[Wybierz datę]

WYDZIAŁ INŻYNIERII MECHANICZNEJ I ROBOTYKI
FACULTY OF MECHANICAL ENGINEERING AND ROBOTICS

AGH

SHAFT DESIGN

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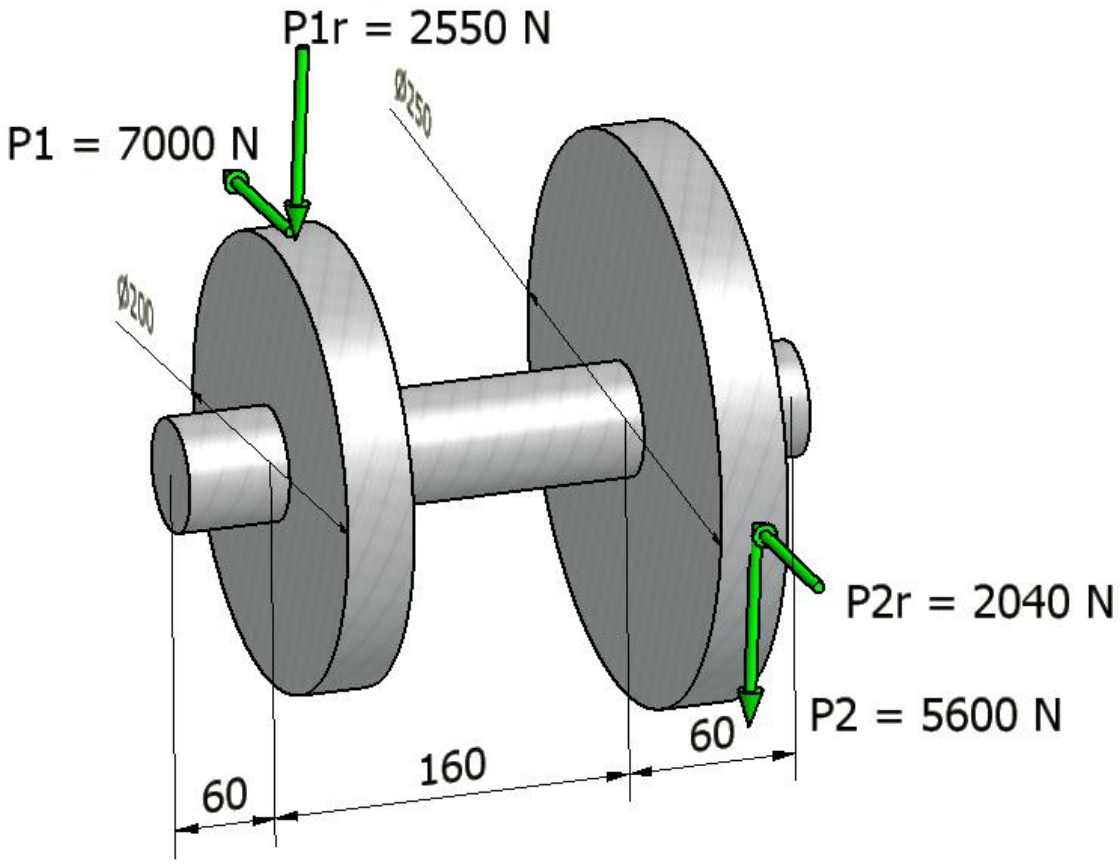
1. INTRODUCTION

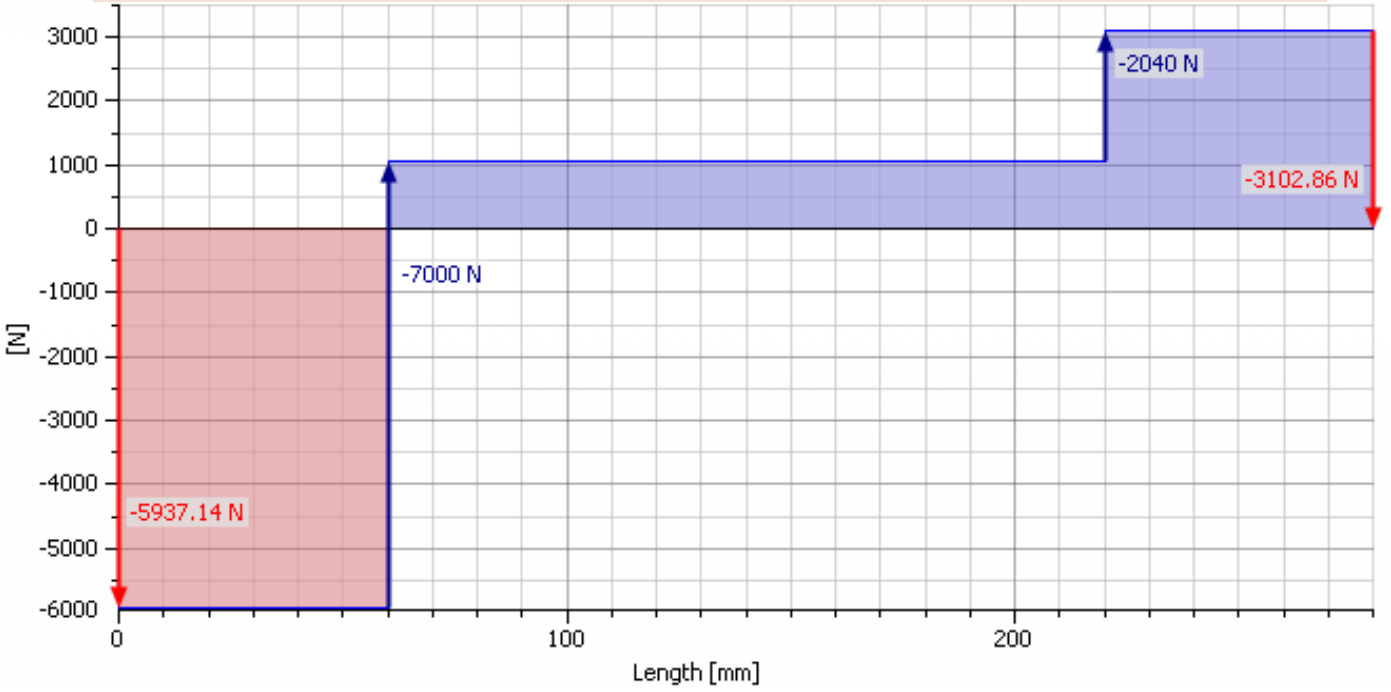
Objective of this project was to design shaft, able to transmit torque from one to second gear. Loads are from task number 9 and are distributed as on image bellow.



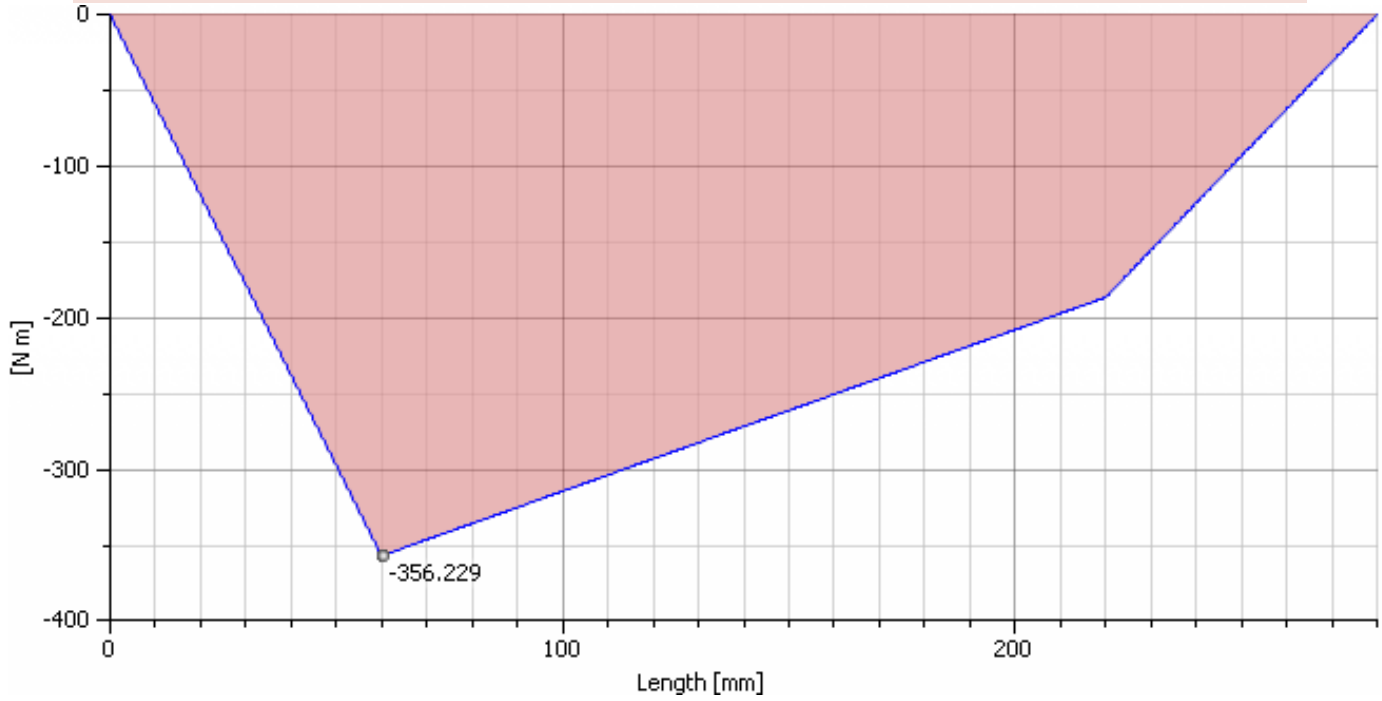
I set up as my objective in this exercise to make all parts of design process using computer software (Autodesk Inventor 2010).

2. ANALYSIS IN XZ PLANE

2.1 SHEAR FORCE.

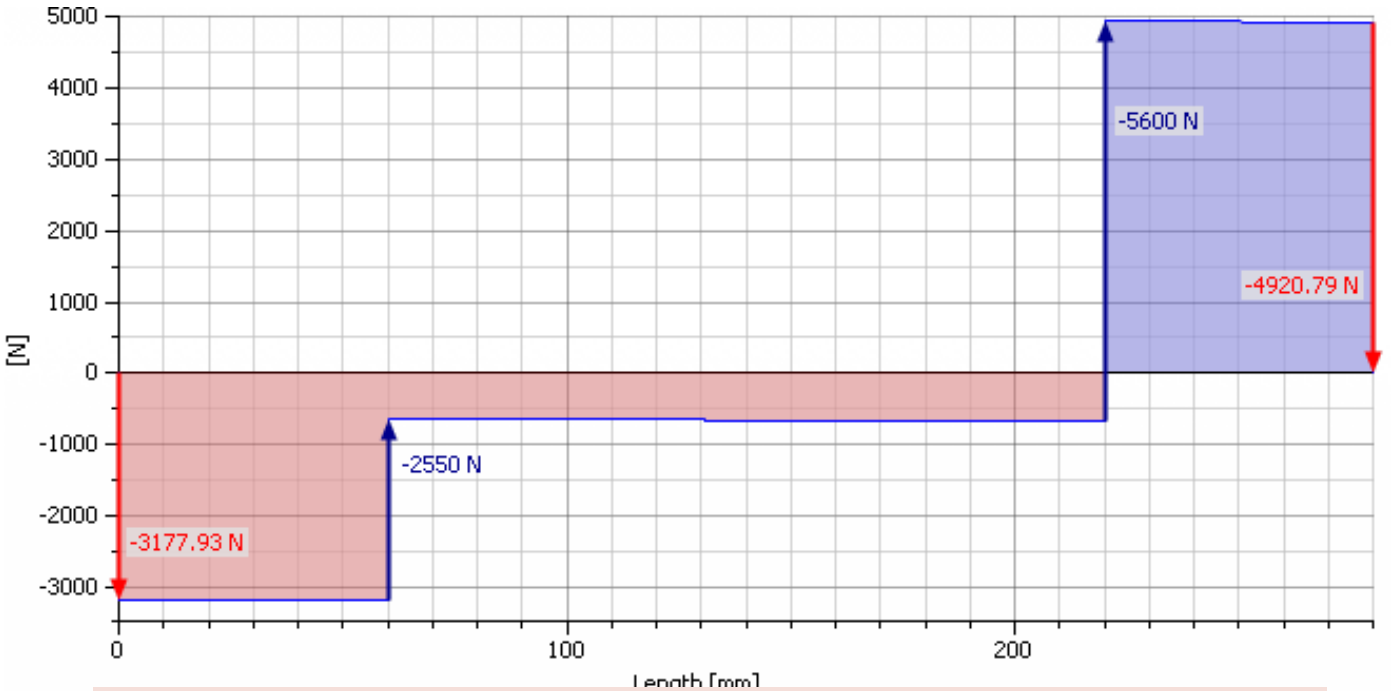


2.2 BENDING MOMENT.

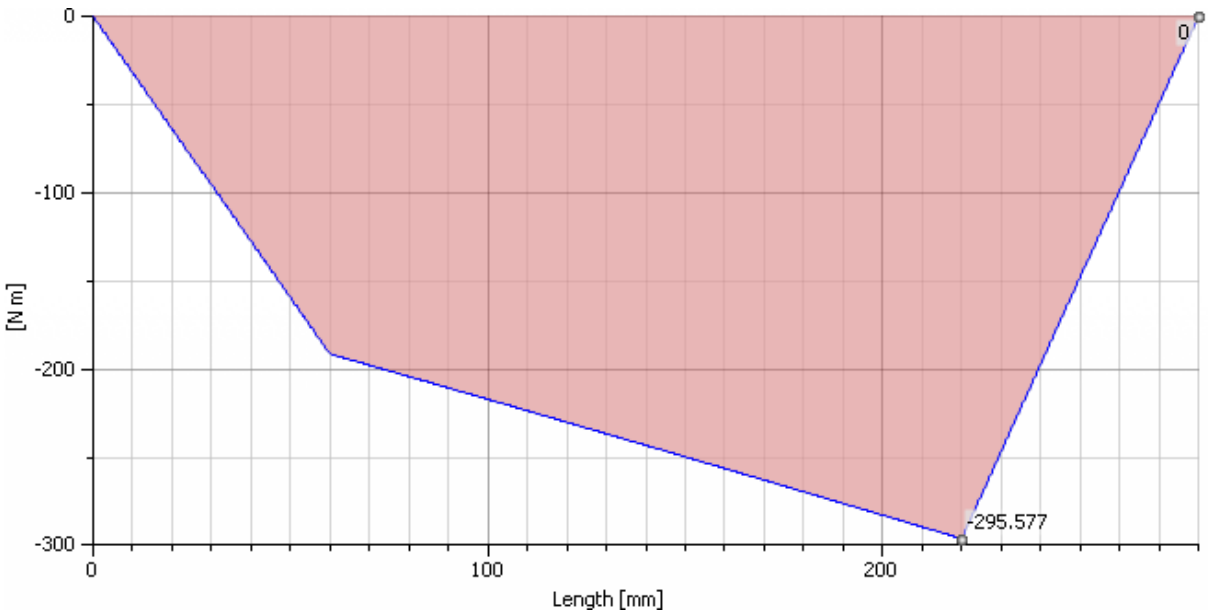


3. ANALYSIS IN YZ PLANE

3.1. SHEAR FORCE.

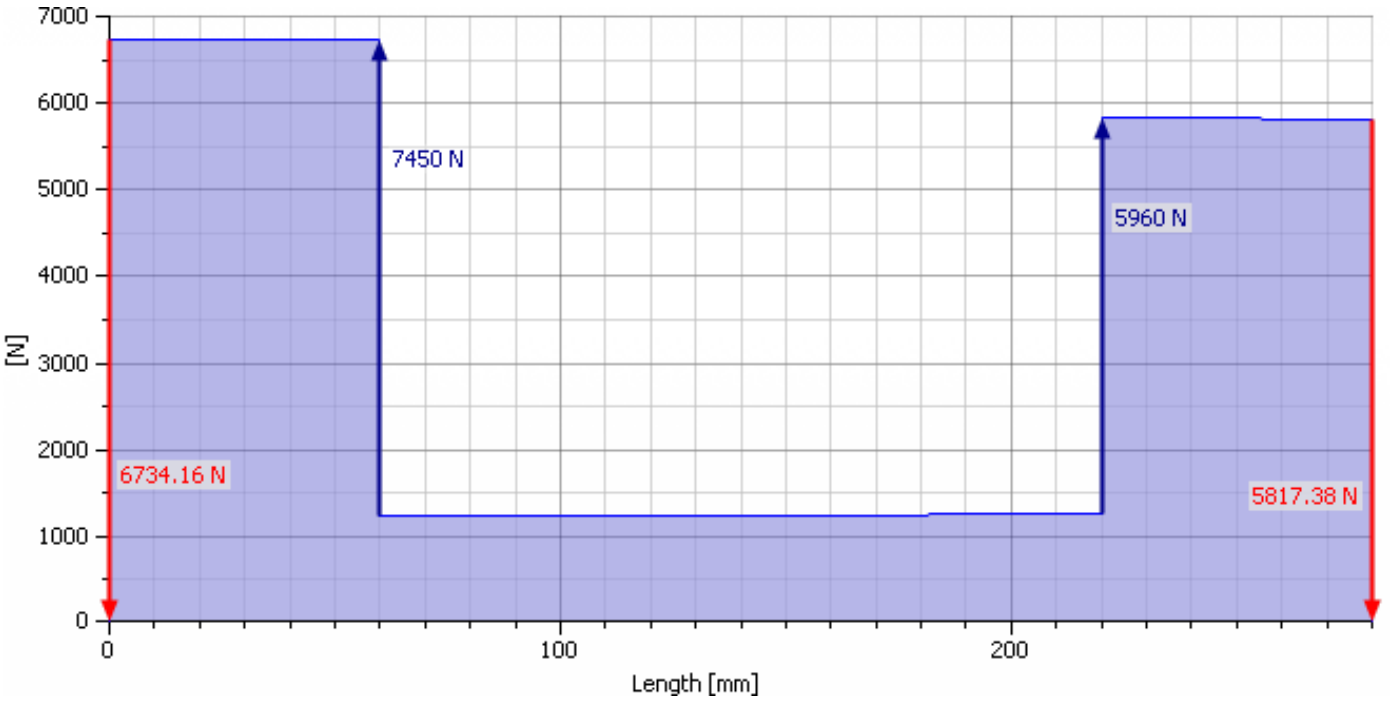


3.2. BENDING MOMENT.

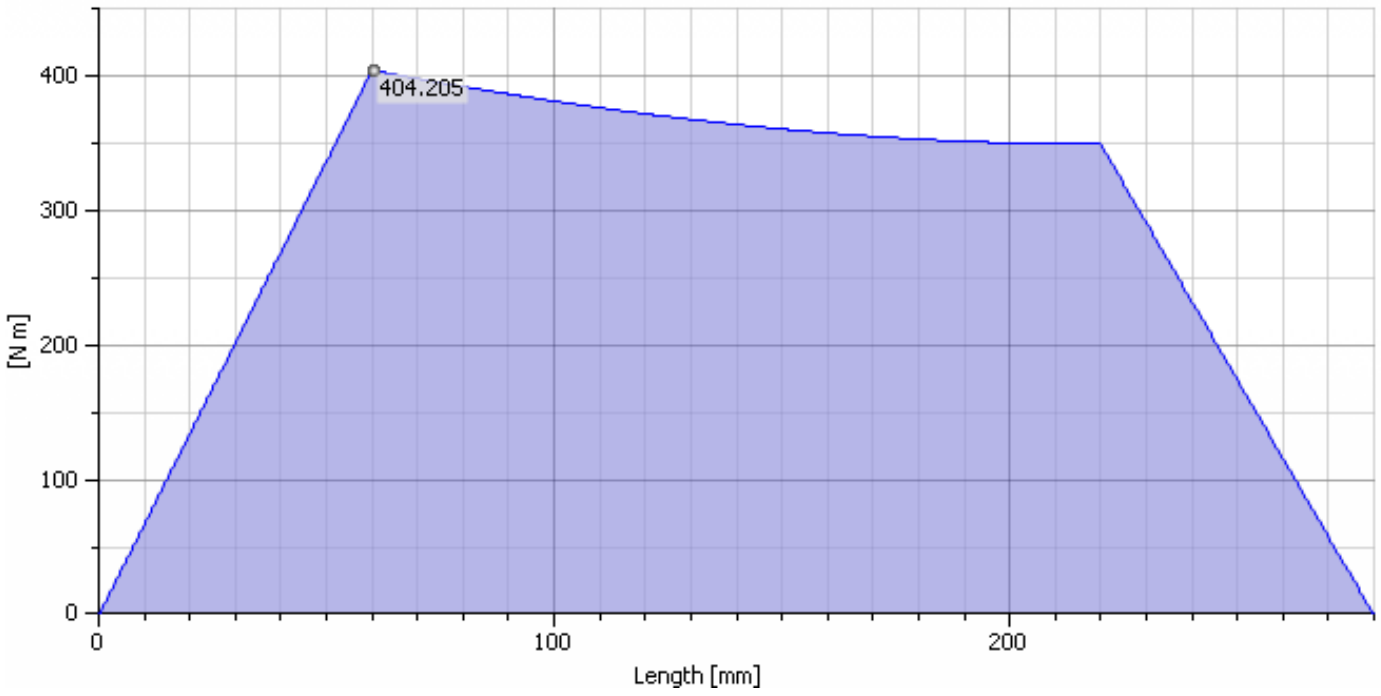


4. ANALYSIS OF RESULTANT VALUES

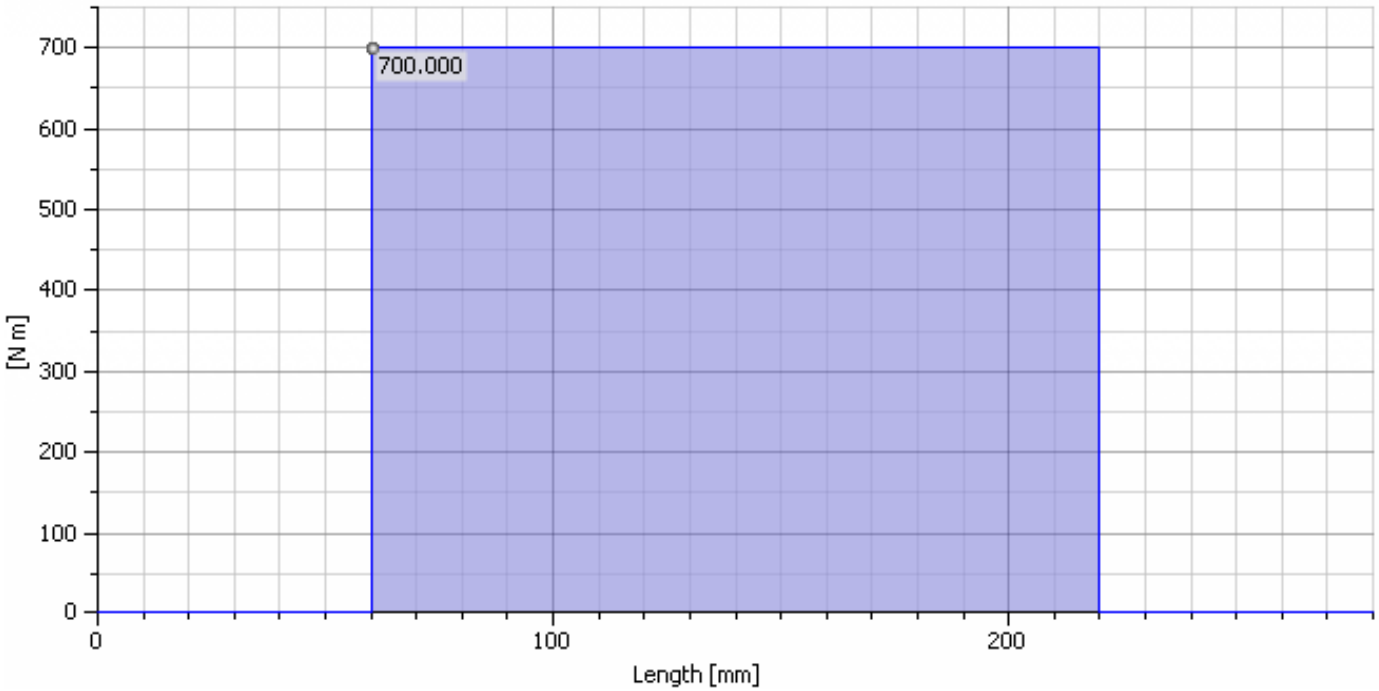
4.1. SHEAR FORCE



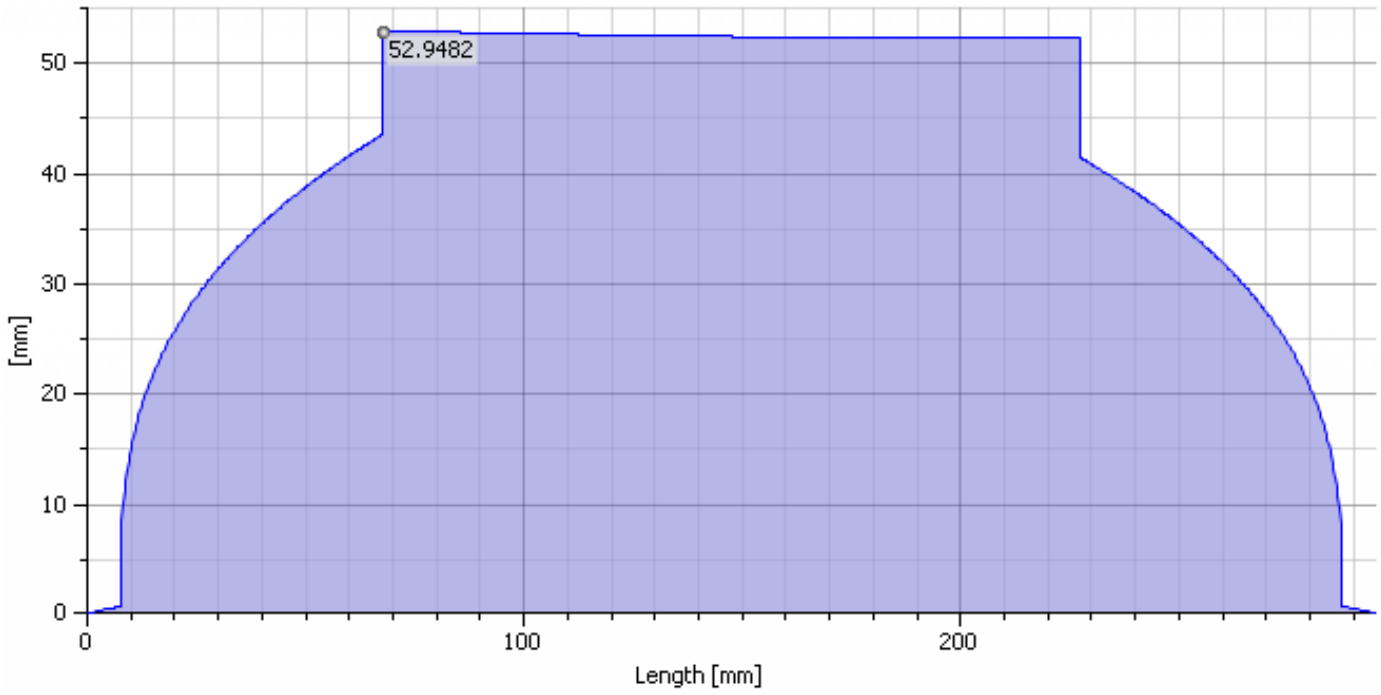
4.2 BENDING MOMENT



4.3. TORQUE IN SHAFT.

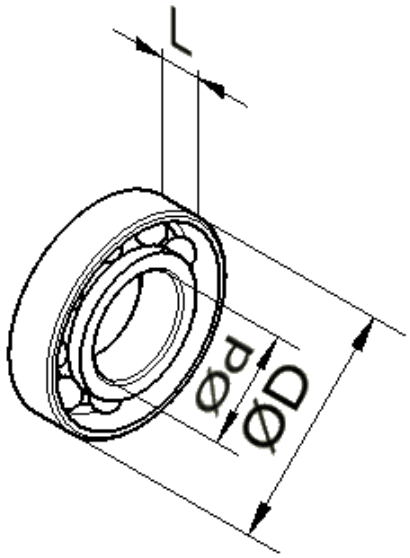


5. SHAPE OF IDEAL DIAMETERS FOR THE SHAFT



6. BEARINGS

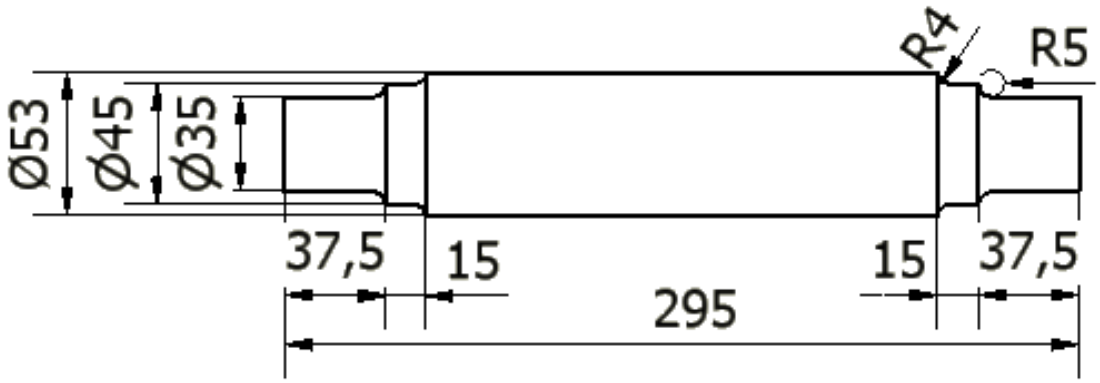
Knowing the shape of ideal diameter, and reactions at the ends of shaft we can choose bearings (from PN-87/M-86160) using ANSI/AFBMA 9-1990(ISO 281-1990) calculation method in Design Accelerator software in Autodesk Inventor.

Input properties	Results
$F_r = 7000N$ - approximated value of reaction forces (load carried by bearing) n=1500 rpm (speed of rotation of shaft) $s_0 = 2$ – safety factor $\mu = 0.0015$- friction factor Grease – lubrication type • For bearing life calculation I used such properties: $L_{req} = 1650\ hr$ Required life $R_{req} = 90$ required reliability $T = 100^oC$ working temperature	D=72mm D=35mm B=17mm 

Inner diameter of bearing is 35mm so diameter of first part of shaft should have 35mm.

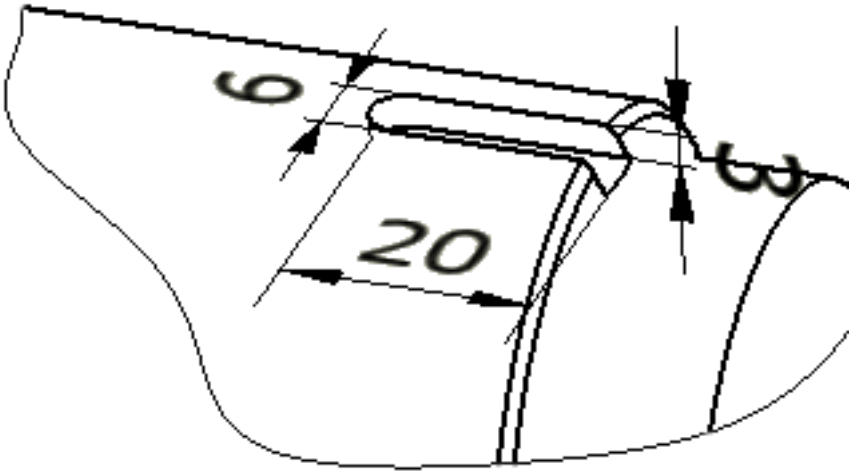
7.DIAMETERS.

According to the graph of ideal diameters I have chosen lengths of sections and diameters.



8.KEYWAY GROOVES.

Dimensions of grooves taken from table in Shingley's book.

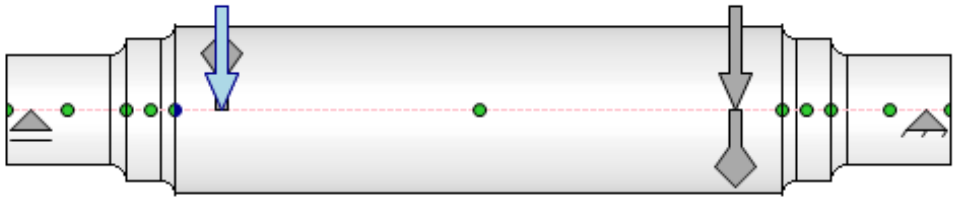


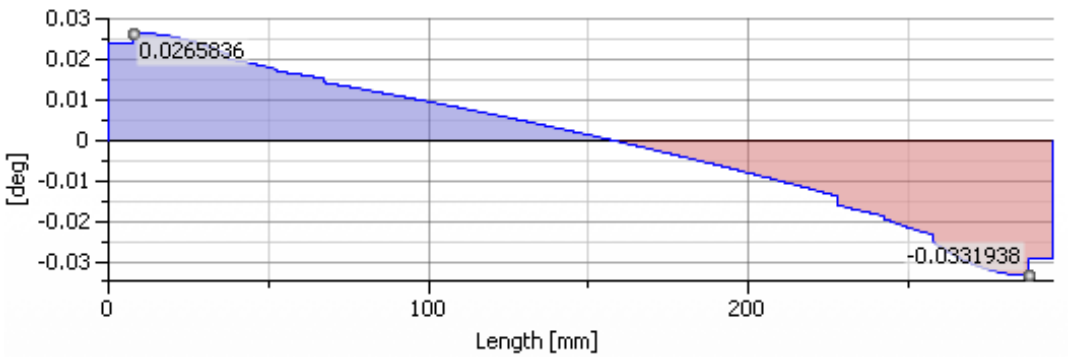
9. STRESSES AND DEFORMATIONS

(calculated using Autodesk Inventor 2010)

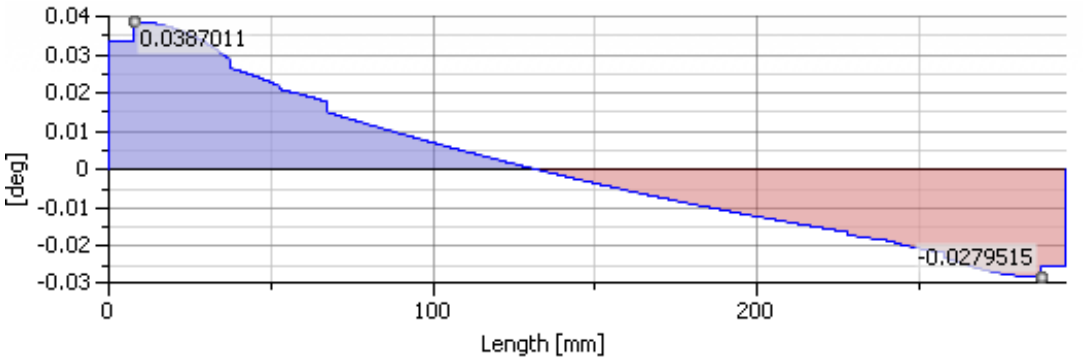
1. DEFLECTION ANGLES:

IN YZ PLANE

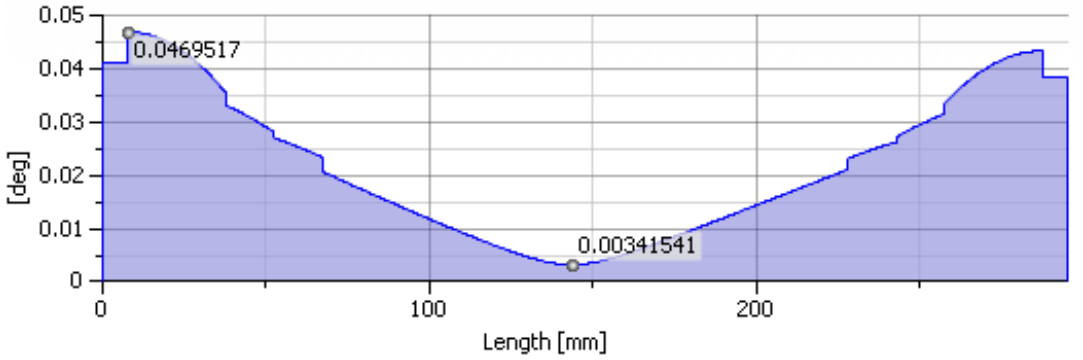




IN XZ PLANE

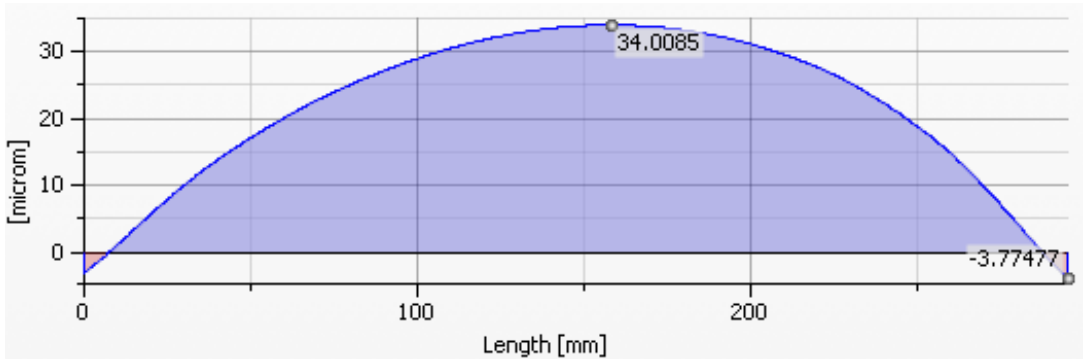


RESULTANT

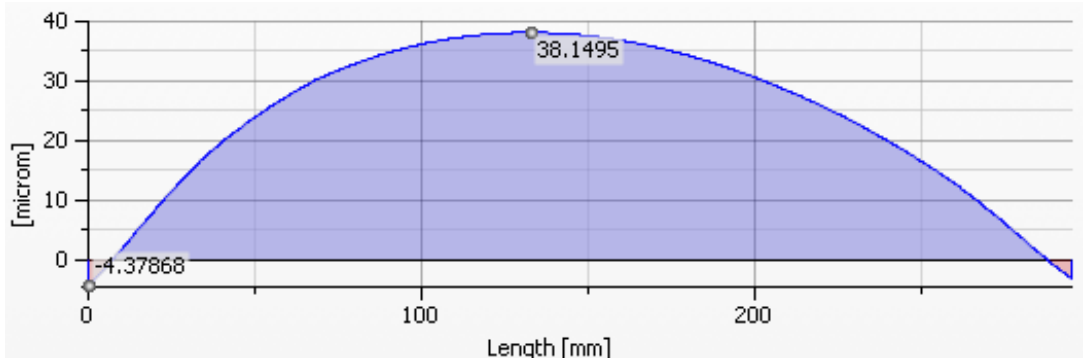


2. DEFLECTION

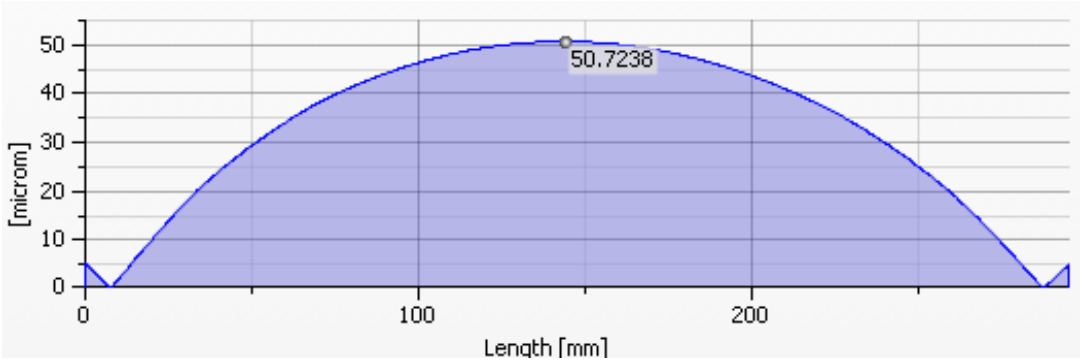
IN YZ PLANE



IN XZ PLANE

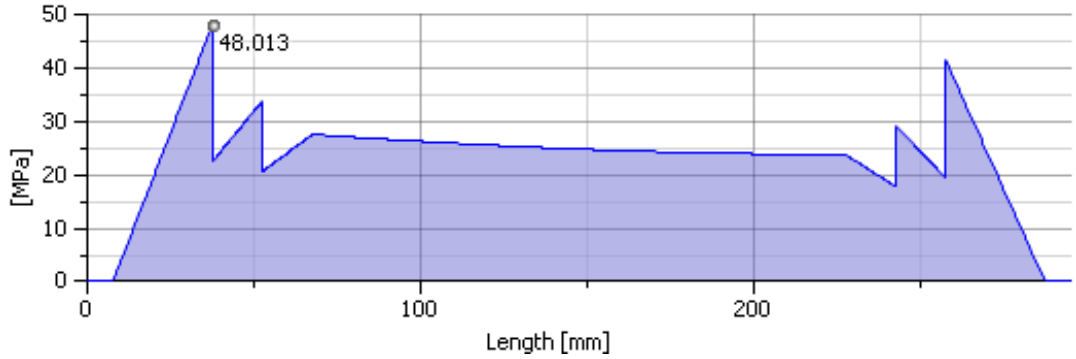


RESULTANT

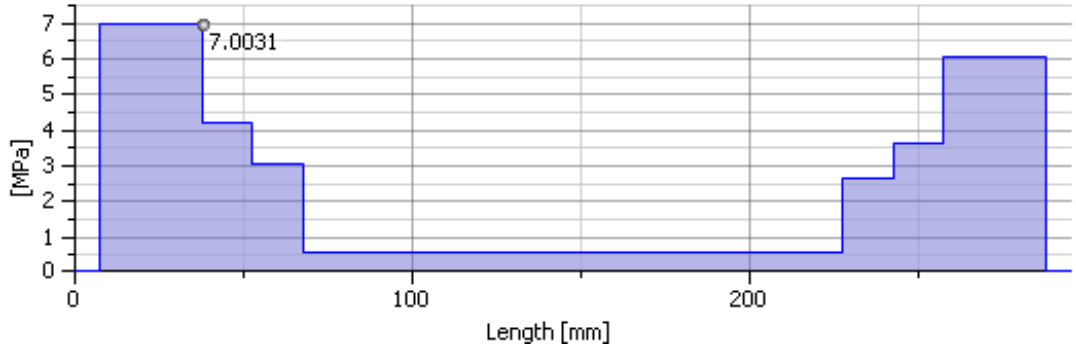


3. TOTAL STRESSES.

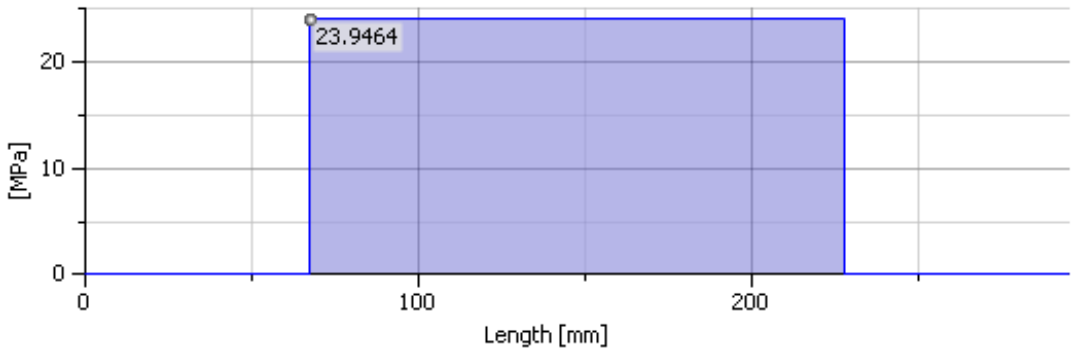
BENDING STRESS



SHEAR STRESS



TORSIONAL STRESS



REDUCED STRESS