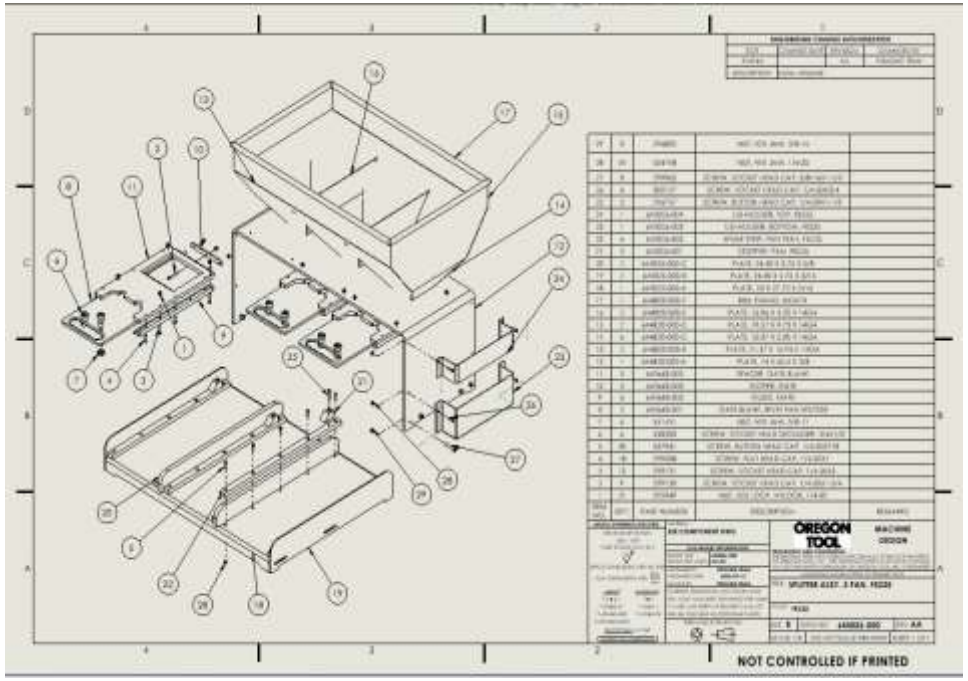
# Pan Splitter – Background (~3 months)

- **Problem Statement**: Cone type divider unequally distributed between 3 pans created scrap at FKS35 in Part Processing Department
- **Stakeholders:** Part Processing / Heat Treat, Manufacturing Engineer, CAD Design
- **Financial and Physical Impact:**
  - Yearly scrap (2016 – 2022): Increased from 125.6 lb to 1118.5 lb
  - Costing at least $2,800 per year*
- **Scope:**
  - Define requirements
  - Document design and hold design review meeting
  - Issue engineering drawings suitable for internal and external build

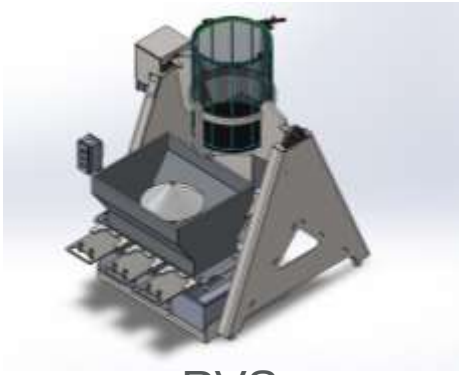



*Based on the lowest cost components

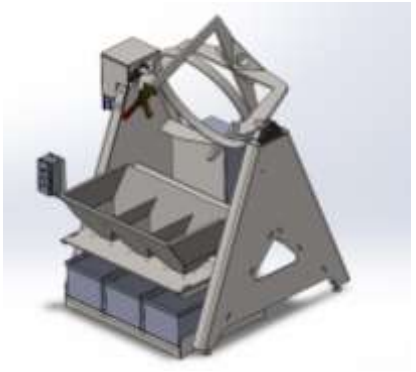
# Pan Splitter – Solution




- **Redesign a new Pan Splitter based on the 2 latest models in CAD file:**
  - **Requirements:**
    - Evenly distribution between 3 pans => Reduce scrap
    - Reduce cleaning and distribution time
- **What I learned:**
  - CAD Design, Communication and Investigation skills
  - Calculating and Measuring Volume of geometrically non-standard objects

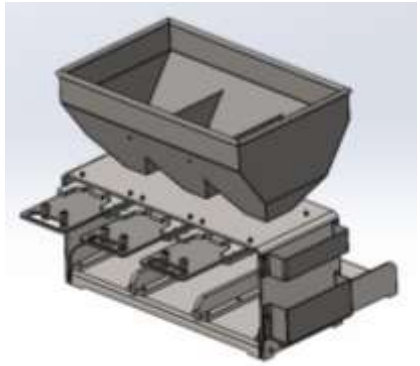


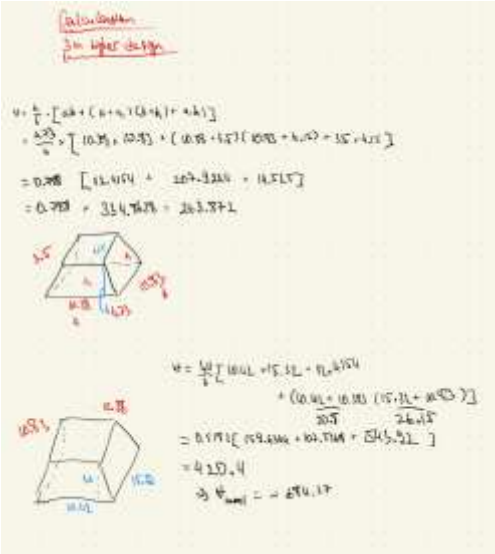
RVS



Part Processing

=







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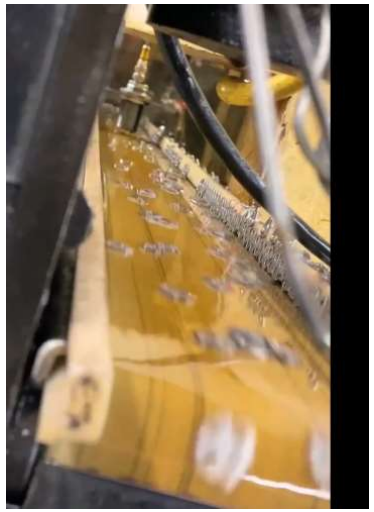
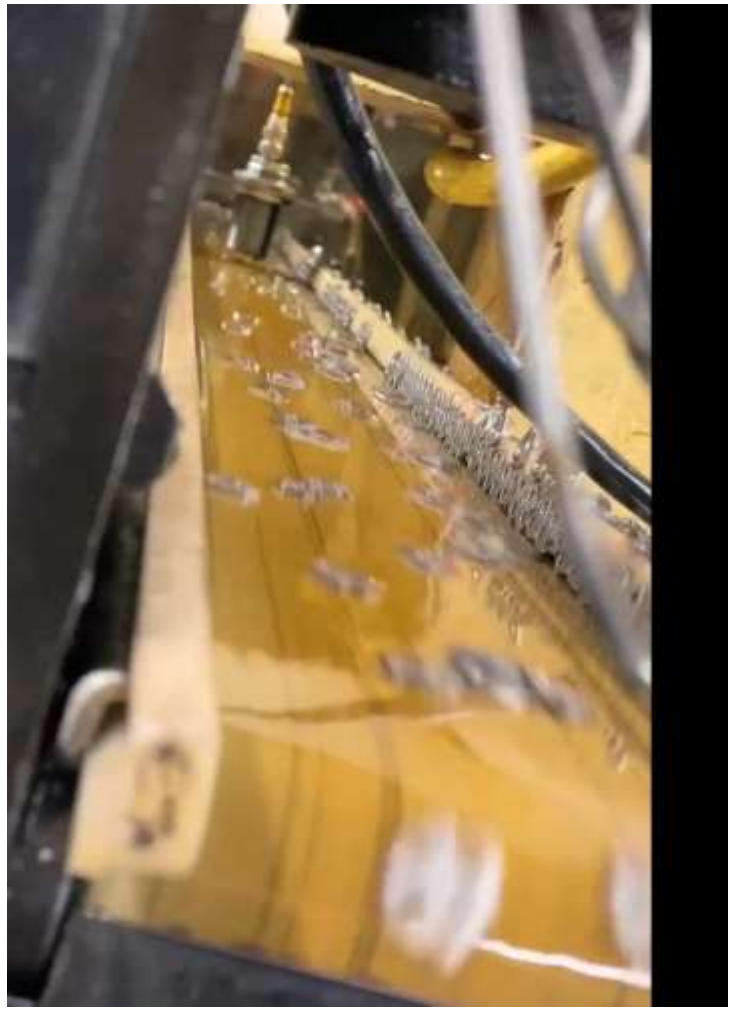
# Press Conveyor Lifter – Background (~3 month)

- **Problem Statement:** The Conveyors on Press 4, 7, and M3 need to be repositioned to properly collect parts from the Die Output Chute
- **Stakeholders:** Blanking, Manufacturing Engineering, Maintenance Mechanist, CAD Design Department
- **Financial and Physical Impact:** Each press generated $750 of scrap per year on average. Required labor intensive cleaning and left a disorderly work environment
- **Scope:**
  - Leverage existing concepts
  - Produce CAD & Drawing for Lifter Assembly
  - Procurement, Fabrication, Assembly of Mechanism
  - Deployment and Testing of lifting mechanisms



Use a block for leveling

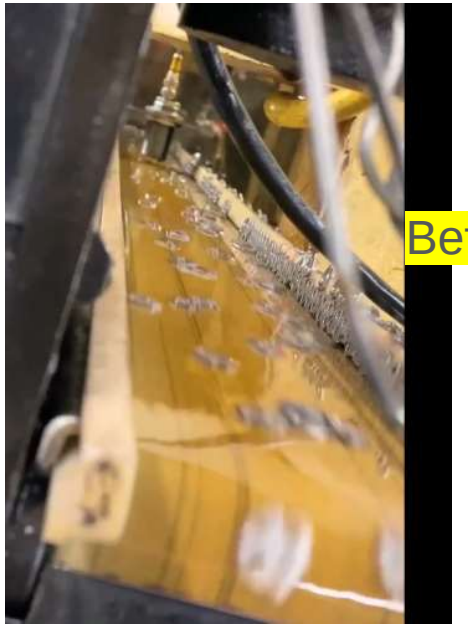
# Before



# After

# Press Conveyor Lifter - Solution

- **Design a Conveyor Lifter for leveling and Ramp for scrap reduction**
  - Reduce scrap, expecting each press save $600/year on average
    - Solution cost for each press: $165
      - Break-even in 3 months
  - Received thanks from Operators: Austin, Dan, J-Moon
- **What I learned:**
  - How to create a universal solution that fits all machines.



Before

After

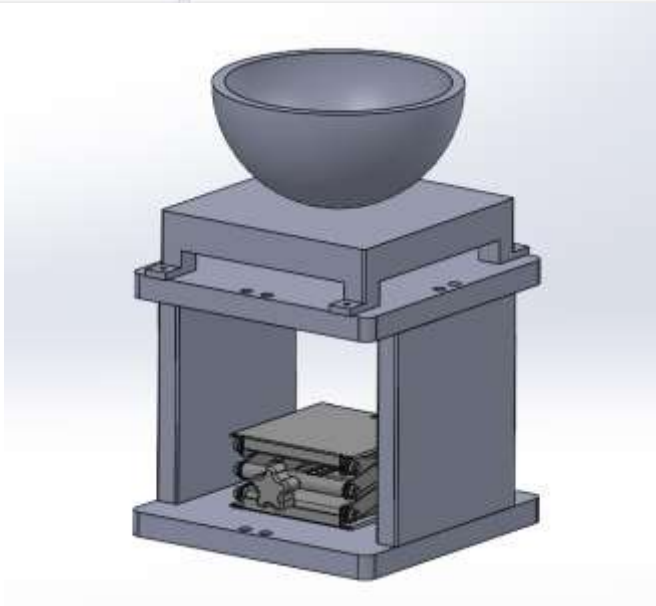
# Cutter Grinder Changeover – Background (2 months)

- **Problem Statement:** The Changeover Process from 4 Cutter Grinders – 18HX and 19HX – (48, 49, 80, 81) took 3 hours per machine on average.
- **Stakeholders:** Manufacturing Engineering, Machine Build, Cutter Grinder Department
- **Financial impact:** 3 hours down time per machine during changeover, leading to slow productions for both Cutters, affecting Operator's and Machine Build's time
- **Scope:** Document changeover procedure and reduce the changeover time.



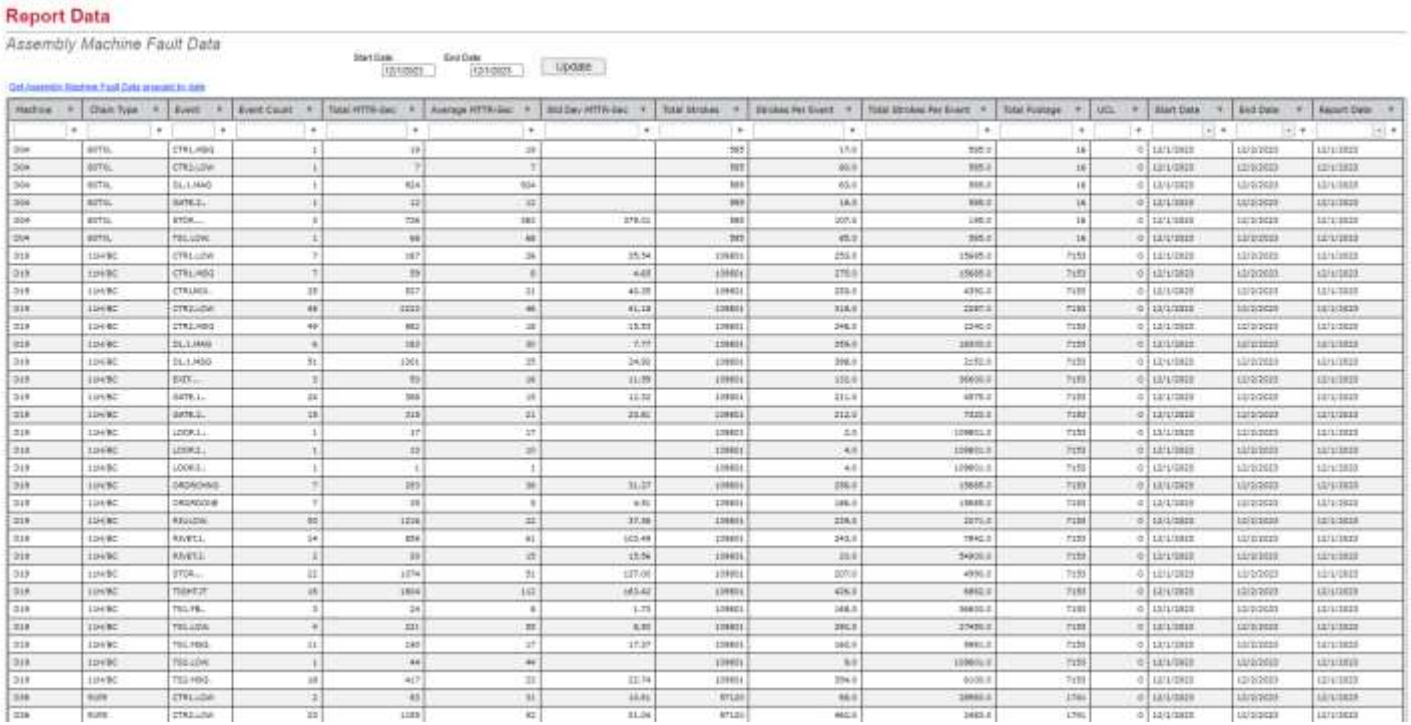

# Cutter Grinder Changeover – Solution

- **Document the changeover procedure:**
  - Seperated Internal vs External Activities:
    ~ 1.03 hours (34%)
  - Reduced problem solving and adjustment time:
    ~ 30 minutes (16%)
- **Implement a Bowl lifter:**
  - Adjusting Bowl's height instead of replacing Bowl + Bowl Riser:
    ~ 10 minutes (5%)
- **What I learned:**
  - Lean Manufacturing / SMED / Kaizen
    Eliminate the waste in production



# Assembly Machine Data – Minor Project

- **Problem Statement:** In the Cockpit's Chain Assembly raw data, it shows only the number of faults for each machine while we want to see the number of faults / hour.
- **Stakeholders**: Continuous Improvement, Assembly Department, Manufacturing Engineers.


Report Data

Assembly Machine Fault Data

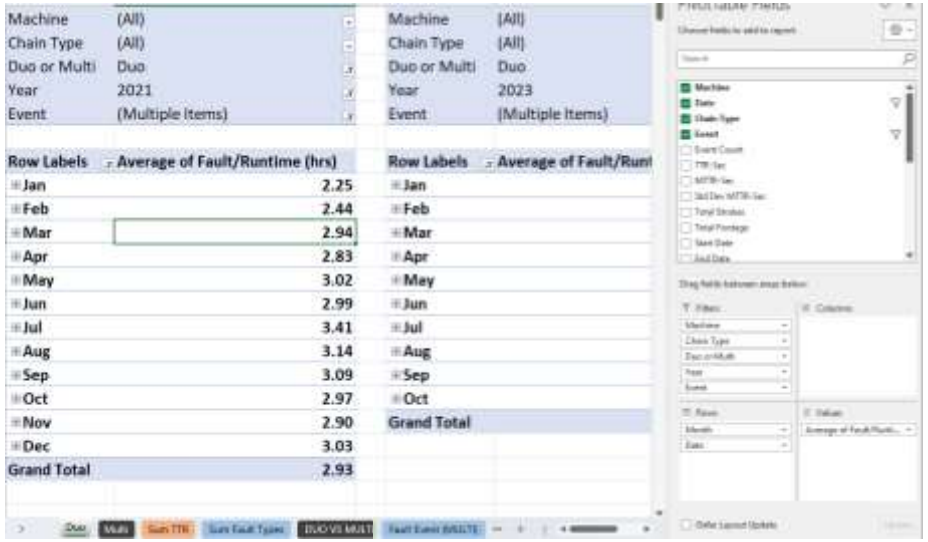
Start Date 12/1/2021 End Date 12/1/2021 Update

Get Assembly Machine Fault Data grouped by date

| Machine | Chain Type | Event | Event Count | Total HTTR-Sec | Average HTTR-Sec | Std Dev HTTR-Sec | Total Strokes | Strokes Per Event | Total Strokes Per Event | Total Footage | UCL | Start Date | End Date | Report Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 304 | 60TSL | CTRL.HSG | 1 | 19 | 19 | | 297 | 17.0 | 595.0 | 16 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 304 | 60TSL | CTRL.LOW | 1 | 7 | 7 | | 297 | 60.0 | 595.0 | 16 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 304 | 60TSL | DL1.MAG | 1 | 614 | 614 | | 889 | 65.0 | 889.0 | 16 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 304 | 60TSL | GATE.2.. | 1 | 12 | 12 | | 889 | 16.0 | 889.0 | 16 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 304 | 60TSL | STOP.... | 1 | 726 | 363 | 378.01 | 889 | 107.0 | 1185.0 | 16 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 304 | 60TSL | TSS.LOW. | 1 | 98 | 49 | | 297 | 65.0 | 595.0 | 16 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | CTRL.LOW | 7 | 167 | 24 | 35.54 | 109801 | 253.0 | 15695.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | CTRL.HSG | 7 | 59 | 8 | 4.69 | 109801 | 270.0 | 15695.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | CTRL.HSG.. | 19 | 817 | 31 | 45.38 | 109801 | 253.0 | 4390.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | CTRL.LOW. | 46 | 2233 | 46 | 41.18 | 109801 | 318.0 | 2387.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | CTRL.HSG | 49 | 882 | 18 | 15.33 | 109801 | 246.0 | 1240.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | DL1.MAG | 6 | 182 | 30 | 7.77 | 109801 | 259.0 | 18000.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | DL1.MSG | 31 | 1261 | 35 | 24.92 | 109801 | 306.0 | 2232.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | EXIT.... | 3 | 93 | 16 | 11.59 | 109801 | 132.0 | 36600.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | GATE.1.. | 24 | 366 | 15 | 11.32 | 109801 | 211.0 | 4875.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | GATE.2.. | 18 | 319 | 21 | 23.81 | 109801 | 212.0 | 7320.0 | 7152 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | LOOP.1.. | 1 | 17 | 17 | | 109801 | 0.0 | 109801.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | LOOP.2.. | 1 | 12 | 12 | | 109801 | 4.0 | 109801.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | LOOP.3.. | 1 | 1 | 1 | | 109801 | 4.0 | 109801.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | OADAOHG | 7 | 283 | 36 | 31.27 | 109801 | 256.0 | 15695.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | OADAOOH | 7 | 19 | 3 | 0.81 | 109801 | 186.0 | 15695.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | RAILOW. | 60 | 1216 | 22 | 37.38 | 109801 | 226.0 | 2071.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | RAVE1.. | 14 | 834 | 61 | 103.49 | 109801 | 243.0 | 7842.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | RAVE1.. | 1 | 33 | 33 | 15.56 | 109801 | 33.0 | 54900.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | STOA.... | 11 | 1074 | 31 | 127.05 | 109801 | 207.0 | 4936.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | TSHF2F | 15 | 1804 | 112 | 165.42 | 109801 | 426.0 | 6862.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | TSL.FB.. | 3 | 24 | 8 | 1.73 | 109801 | 168.0 | 36600.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | TSL.LOA. | 9 | 221 | 33 | 8.88 | 109801 | 280.0 | 27450.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | TSL.MAG. | 11 | 190 | 17 | 17.27 | 109801 | 160.0 | 9981.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | TSS.LOW. | 1 | 44 | 44 | | 109801 | 9.0 | 109801.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 318 | 12HBC | TSS.MSG | 10 | 417 | 33 | 22.74 | 109801 | 334.0 | 9000.0 | 7153 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 336 | 60TSL | CTRL.LOW. | 2 | 63 | 31 | 10.61 | 87120 | 66.0 | 18900.0 | 1761 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |
| 336 | 60TSL | CTRL.LOW. | 20 | 1189 | 62 | 31.04 | 87120 | 460.0 | 2403.0 | 1761 | 0 | 12/1/2021 | 12/2/2021 | 12/1/2021 |

# Assembly Machine Data - Solution

- **Filtering a high amount of data:**
  - Filtered out over 500,000 rows of data (Number of Faults, Stroke, Runtime, Performance over 3 years)
    - The data is normalized by run-time hour so that performance can be compared between various machines
- **What I learned:**
  - Data analysis: T-test, Anova
  - Excel: Data filtering, Excel formulas, Pivot Table, A3

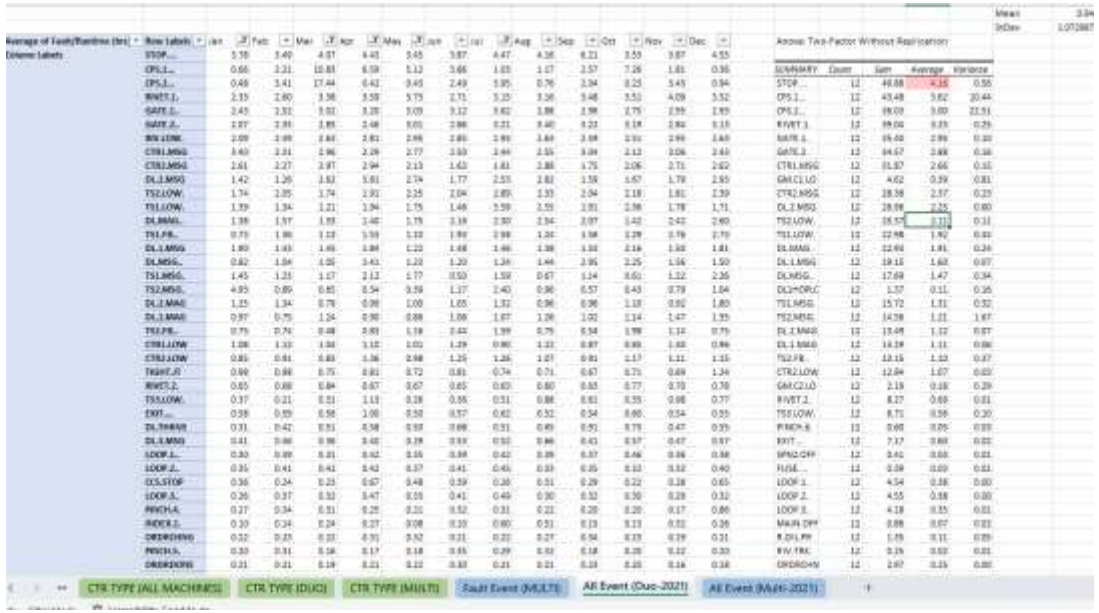


| Machine | (All) |
|---|---|
| Chain Type | (All) |
| Duo or Multi | Duo |
| Year | 2021 |
| Event | (Multiple Items) |

| Row Labels | Average of Fault/Runtime (hrs) |
|---|---|
| Jan | 2.25 |
| Feb | 2.44 |
| Mar | 2.94 |
| Apr | 2.83 |
| May | 3.02 |
| Jun | 2.99 |
| Jul | 3.41 |
| Aug | 3.14 |
| Sep | 3.09 |
| Oct | 2.97 |
| Nov | 2.90 |
| Dec | 3.03 |
| Grand Total | 2.93 |

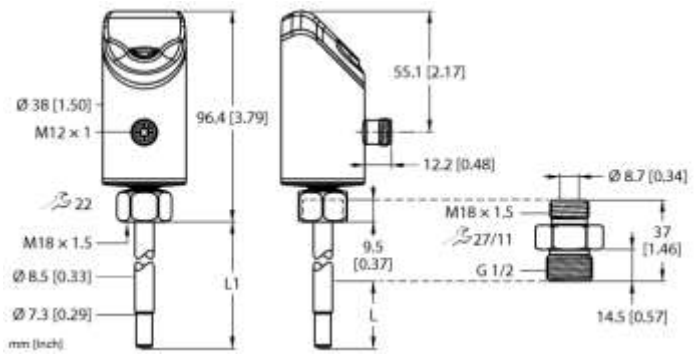
| Machine | (All) |
|---|---|
| Chain Type | (All) |
| Duo or Multi | Duo |
| Year | 2023 |
| Event | (Multiple Items) |

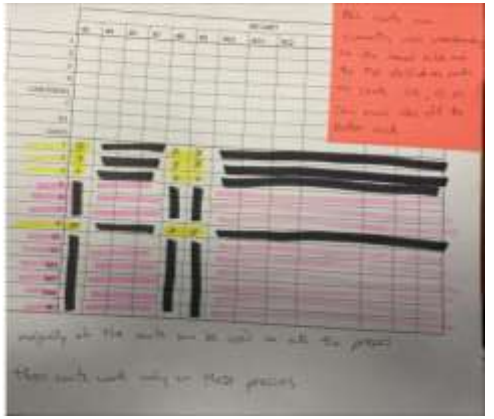
| Row Labels | Average of Fault/Runt |
|---|---|
| Jan | |
| Feb | |
| Mar | |
| Apr | |
| May | |
| Jun | |
| Jul | |
| Aug | |
| Sep | |
| Oct | |
| Grand Total | |

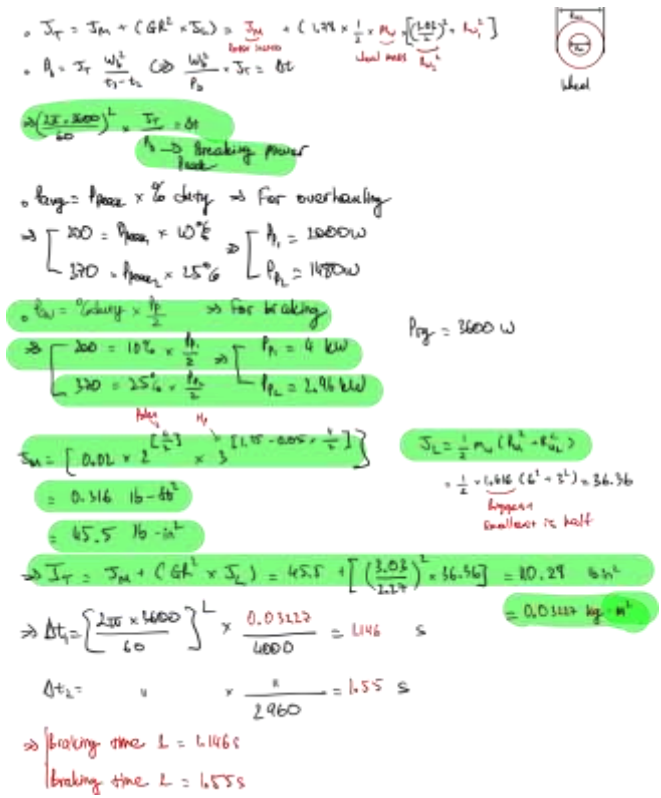


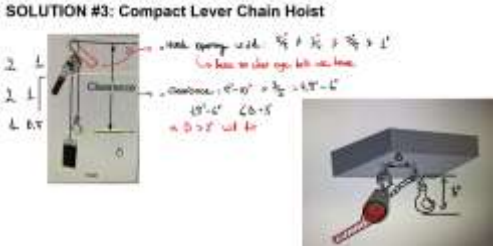
# OTHER PROJECTS

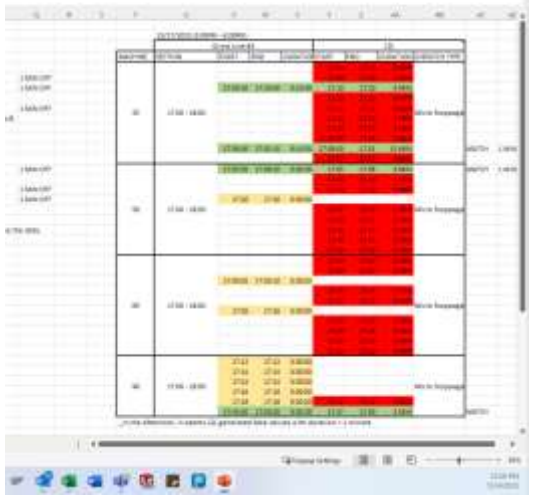
- Major projects (~ Months)
  - **CNC Grinder Flood Control**: Root Cause Analysis (No Data Collected)
  - **SMED Table**: Lock Cart to SMED Table
  - **Nitrogen Block Handling**: Applying Mechanical Advantage on lifting Nitrogen block ~80lb
- Minor projects ( ~ Weeks)
  - **Burr**: Sliver
  - **Braking Resistor Calculation**: Decision on Braking Resistor for Cutter Grind machines by calculating Braking time from each Braking Resistor
  - **L2L Data Collection**: Analyze and conclude major errors from L2L data by comparing L2L with actual Cutter Grinder data









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# Useful Courses

- ENGR 248 – Engineering Graphics and 3D Modeling
- ENGR 250 – Machine Design
- ENGR 211 – Statics

# Impression

- Operators, MFTM, Supervisor, Engineers, and Maintenance all exhibit a high level of friendliness.
- Each individual contributes their unique approach to create a pleasant workplace environment.
- I was greatly impressed during our idea review session, even when my ideas faced challenges and issues, everyone remained committed to finding solutions.
- They are always eager to impact their knowledge and help me learning how to navigate challenges effectively.

# THANK YOU

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