Parabolic Trough Energy Extraction

Mid-Point Project Progress

Team 14:

Saad Almonnieay, Robert Blaskey, Daniel Chief, Christopher Mesko, Jairo Rivera, and Jacob Seitzer

NORTHERN ARIZONA UNIVERSITY

Overview

- Trimming
- Drive
- Connecting the motor and drive
- PLC Programing
- Control Box
- Energy Extraction
- Materials
- Conclusion

Introduction

- Mylar used to cover damages on the trough.
- Trim installed successfully around the trough.
- Replaced the previous drive.
- The tracking system was successfully tested and operated.

Trim Damage

- Rope keeping trough held upside-down broke
- Resulted in damage to corner of trough
- Can be repaired easily
- Since all Mylar has been applied, trough can be positioned upright

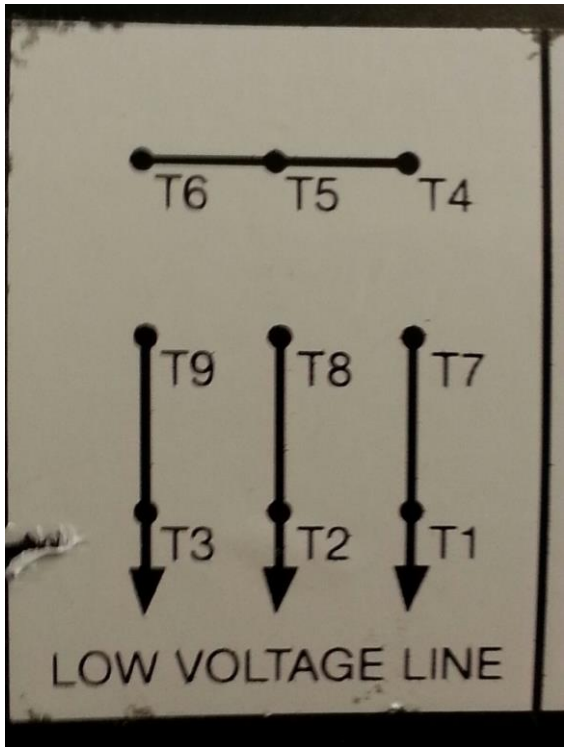
Drive

- GS2-11P0 drive was ordered and received
- Old drive- 230V three-phase power source was unattainable
- New drive- input power is 120V, single-phase
  - Smaller in size
  - Output power to motor is the same
- All other specs are the same, new drive is slightly less efficient than the larger model

Source: AutomationDirect

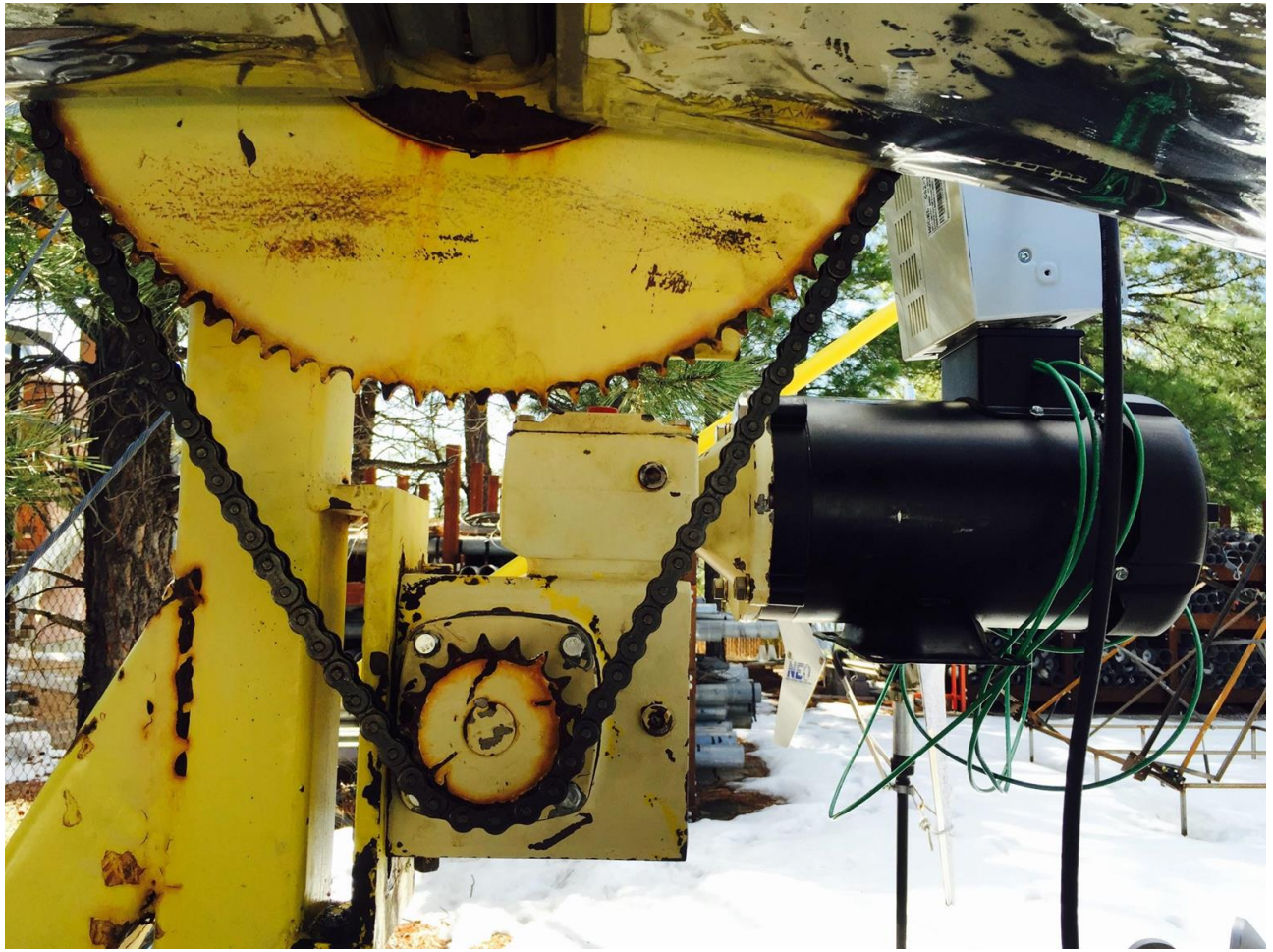
Connecting the motor and drive

- 12 AWG wire is used to connect the motor and control box.
  - T7-T1 from the motor connects with port T1 of the control box.
  - T8-T2 from the motor connects with port T2 of the control box
  - T9-T3 from the motor connects with port T3 of the control box
- T4 toT6 are not needed



Left: Shows the connections for the motor.
Right: 12 AWG wire connecting the motor to the control box.

Motor and Gear Box Assembly



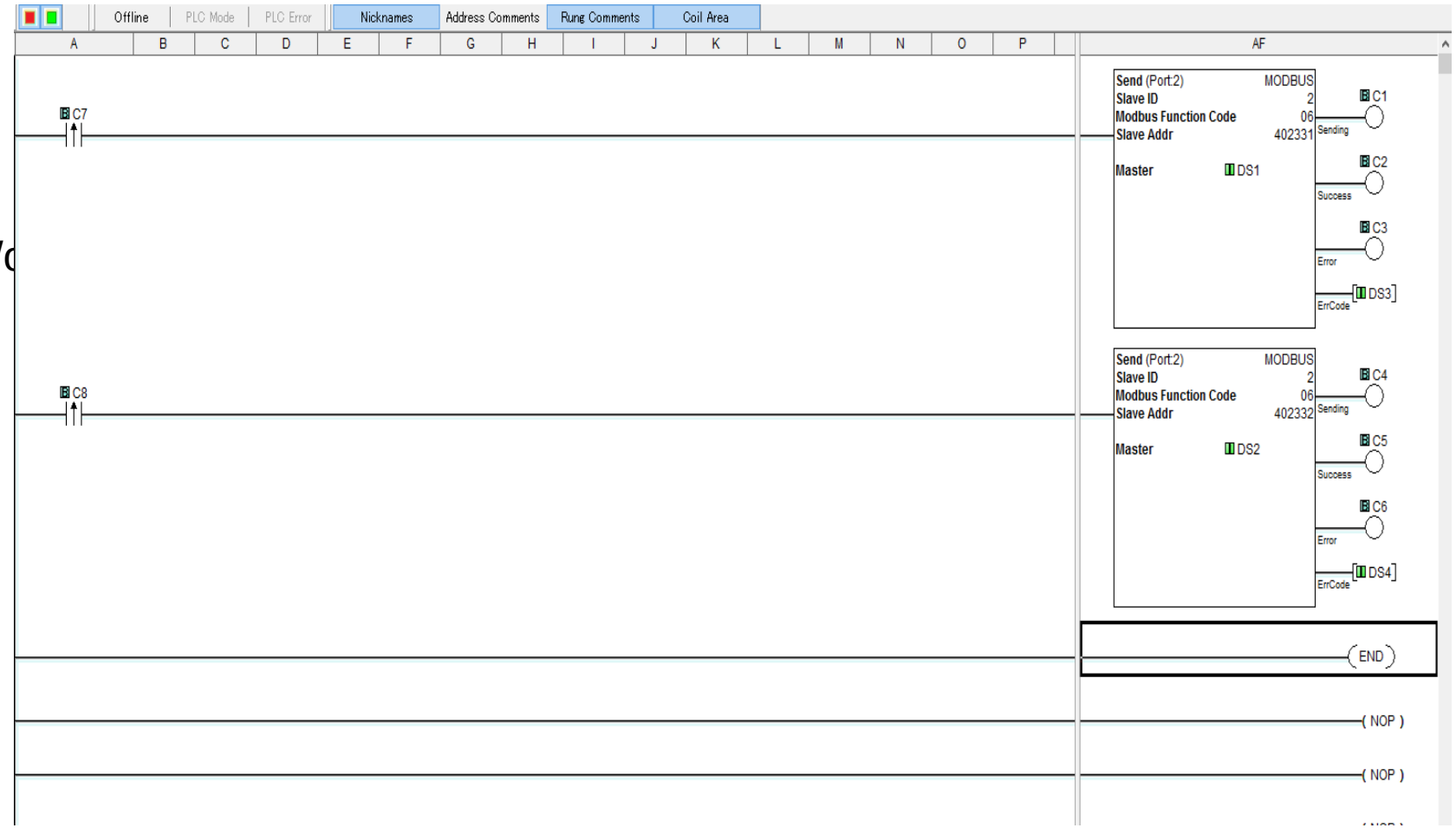
Video 1: Testing of motor on/off

Video 2: Testing of trough rotation (CCW)

Video 3: Testing of trough rotation (CW)

PLC Programming

- CLICK Programming Sofware
- Sample program for turning motor on/

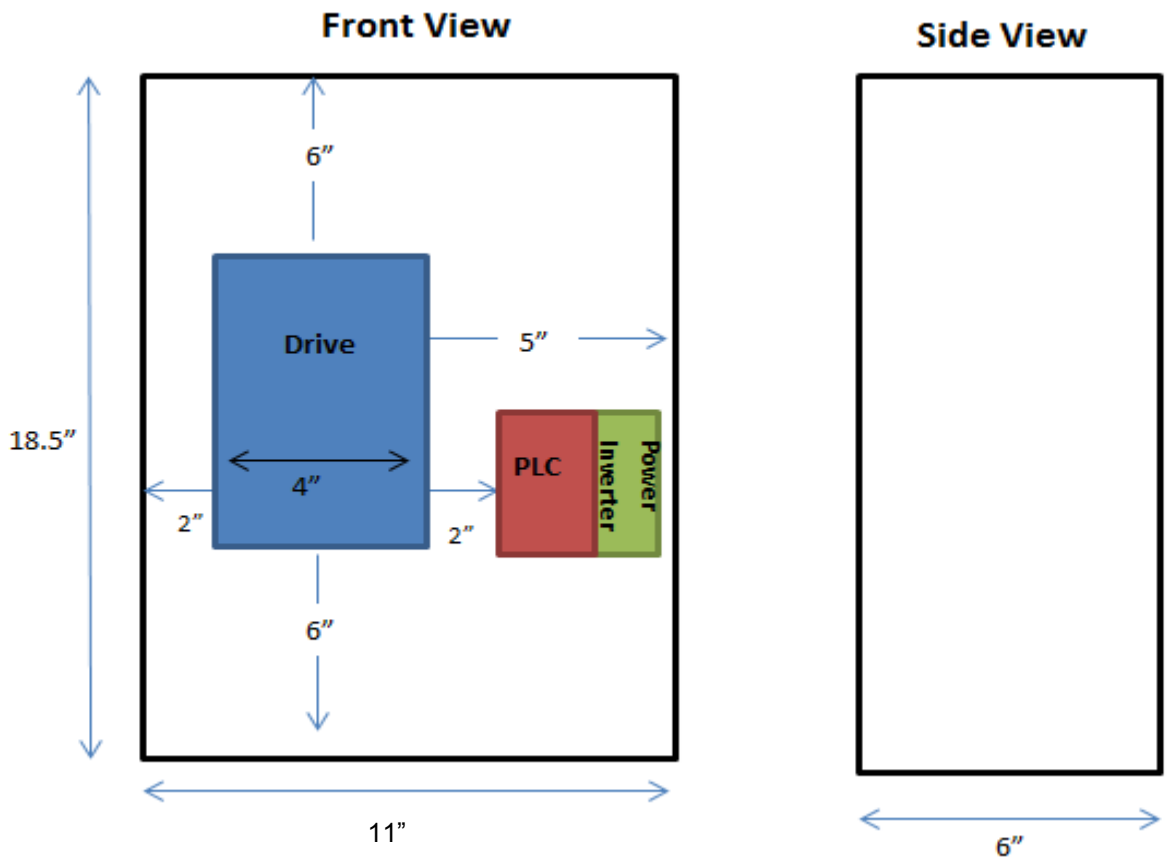


Control Box

Based on dimensions of components and required clearances, schematic of control box components shown

A 19” X 11” X 6” box is needed

From FactoryMation.com
Eldon Enclosure, steel, single door, wall mount, 20” X 12” X 8”
$102.00



Energy Extraction

- Closed Energy Extraction System
  - Use solar energy to heat water.
  - A pump will be used to create flow within the closed system.
  - A thermocouple, measuring the water inside the storage tank, will be attached to the PLC.
  - A valve will be installed on the storage tank.

Materials

EMT Steel piping used to heat water along top of trough

- inexpensive and easily obtainable

PVC, mounted on the frame of parabolic surface (underside), piping used for the rest of system

- easy to work with, inexpensive

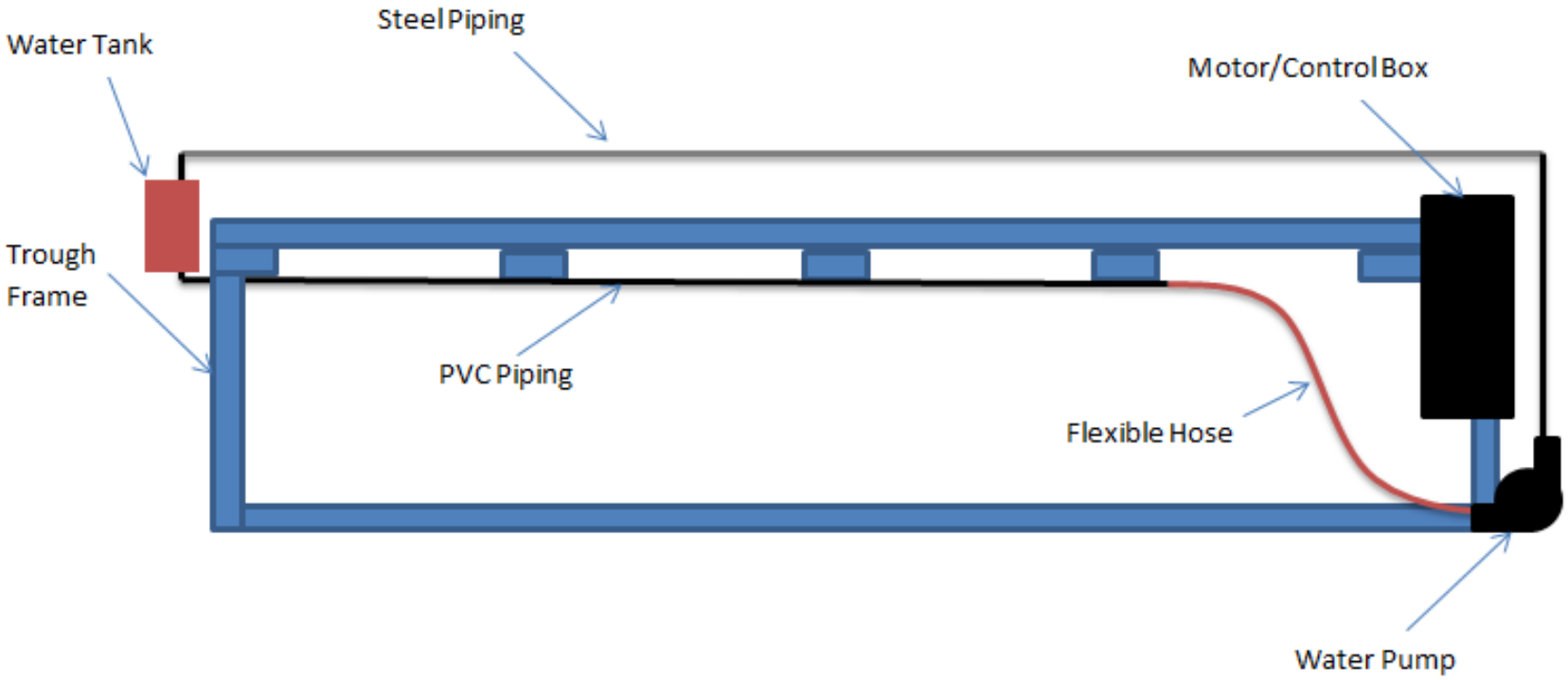
Water pump mounted to frame of trough, near the motor and control box

Flexible hose used to connect PVC to stationary pump

- This will ensure components stay connected when trough moves in either direction
- Small segments of flexible hose may be used to avoid 90 degree angles.

A plastic five gallon bucket will be used for water storage.

Energy Extraction Schematic



Conclusion

- Update on cosmetics of trough
- Motor, drive, and gearbox have been tested and installed
- Programming has begun
- Water heating system designed, parts need be purchased
- Control box for electrical components has been chosen

References

McMaster-Carr." *McMaster-Carr*. N.p., n.d. Web. 15 Oct. 2014.

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QUESTIONS?