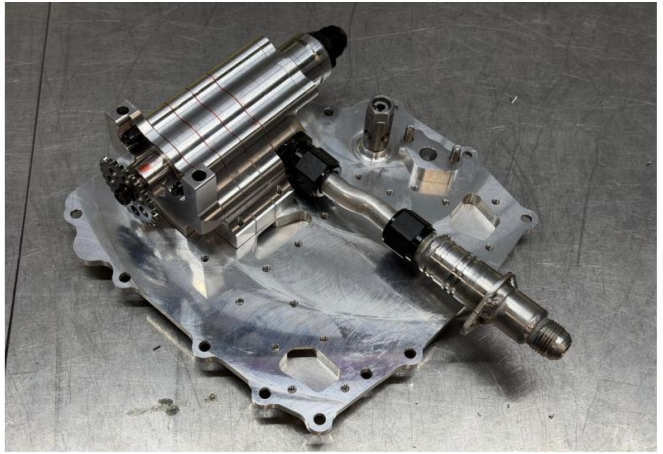
# POWERCAT MOTORSPORTS

2025-2026

# Oil Pump Flow Rate Testing Project

# Purpose

- To validate the new design for the oil pump by running the stock oil pump and measuring the flow rate
- To calculate scavenge pressure to find the load on the shafts in the oil pump



# Leopard Oil Pump Testing

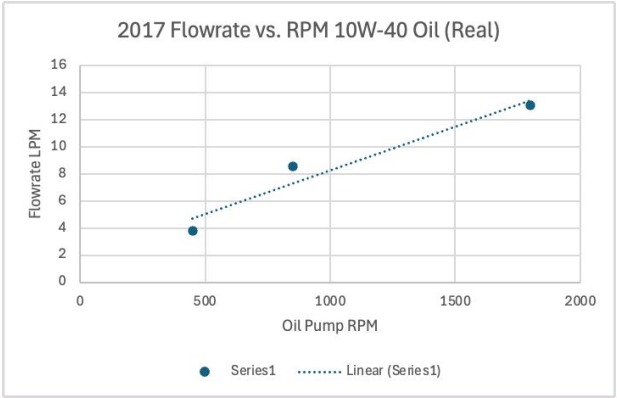
| | Max Oil Pressure | Max Scavenge Pressure |
|---|---|---|
| Peak prs | 65.922 | 21.828 |
| rpm | 9042 | 10132 |
| temp | 85.2 | NA |
| Avg Prs | 32.172 | 3.402 |
| Strd Dev | 12.6 | 2.6 |

- Data logs from formula wheat showed peak scavenge pressure to be 21.8 psi
- Much larger load on the shafts then what we had assumed
- Gave this data to Payton, for new oil pump design

# Old Data

- 2017 Flow Rate Data

| 1800 | Average Flow Rate: | | 13.0406 |
|---|---|---|---|
| 450 | 2.75 | 46.10 | 4.1426 |
| 450 | 2.25 | 43.77 | 3.5698 |
| 450 | 2.50 | 43.29 | 4.0104 |
| 450 | 2.50 | 47.73 | 3.6374 |
| 450 | 2.50 | 47.00 | 3.6939 |
| **450** | **Average Flow Rate:** | | **3.8108** |
| 850 | 2.50 | 19.50 | 8.90 |
| 850 | 2.75 | 22.44 | 8.51 |
| 850 | 3.25 | 26.29 | 8.58 |
| 850 | 3.00 | 25.26 | 8.25 |
| **850** | **Average Flow Rate:** | | **8.56** |



# Possible Testing Ideas

1. Run oil pump using electric motor and revving the oil pump up to operational speeds
    a. Measuring flow rate based off of amount of fluid displaced and the RPM found using something that can read the speeds

OR

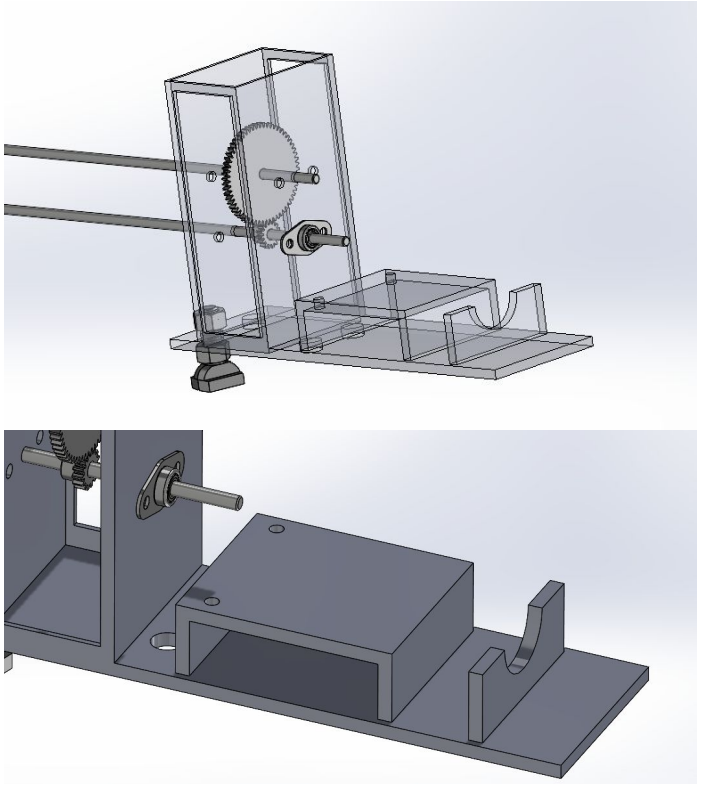
2. Run oil pump using gearbox connected to lathe in student shop
    a. Measuring flow rate based off of amount of fluid displaced and the RPM found using the speed of the lathe and the gear ratio of the designed gearbox

# Chosen Plan

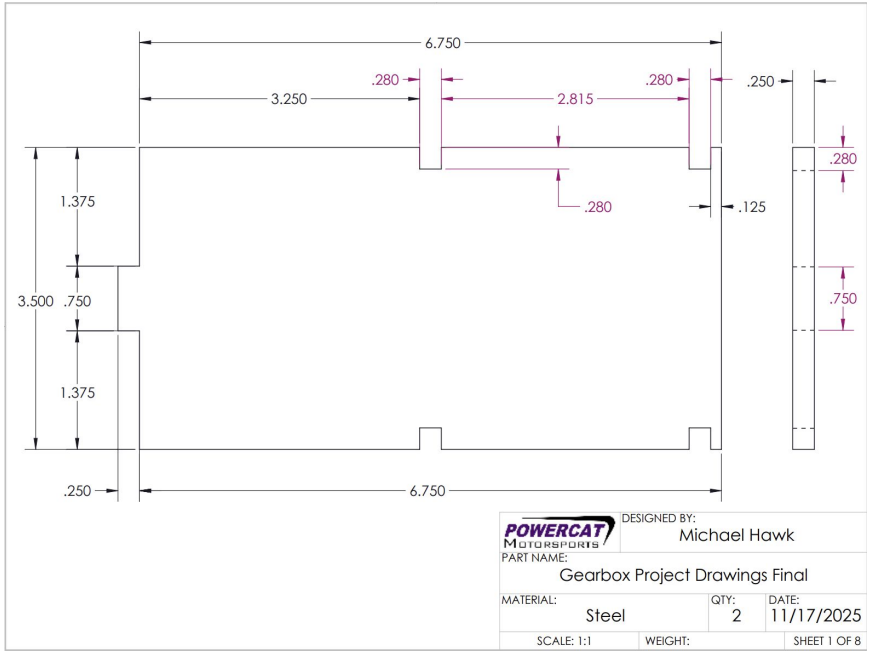
- Decided to go with option 2
- NEXT STEPS:
  - Design gearbox so that the lathe speed can be ramped up to operational RPM of the oil pump in the Triumph Daytona 675R
  - Design adapter pieces for the gearbox rod to oil pump and the hose adapter for testing

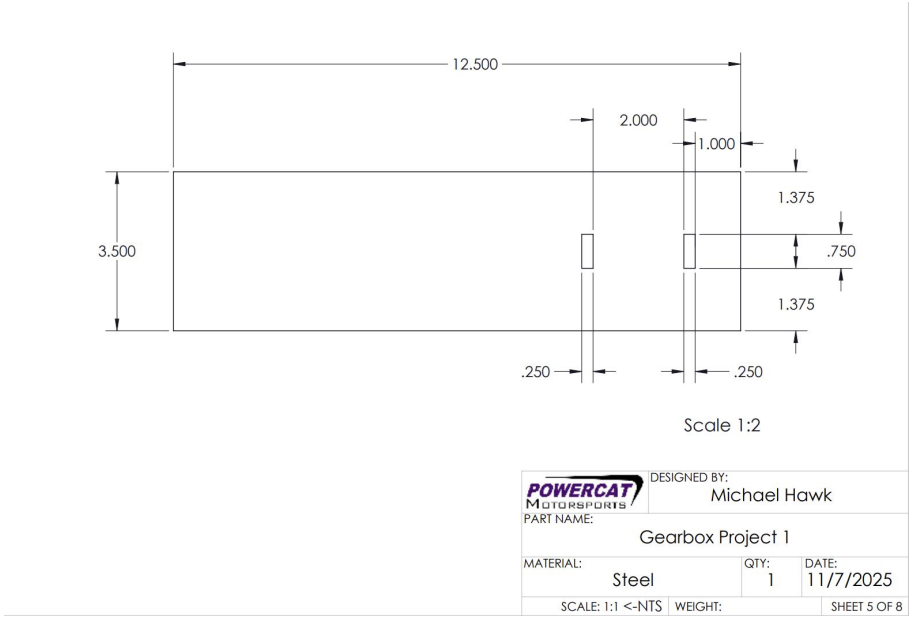
# The Design

- The gearbox will be directly connected to the lathe by a steel rod
- The input shaft will be connected to a 60 tooth gear, which will be meshed to a 15 tooth gear, in order to gear up the output shaft 4x RPM
- The output rod will be welded to the oil pump adapter
- The oil pump will rest on a mount and the hose adapter will be mounted on top

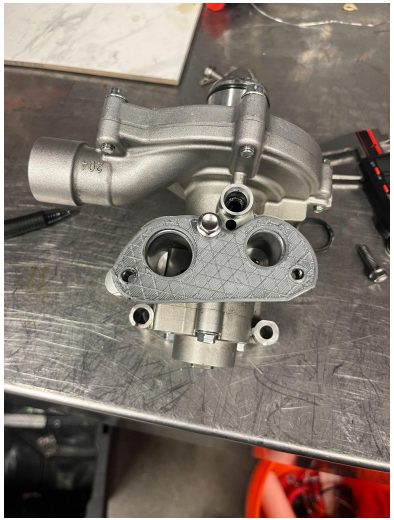


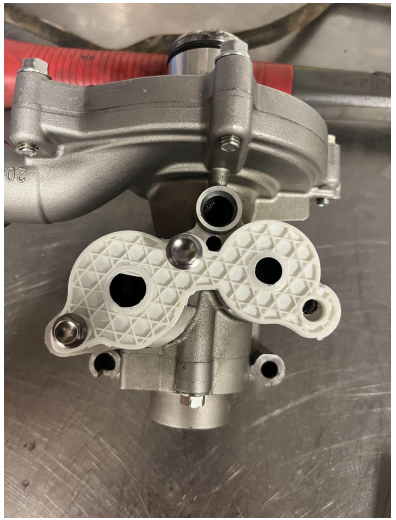
# Drawings

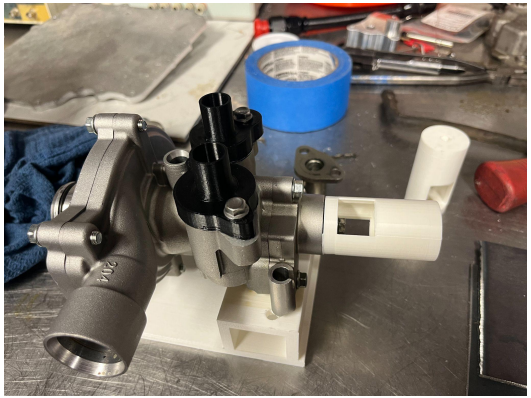

6.750
3.250
.280
2.815
.280
.250
.280
.280
.125
.280
.750
1.375
3.500
.750
1.375
.250
6.750
POWERCAT MOTORSPORTS
DESIGNED BY: Michael Hawk
PART NAME: Gearbox Project Drawings Final
MATERIAL: Steel
QTY: 2
DATE: 11/17/2025
SCALE: 1:1
WEIGHT:
SHEET 1 OF 8


12.500
2.000
1.000
1.375
.750
1.375
3.500
.250
.250
Scale 1:2
POWERCAT MOTORSPORTS
DESIGNED BY: Michael Hawk
PART NAME: Gearbox Project 1
MATERIAL: Steel
QTY: 1
DATE: 11/7/2025
SCALE: 1:1 <-NTS
WEIGHT:
SHEET 5 OF 8

# Adapter 3D Prints







# Assembly

- After the drawings were sent to Vortex, the parts arrived at the end of winter break
- Now assembly and fabrication can begin

# Attempting to Manufacture

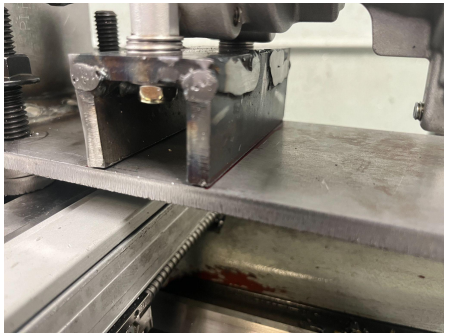
- Spent majority of the time learning how to fabricate
- Welding, Milling, Drilling, and most importantly, Measuring
- *Much to Improve*

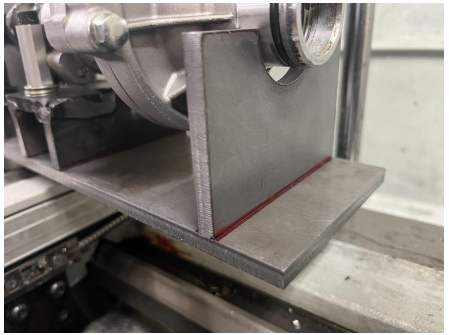
# Building Stuff

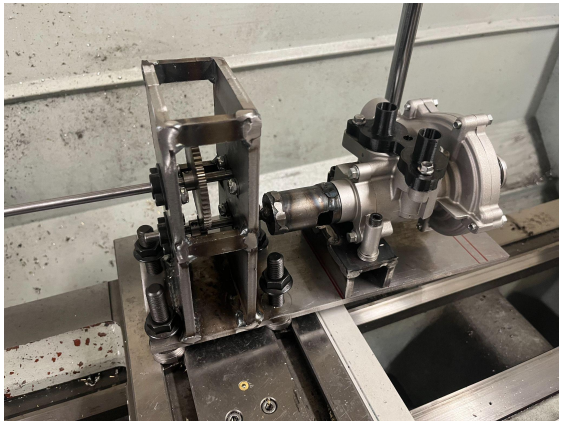
- Essential parts completed
- Lots of “just sending it”

# Building Stuff Cont.

- Getting closer to final product
- Large amount of adjustments made

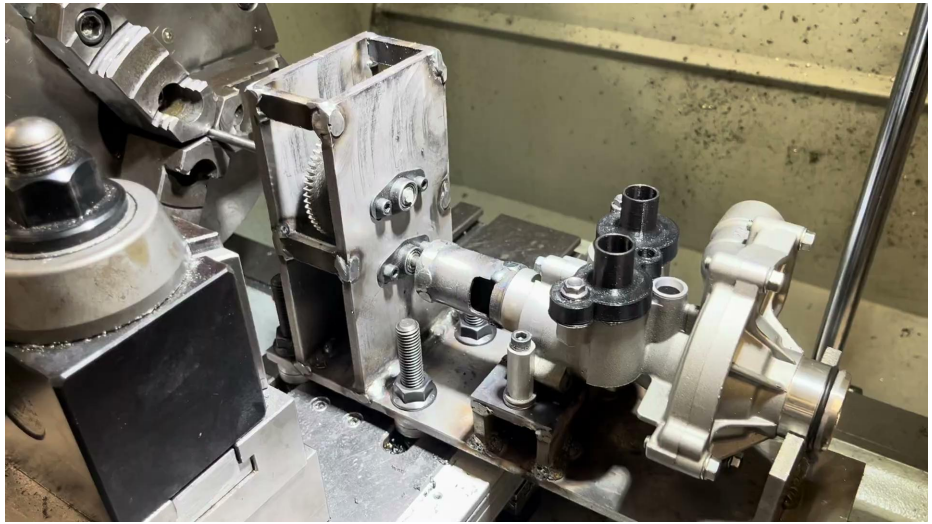






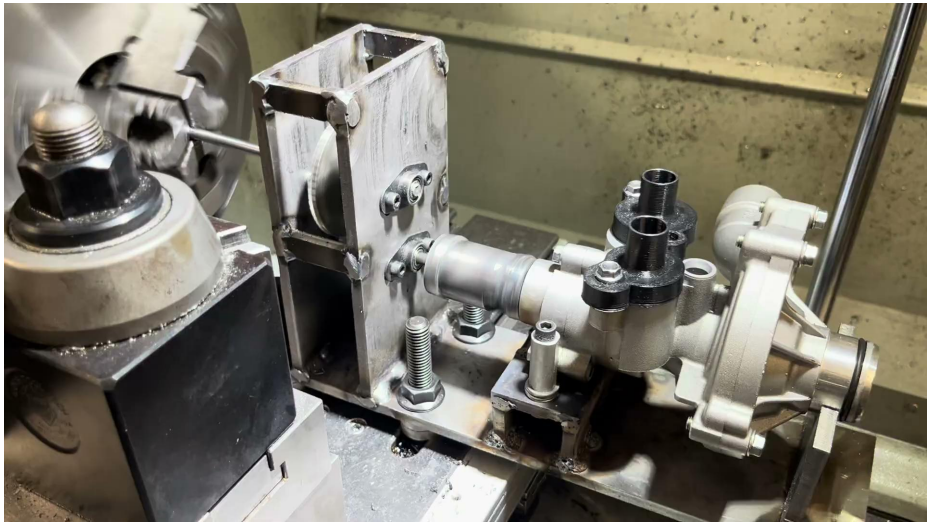
# First Tests

- Proving it works
- Had loads of issues but actually worked



# First Tests Cont.

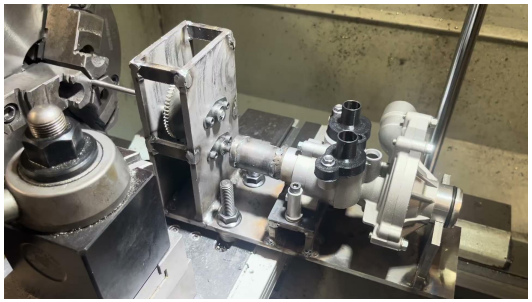
- The more we tested, the better it worked



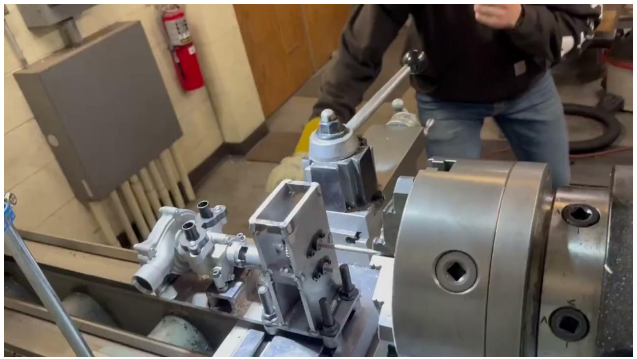
# First Tests Cont.

- We continued until we hit each RPM we needed for testing

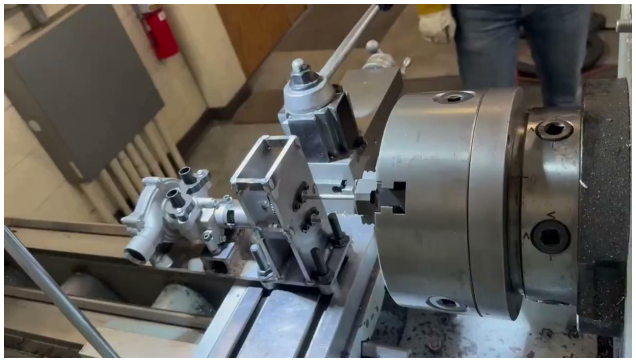
Bearing Broke



1200 RPM (4800)



1800 RPM (7200)



# Testing

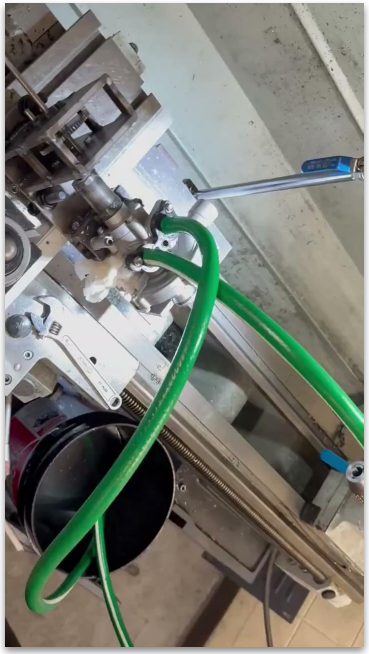
- After making sure it works, we began the actual testing
- Running water through the hose inlet, the oil pump, and then the hose outlet
- Estimated water amount using 5 gallon bucket
- Recorded the amount of time required to transfer 5 gallons through the oil pump using the gearbox
- Flowrate = Gallons/Minute

# Testing Cont.

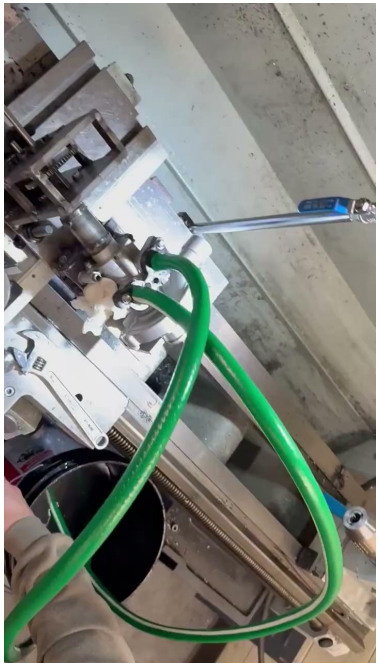
- Completed testing

620 RPM (2480)

900 RPM (3600)



1200 RPM (4800)
**Breaks**

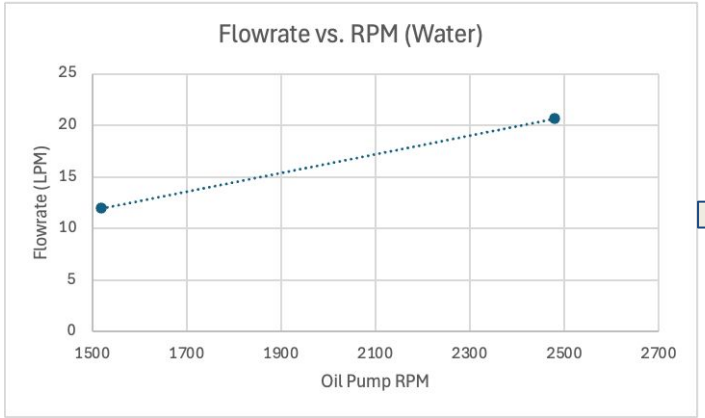


# Data

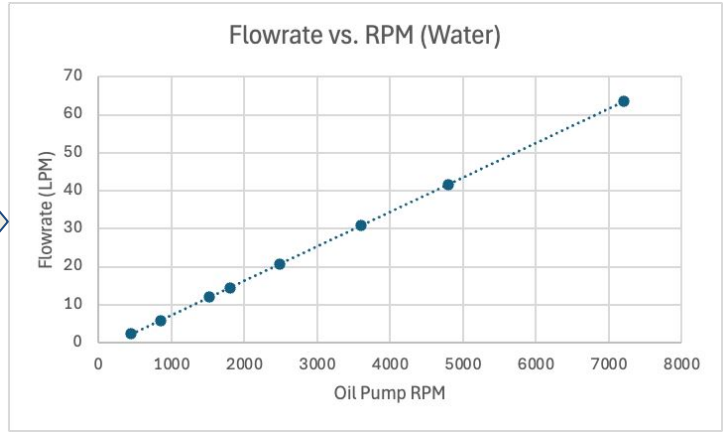
- Only collected 2 data points
- Extrapolated trend according to RPM vs Flowrate trends

| Time (minutes) | Lathe RPM | Oil Pump RPM (Lathe * 4) | Flowrate GPM (5 Gallons/ x minutes) | Flowrate LPM (GPM*3.79) |
|---|---|---|---|---|
| 1.583 | 380 | 1520 | 3.158559697 | 11.97094125 |
| 0.9167 | 620 | 2480 | 5.454347115 | 20.67197556 |

Real

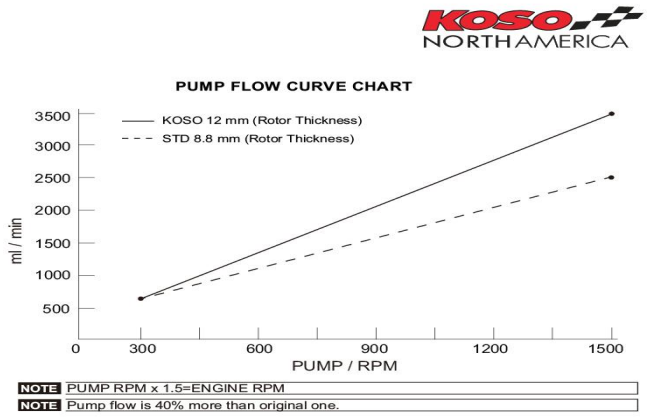



Expected



# Data Cont.

- Overall, the data points contribute to a linearly increasing slope that can determine flowrate at different RPM
- Model works until PRV opens around 8k RPM (standard motorcycle engines)

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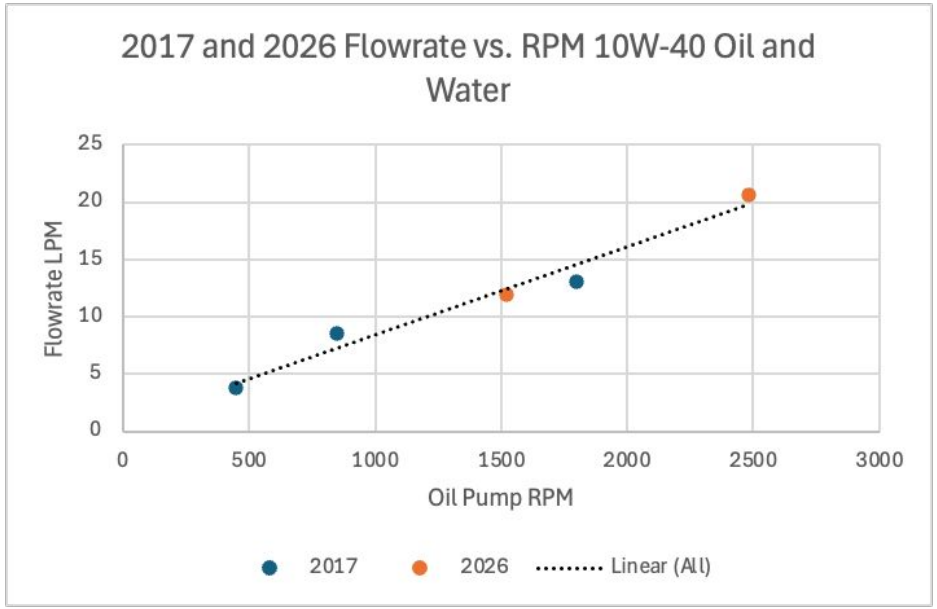
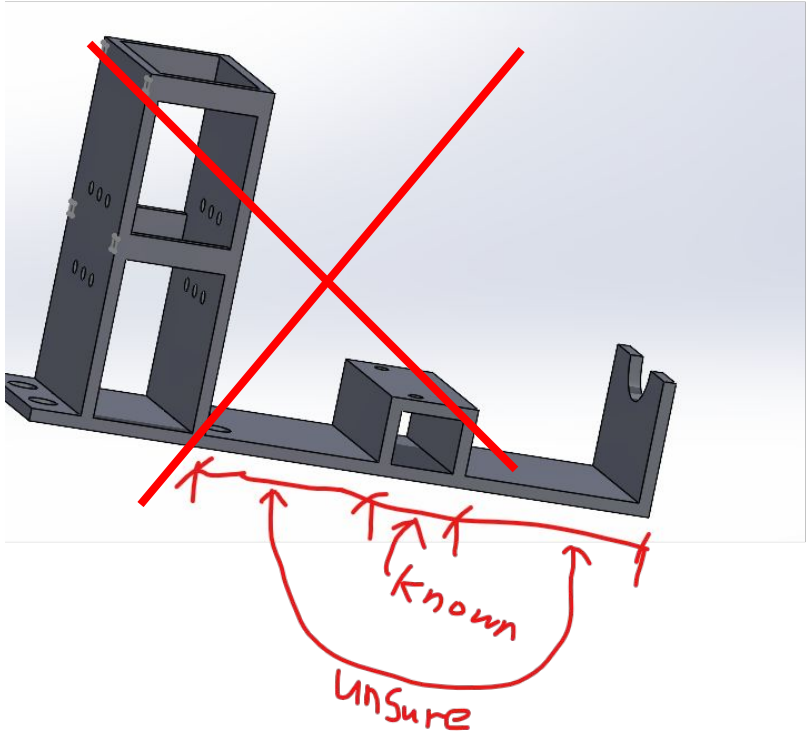


# What We Learned

- Measure twice, cut once
- Get everything cut by the waterjet, don’t do it yourself
- Get a fully designed model with all measurements before getting parts made
- Skills: Welding, machining, SolidWorks, 3D printing, “fluid mechanics”
- Project management

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# Questions?