

Parabolic Trough Tracking System

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Overview

- Introduction
- Project Definition
- Objectives and Constraints
- Tracking System
- Repairs to Parabolic Trough
- New Location of Trough
- Cost of Project
- Conclusion

Introduction

- Client: Dr. Srinivas Kosaraju
- Tracking system of parabolic trough is inoperable
- Parabolic trough has accumulated damage
- Convert absorbed solar energy into a useful form of energy.

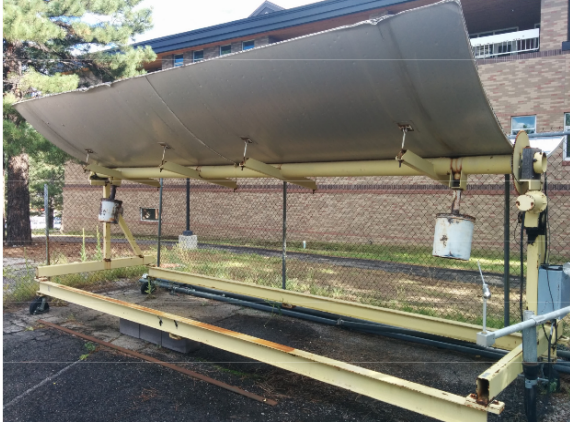
Project Definition

Customer Needs

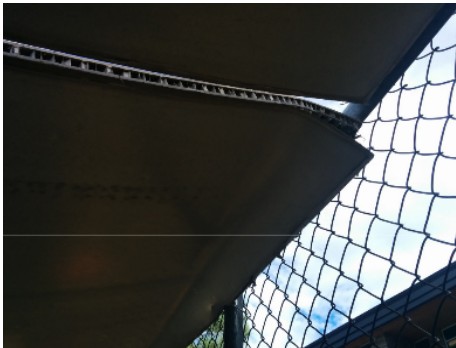
- The tracking system to move the parabolic trough is inoperable

Project Goal

- Repair the parabolic trough and the tracking system
 - Replace motor
 - Repair damaged parts
 - Replace tires
 - Determine/program a control system



Overall Picture of the System



Crack in the Panel

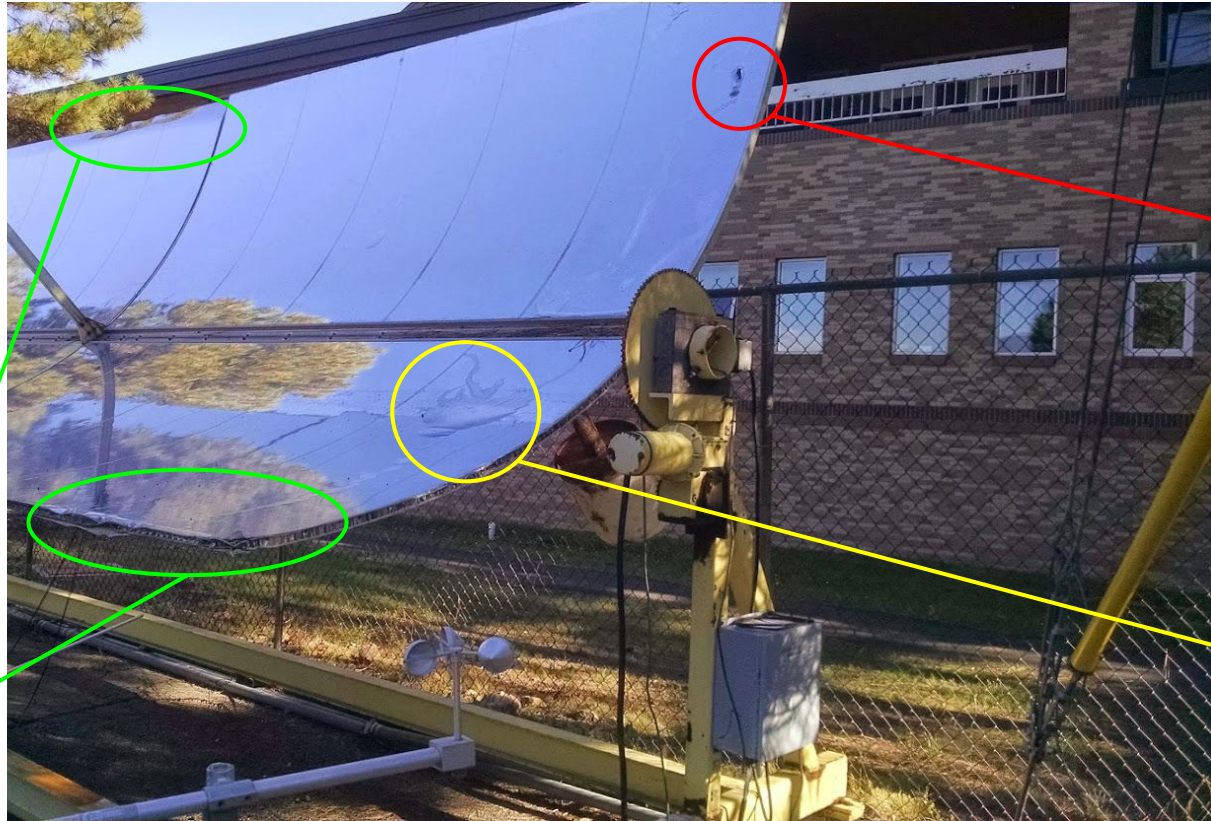


Motor

Control
Box

Motor and Control Box
Location Picture

Initial Condition of Parabolic Trough



Holes on Surface

Water Damage

Frayed Edges

Parabolic Trough Initial Condition
Picture

Objectives and Constraints

Objectives

- Allow maximum energy extraction by rotation of trough about its horizontal length
- Repair surface in order to increase efficiency of energy extraction
- Expand expected lifespan of tracking system and parabolic surface

Constraints

- Must be able to control the tracking system using a computer
- Must be able to withstand up to 70mph winds
- Operate efficiently between -20 and 100 degrees Fahrenheit
- Operate efficiently under changing weather conditions (wind, snow, rain, etc.)

Motor

Specs

- 1 HP
- 90 V
- 56 C Face
- 1750 RPM
- Shaft size- $\frac{5}{8}$ "

Motor from Baldor found

- Model CDP3445
- Price: \$743.30



Motor Picture(**Source:** Applied Industrial Technologies)

Control Box

Specs

- Dimensions (inches): 7.4h x 5.53w
- 1 HP
- 120 Volts
- Price: \$200

Control Box from Dart Controls



Control Box Picture(**Source:** Applied Industrial Technologies)

Tire Information and Solution

- 4 Marathon wheels and tires assembled
- 4 ply
- 300 lbs capacity per tire and wheel
- 10.5 inches height
- 3/4 in bearings



Damaged Tire Picture



Marathon Tire Picture
(Source: Marathon)

Tire Information and Solution

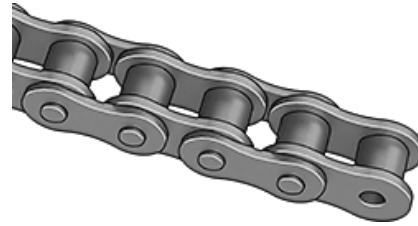


Replaced Caster/Tire
Picture

- 3 wheels installed in good shape with spacers
- One wheel caster broke in the process of installing wheel
- Solution: Order a wheel/caster assembly and have a spare tire
- Subtotal: \$123.99

Chain Information

- Steel ANSI 50
- 7 Feet
- $\frac{5}{8}$ inch pitch
- $\frac{3}{8}$ inch roller width
- 561 lbs working load
- \$5.98 per foot
- Subtotal \$41.86



Chain Picture
(Source: McMaster-Carr)



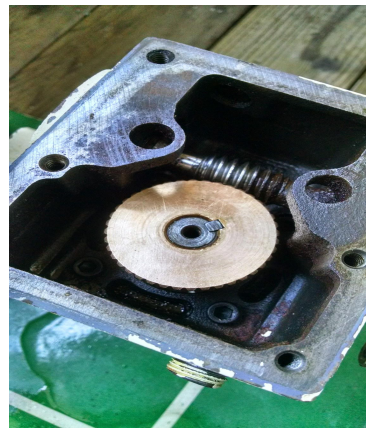
Location of Chain Picture

Before



Gear Box Picture#1

After



Gear Box Picture#4



Gear Box Picture#2



Gear Box
Picture#3



Gear Box Picture#5



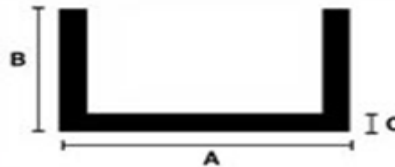
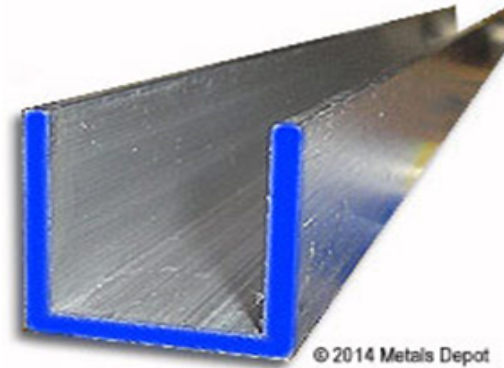
Gear Box Picture#6

Gear Box

- The gearbox was taken to Coconino Auto suppliers in Flagstaff, AZ, and cleaned professionally from the rust and oil.
- The cost was \$35
- New gasket cost: \$8
- Gear oil- 75W 90: \$8.50

Edge Trimming

- 6063-T52 Aluminum Channel (Sharp Corners)
 - Cheaper than plastic
- Dimensions:
 - Width(A) = 1.25"
 - Legs(B) = 1.25"
 - Web Thickness(C) = .125"
 - Leaves 1" as the inner width.
- For curved edges, aluminum was cut into 2" sections for assembly
- Adhesive: Loctite PL375 Heavy Duty



U Trim Picture (Source: Metals Depot)

Installed Trim



Picture1: Installed Trim



Picture3: Installed Trim



Picture2: Installed Trim



Picture4: Installed Trim

Material to Cover Damaged Surface

Mylar

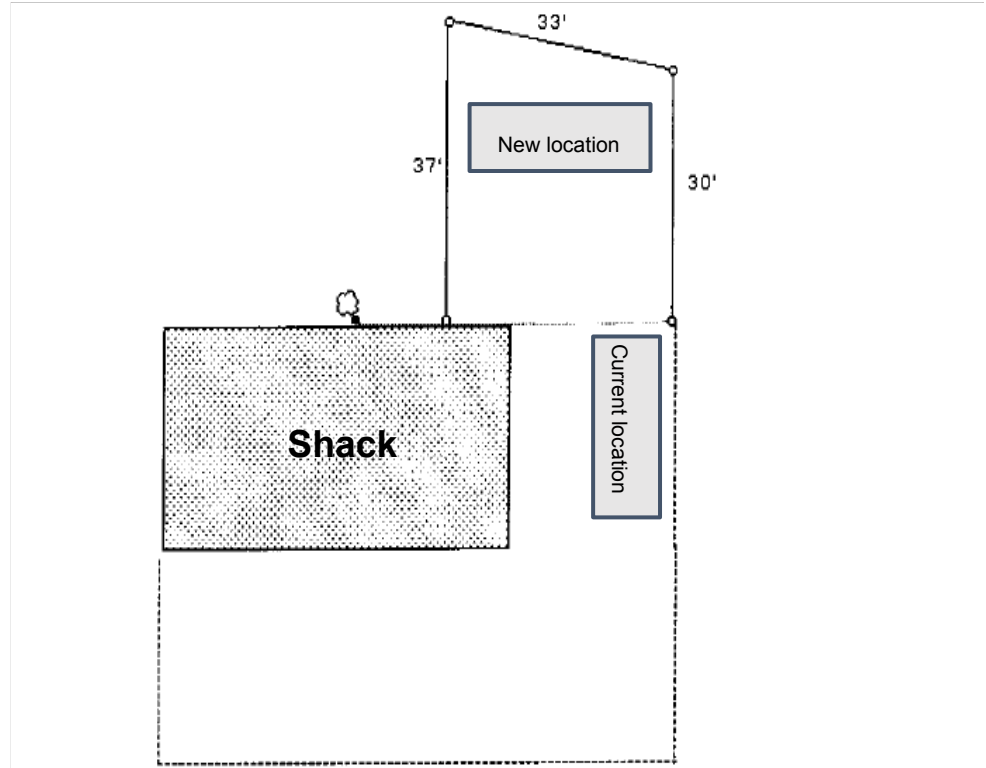
- Cheap
 - Reflective
 - Flexible
 - Can be used to cover holes in parabolic surface and water damaged spots
 - Can also be used to cover trim on reflective surface, optimizing solar reflection
-
- 2 mil 25ft X 4ft = 100 ft²
 - Cost: \$20.02



Picture of the Surface of the Trough

Fencing

- News fencing perimeter based on ground condition and professional advice
- Two quotes on materials and installation:
 - Buffalo Fencing- \$2,800
 - Alamo Fencing- \$2,750
- Alamo can begin installation can begin as early as the week of Dec. 15
- Buffalo can begin at the end of December



New Location of Trough

Total Cost

- Tires: \$58.00
- Caster: \$71.48
- Chain: \$41.86
- Motor: \$743.30
- Control box: \$200
- Trim: \$220.38
- Adhesive: \$7.20
- Gear Box
 - Professionally cleaned: \$35.00
 - Gasket: \$8.00
 - Gear Oil: \$8.50
- Fencing: ≈\$2,800
- Mylar: \$20.02
- Rope: \$6.27
- Subtotal: \$4,220.01

Conclusion

- Tasks completed
 - Most of trough damage repaired
 - Tires replaced
 - Gear Box cleaned
 - Chain purchased
 - New location/dimensions determined
- To be completed
 - Order motor and control box replacement
 - Install new components
 - Install fencing
 - Move to new location
 - Apply Mylar to damaged surface

References

Applied Industrial Technologies <http://www.applied.com/apps/commerce/catalog/catalog.do?e=10&s=102215882&r=0&type=a&mp=MD30E-7#>

Marathon 20011 4.10/3.50-4 Sawtooth Tread Pneumatic, 2.25" Offset, 3/4" Bearings." *Global Industrial*. N.p., n.d. Web. 15 Oct. 2014.

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

Metals Depot <http://www.metalsdepot.com/products/alum2.phtml?page=6063%20aluminum%20channel&LimAcc=%20&aident>

Questions?