AUTOMATIC DOG FEEDER

HELLO!

I AM ALEKSANDRE KOBESHAVIDZE
Fifth Semester (junior)

MAJOR - MECHANICAL ENGINEERING

MINOR – COMPUTER ENGINEERING

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THE PROBLEM

INTRODUCTION

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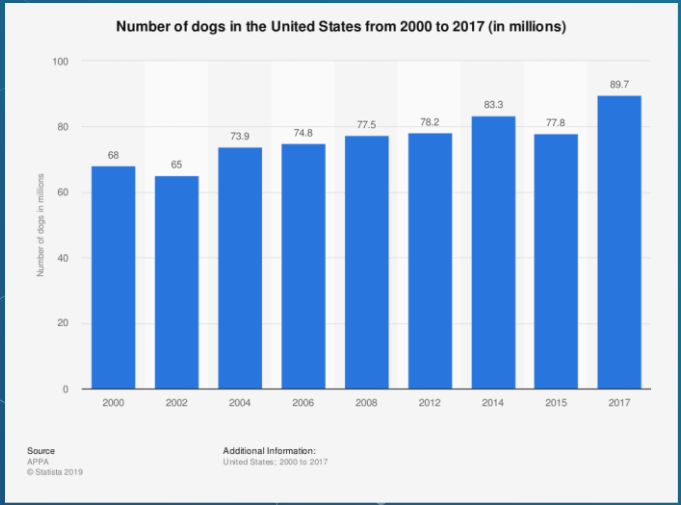
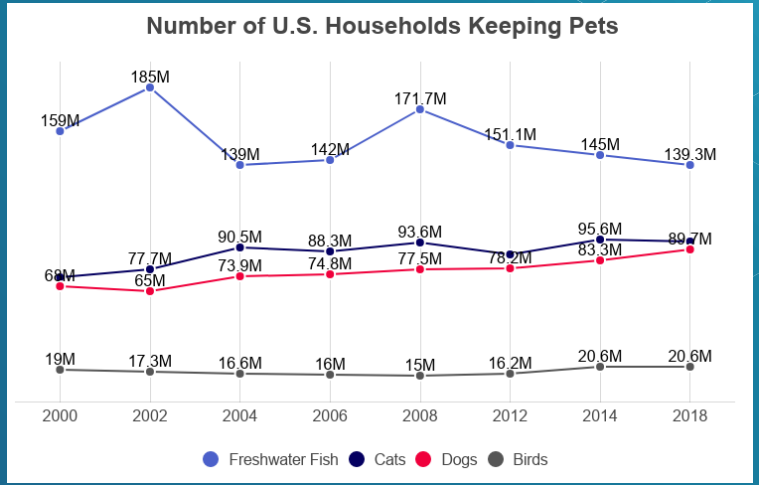
According to statistics, the number of dog owners is increasing over and over

STATISTICS

- Number of dogs in the U.S. 2000 - 2017
- Number of dogs compared to other pets

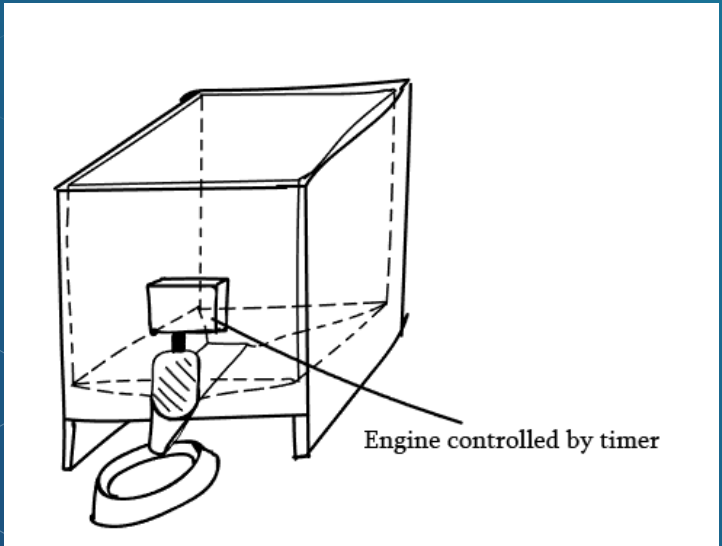




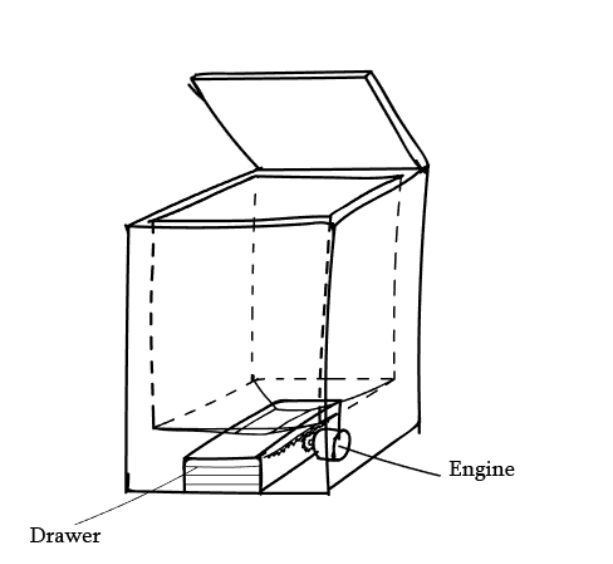
DESIGN

DESIGN OPTIONS

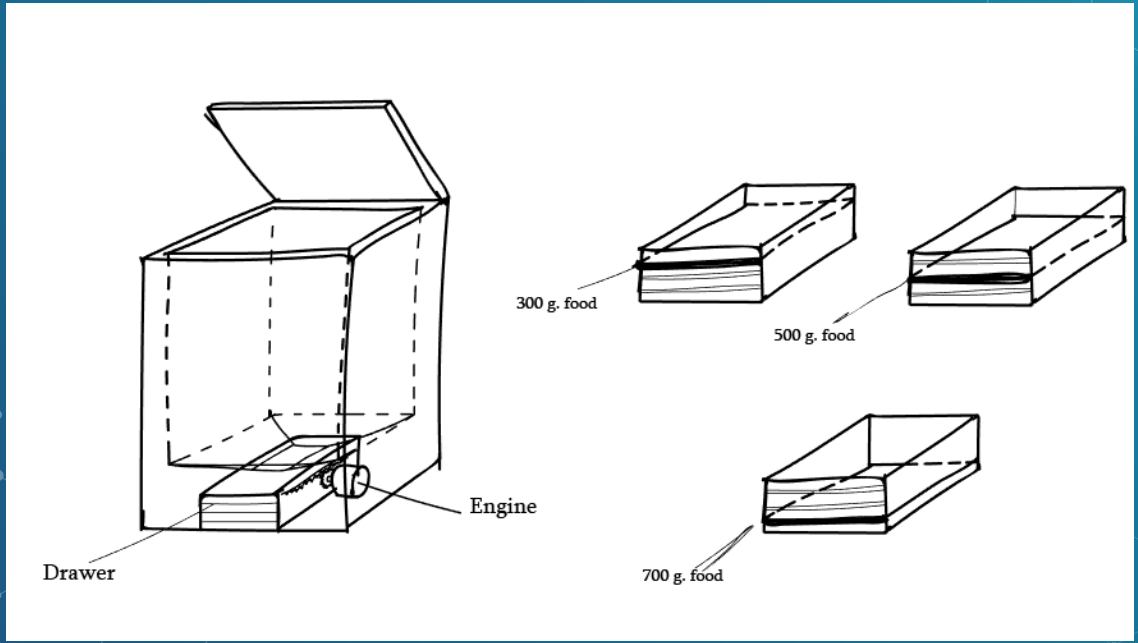
Little door which is controlled by electric timer



The second one is equipped with its own drawer



CHOOSEN DESIGN

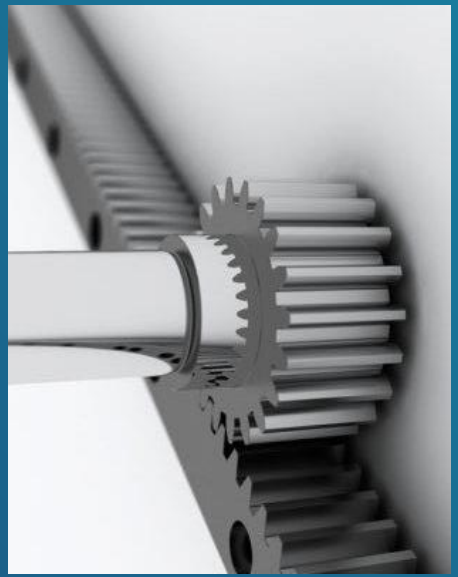


MECHANISMS

- RACK AND PINION
- CAM AND FOLLOWER

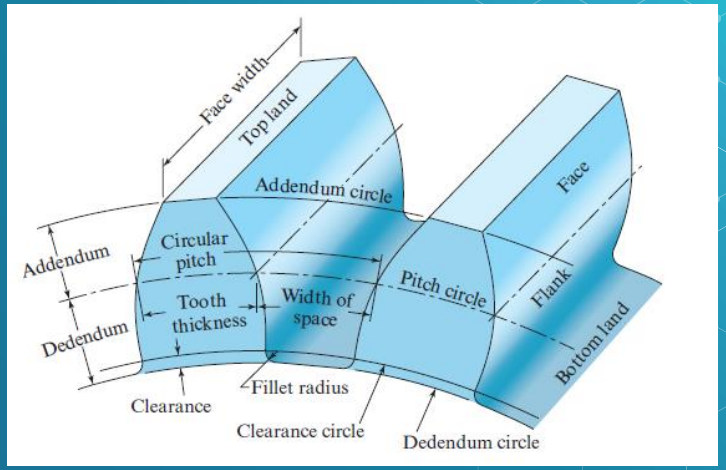
RACK AND PINION

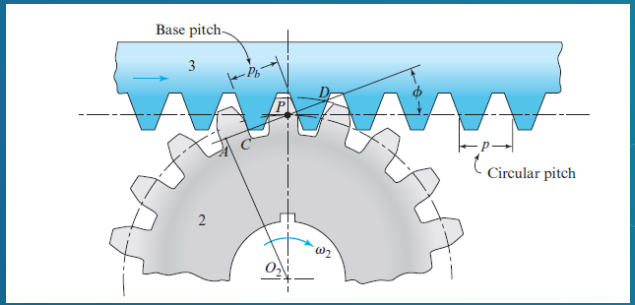
- They are characterized with perfect durability and are very compact in size



PARAMETERS

- Module - $m = P_t/\pi$ (Input Value)
- Number of teeth - Z_1/Z_2 (Input Value)
- Pitch circle diameter - $d_w = mz$
- Pitch angle - α
- Height of teeth - $h_d = 2m$
- Fillet radius - $r_i = 0.4m$
- Addendum height - $h_{wa} = m$
- Dedendum height - $h_{wf} = m$
- Pitch - $P_t = m\pi$
- Addendum circle - $d_a = m(z+2)$
- Dedendum circle - $d_f = m(z-2.5)$





OUTPUT PARAMETERS

CALCULATED WITH THE SOFTWARE CODE WRITTEN BY ME IN C++

- Height of tooth - $h_d = 2m = 4mm$
- Fillet radius - $r_i = 0.4m = 0.8mm$
- Addendum height - $h_{wa} = m = 2mm$
- Dedendum height - $h_{wf} = m = 2mm$
- Pitch - $P_t = m\pi = 6.28mm$
- Addendum circle - $d_a = m(z+2) = 38mm$
- Dedendum circle - $d_f = m(z-2.5) = 29mm$

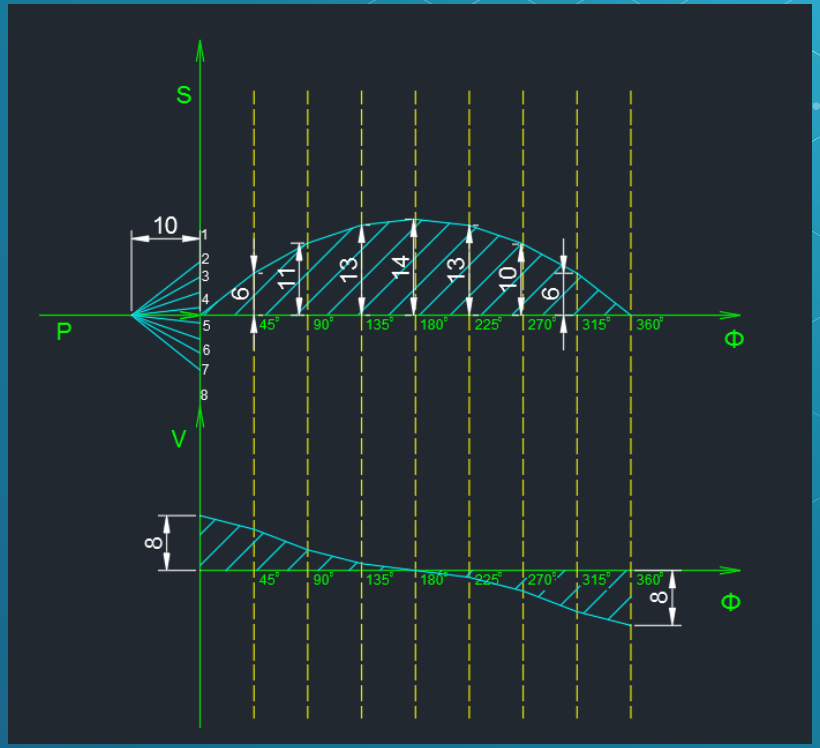
CAM AND FOLLOWER

- The universality and flexibility in the design are among their most attractive features

GRAPHICAL DERIVATION

- Equation of Follower motion. Derived from Lagrange interpolation polynomial :

- $L(x) = -14 * (x^2 - 6.28x)/9.85$



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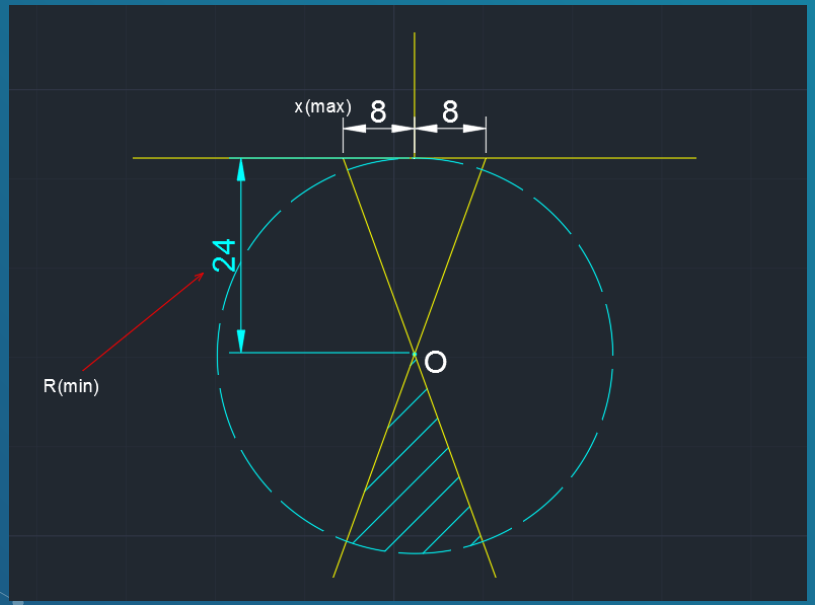
OPTIMAL RADIUS

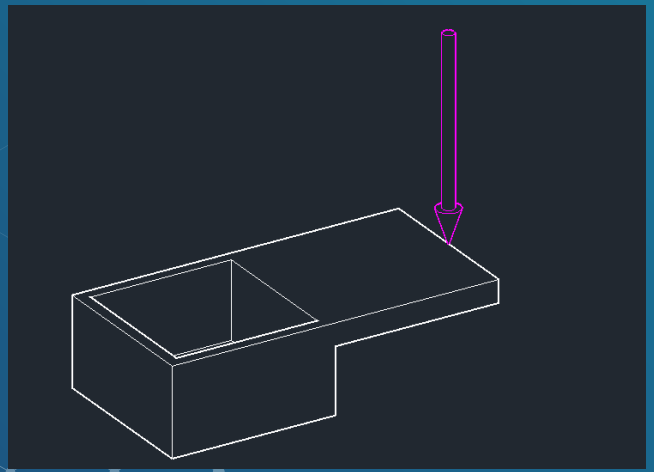
- Every point under hatched plane can be used for Cam center point

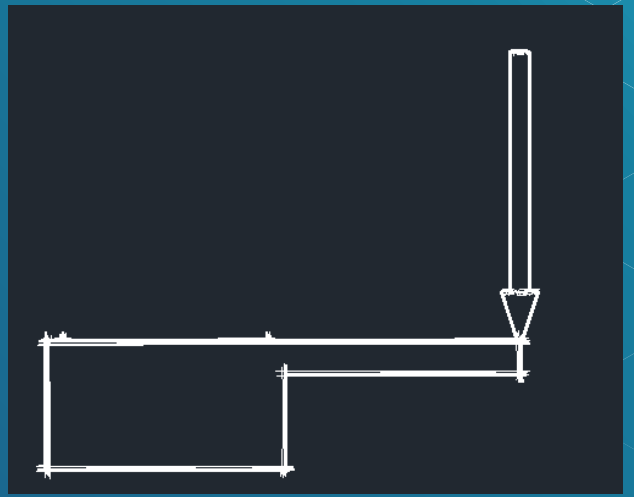


RACK AND PINION vs. CAM AND FOLLOWER

	R.&P.	C.&F.
MANUFACTURING COSTS	✗	✓
COMPACT IN SIZE	✓	✗
POWER USAGE	✓	✗

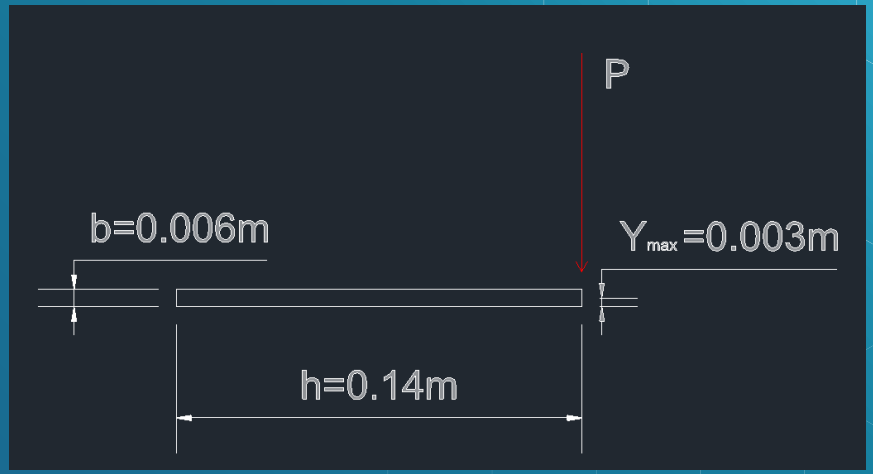
MAX. POSSIBLE STRAIN



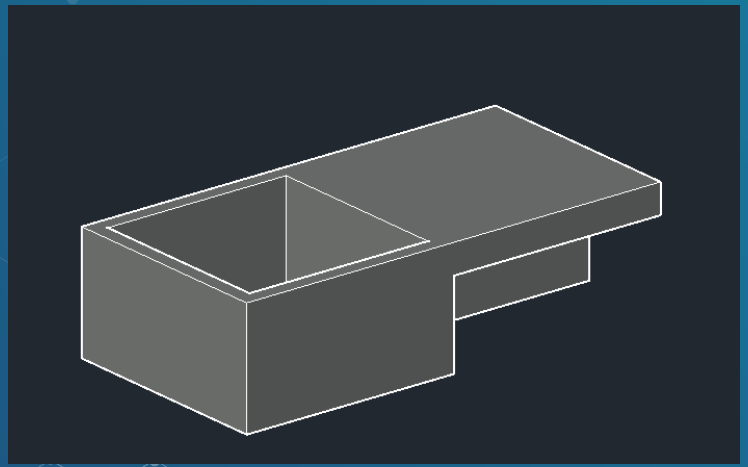


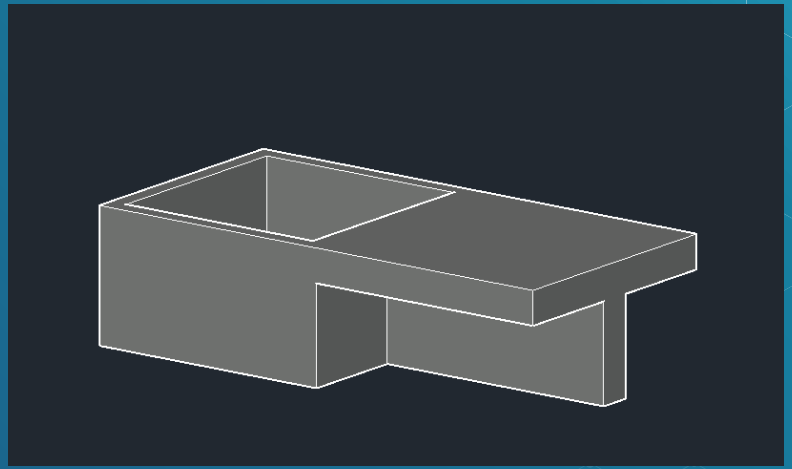
STRAIN CALCULATION

- Maximum possible strain [δ]= 10/196 = 0.051 (kg/cm^2) =
  = 5003(N/m^2)
- $I_x = b*h^3/12 = 137.2(cm^4) = 1.372 \times 10^{-6}(m^4)$
- $\delta_{max} = M_x*y_{max}/I_x = 140 * 0.3 / 137.2 = 0.3\ (kg/cm^2) =$
  = 29400(N/m^2)

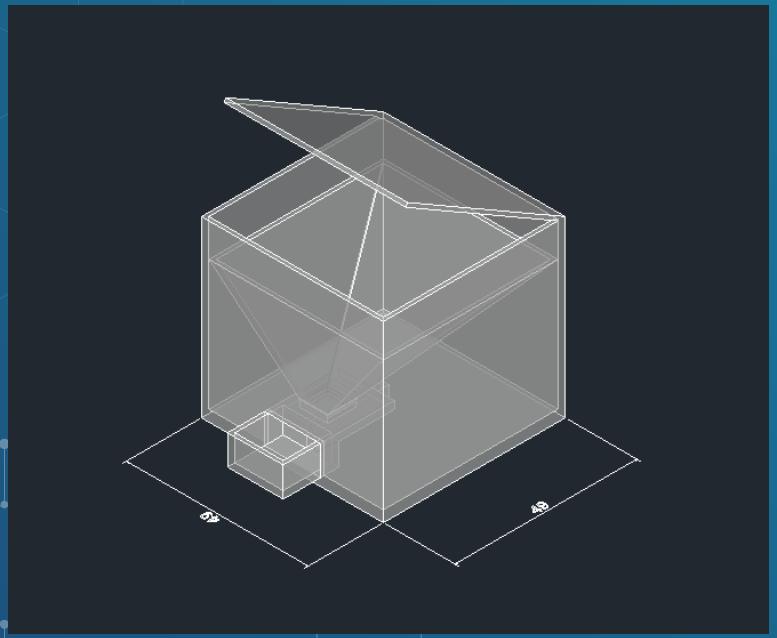


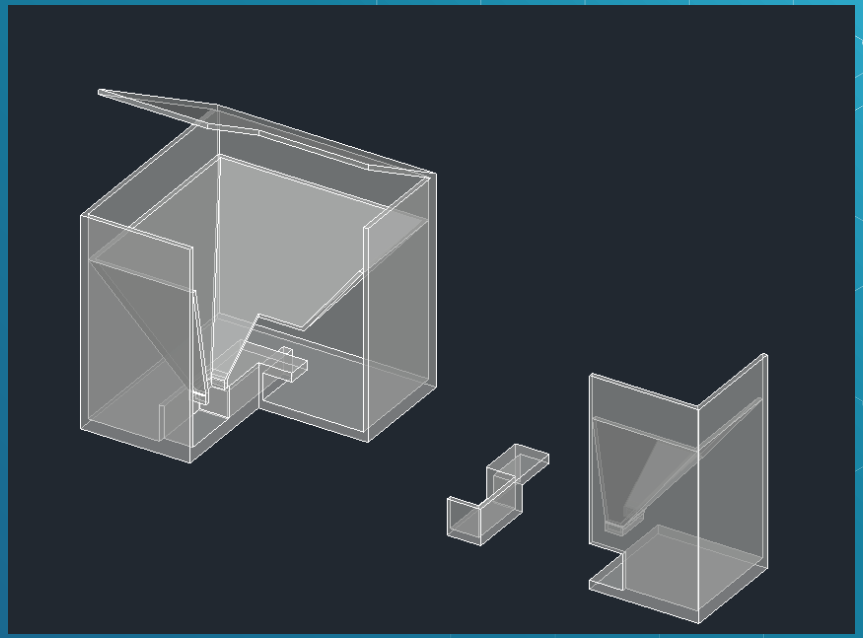
MINIMIZING MAXIMUM STRAIN





AUTOCAD PROTOTYPE





CONCLUSION

TASKS DONE:

- OPTIMAL DESIGN
- CHOOSING AND CALCULATING OPTIMAL MECHANISM
- STRAIN CALCULATIONS

TASKS IN DEVELOPMENT

- ENGINE SELECTION
- ELECTRICAL PART
- PROTOTYPE CREATION

THANKS!

ANY QUESTIONS?