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DESIGN AND ANALYSIS OF FLUID VISCOUS DAMPER FOR VIBRATION REDUCTION IN HAND HELD POWER MACHINERY

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ABSTRACT
Hand-arm vibration (HAV) is vibration transmitted from a work processes into workers' hands and arms. It can be caused by operating hand-held power tools, hand-guided equipment, or by holding materials being processed by machines. Multiple studies have shown that regular and frequent exposure to HAV can lead to permanent adverse health effects, which are most likely to occur when contact with a vibrating tool or work process is a regular and significant part of a person's job. Hand-arm vibration can cause a range of conditions collectively known as hand-arm vibration syndrome (HAVS), as well as specific diseases such as white finger or Raynaud's syndrome, carpel tunnel syndrome and tendinitis. Vibration syndrome has adverse circulatory and neural effects in the fingers. The signs and symptoms include numbness, pain, and blanching (turning pale and ashen).so these vibration reduce by using viscous damper.

KEYWORDS: Hand-held vibrating tools, Hand-transmitted vibration level, Hand Arm Vibration syndrome. Damper design, Piston Design.

INTRODUCTION
The increasing demands of high productivity and economical design led to higher operation speeds of machinery and efficient use of materials through lights weights structures. These makes the trend of resonance condition more frequent the periodic measurement of vibration characteristics of machinery and structures become essential to ensure adequate safety margins. Any observed shifts in the natural frequencies or other vibration characteristics will indicate either failure or a need for maintenance of the machine. The measurement of the natural frequencies of the structure or machine is useful in selecting the operational speed of nearby machinery to avoid resonant condition. The theoretically computed vibration characteristics of a machine or structure may be different from the actual value due to the assumptions made in the analysis. In many applications survivability of a structure or machine in a specified vibration environment is to be determined. If the structure or machine can perform the expected task even after completion of testing the specified environment, it is expected to survive the specified conditions. Hand-arm vibration (HAV) is vibration transmitted from a work processes into workers' hands and arms. It can be caused by operating hand-held power tools, hand-guided equipment, or by holding materials being processed by machines. Multiple studies have shown that regular and frequent exposure to HAV can lead to permanent adverse health effects, which are most likely to occur when contact with a vibrating tool or work process is a regular and significant part of a person's job.So, we design and analysis for discuss damper for reduction hand held power machinery

DESIGN OF VICIOUS DAMPER
The design of damper we design analytically and ANSYS the following parts were design.

A) Analytical Damper body Design:
Material selection,

Designation	Ultimate Tensile strength N/mm^2	Yield strength N/mm^2
EN08	380	270

Factor of safety is taken as 20
fc_{all} for damper body is,

$$fc_{all} = \frac{Ultimatetnsilestrngth}{Factorofsafety}$$

$$= \frac{380}{2}$$

$$= 190 N/mm^2$$

Hoope's stress due to exhaust gas pressure:-
Maximum pressure induced in system due to steam= 3 bar

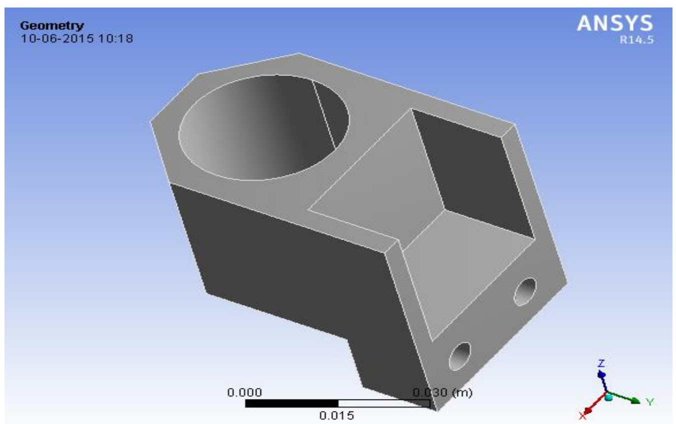
$$fc_{act} = \frac{Pd}{2t}$$

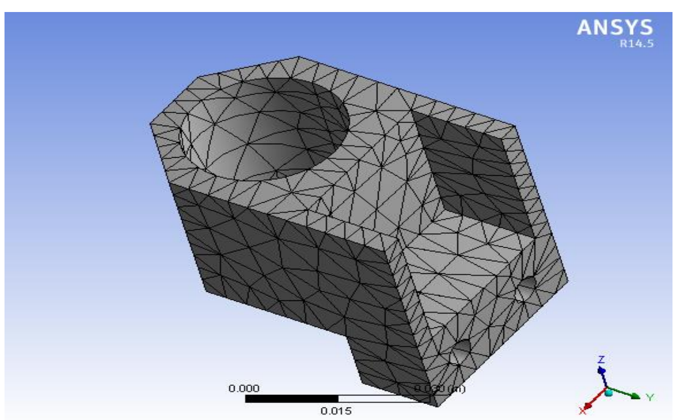
$$fc_{act} = \frac{0.3 \times 28}{2 \times 4}$$

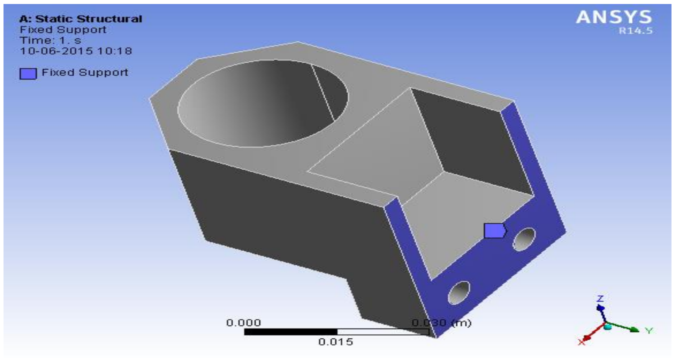
$$fc_{act} = 1.4 N/mm^2$$

As, $fc_{h} < fc_{all}$;
Damper body is safe

B) ANALYSIS OF DAMPER BODY:
GEOMETRY:



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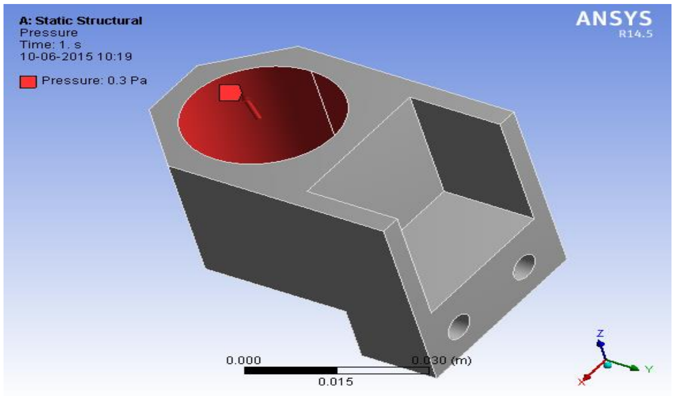
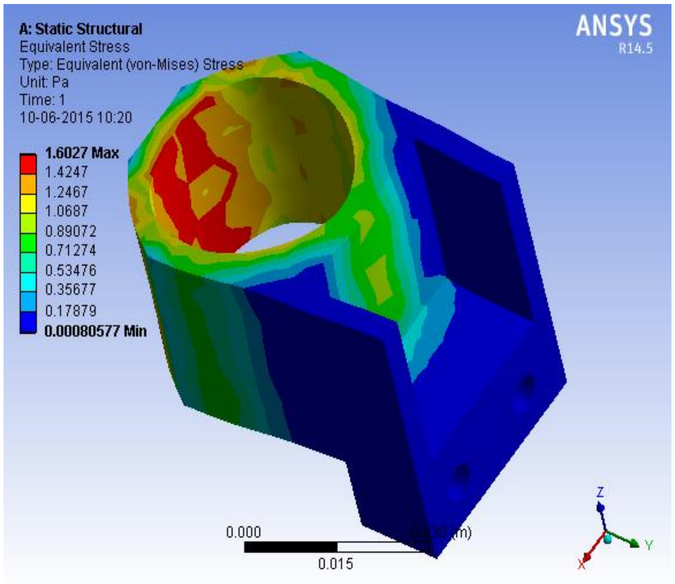
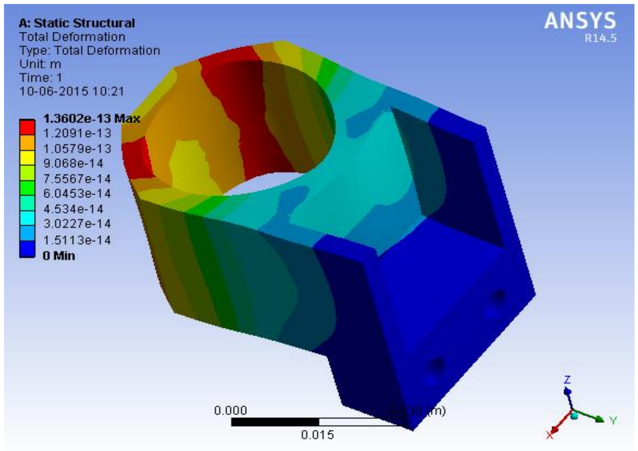
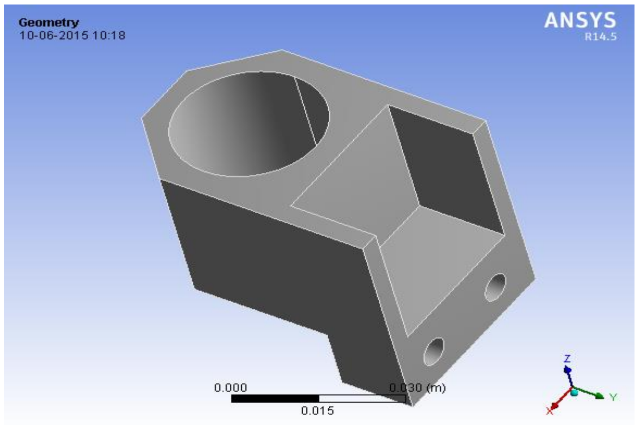
Fixed Support
Time: 1. s
10-06-2015 10:18
Fixed Support
ANSYS
R14.5
0.000
0.015
0.030 (m)


A: Static Structural
Pressure
Time: 1. s
10-06-2015 10:19
Pressure: 0.3 Pa
ANSYS
R14.5
0.000
0.015
0.030 (m)


A: Static Structural
Equivalent Stress
Type: Equivalent (von-Mises) Stress
Unit: Pa
Time: 1
10-06-2015 10:20
1.6027 Max
1.4247
1.2467
1.0687
0.89072
0.71274
0.53476
0.35677
0.17879
0.00080577 Min
ANSYS
R14.5
0.000
0.015





A) Analytical Design of Piston Rod:
Material selection:
Ref :- (PSG – 1.12)

Designation	Tensile Strength N/mm^2	Yield Strength N/mm^2
EN24	800	680

Factor of safety is taken as 20
fc_{all} for damper body is,

$$fc_{all} = \frac{Ultimatetnsilestrngth}{Factorofsafety}$$

$$= \frac{800}{20}$$

$$= 40N/mm^2$$

Direct Tensile or Compressive stress due to an axial load:-
Piston force = Pressure x area
= $0.3 \times (\pi/4)\ 28^2$
Piston force = 184N
Calculate Actual compressive stress,

$fc_{act} = \frac{W}{A}$

$fc_{act} = \frac{W}{\frac{\pi}{4}\times 12^2}$

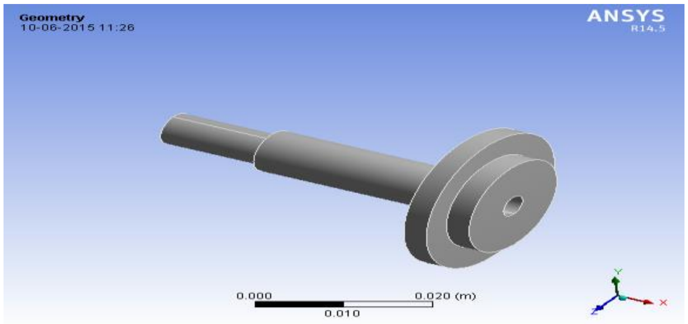
$fc_{act} = \frac{184}{\frac{\pi}{4}\times 12^2}$

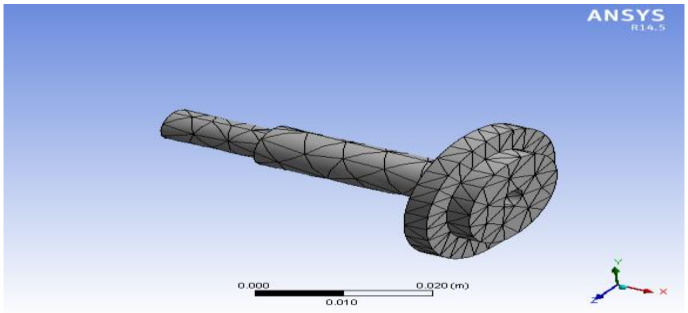
$fc_{act} = 2.62\ N/mm^2$

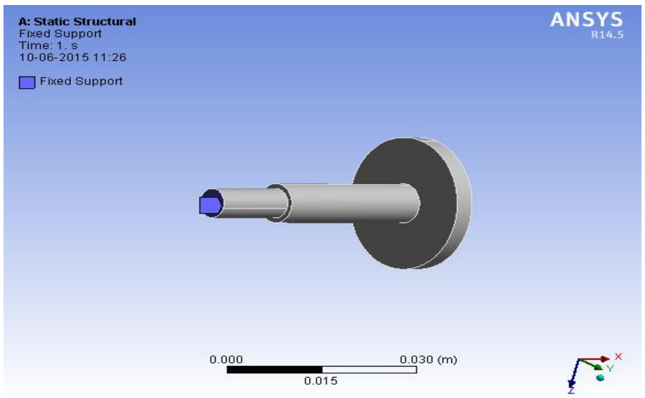
As, $fc_{act} < fc_{all}$;

Piston rod is safe in compression.

B) ANALYSIS OF PISTON GEOMETRY:







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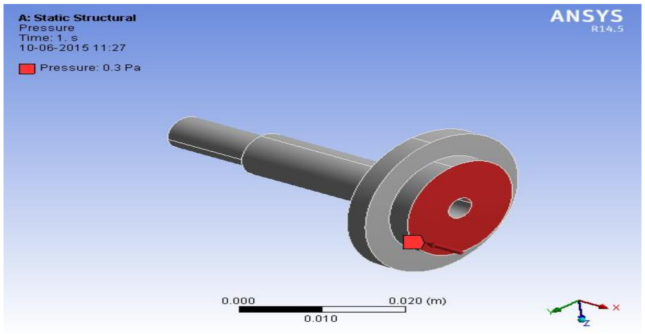

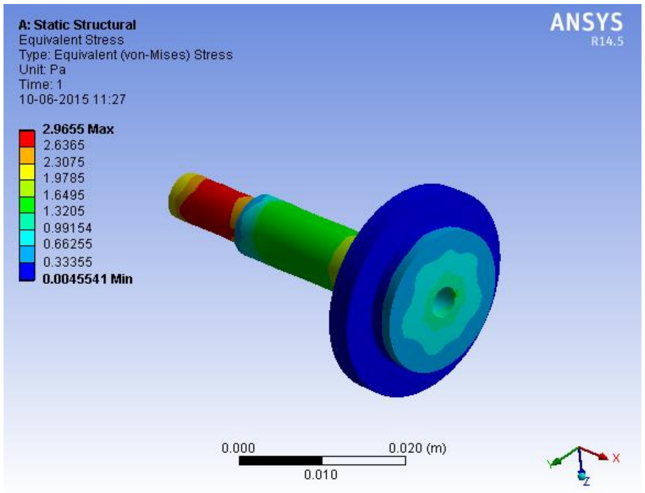

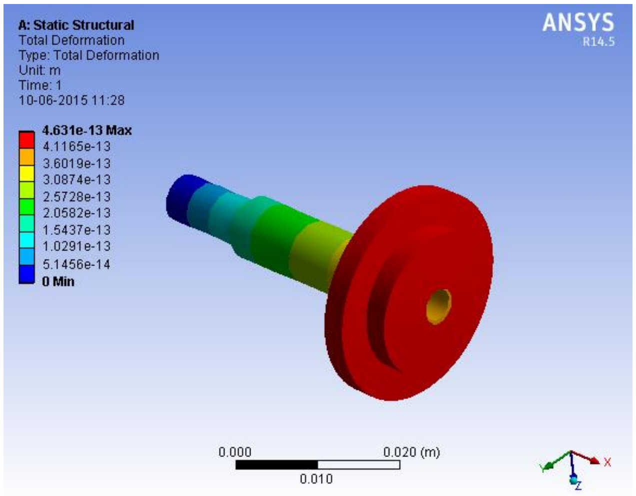

Table No.4.1 Result And Discussion:

Part Name	Maximum theoretical stress N/mm^2	Von-misses stress N/mm^2	Maximum deformation mm	Result
Damper body	1.4	1.6	1.36×10^{-13}	Safe
Piston	2.62	2.9	4.63×10^{-13}	Safe

CONCLUSION

1. Maximum stress by theoretical method and Von-misses stress are well below the allowable limit, hence the damper body is safe
2. Damper body shows negligible deformation under the action of system of forces.
3. Maximum stress by theoretical method and Von-misses stress are well below the allowable limit, hence the piston is safe
4. Piston shows negligible deformation under the action of system of forces.

REFERENCES

[1] M.F. Hassan, M. Mailah, R. Junid and N.A. Alang, “Vibration Suppression of a Handheld Tool Using Intelligent Active Force Control (AFC)”, Proceedings of the World Congress on Engineering 2010 Vol II WCE 2010, June 30 - July 2, 2010, London, U.K., ISBN: 978-988-18210-7-2, ISSN: 2078-0966 (Online).
[2] Lars Skogsberg , “Vibration Control on Hand-Held Industrial Power Tools” , Product Ergonomics, Atlas Copco Tools & Assembly Systems, Stockholm, Sweden, pp 108-109.
[3] Dhananjay Singh Bisht, Mohammed Rajik Khan, “Ergonomic Assessment Methods for the Evaluation of Hand Held Industrial Products:A Review” ,Proceedings of the World Congress on Engineering 2013 Vol I, WCE 2013, July 3 - 5, 2013, London, U.K., ISBN: 978-988-18210-7-2, ISSN: 2078-0966 (Online).
[4] Thomas J. Armstrong, Don B. Chaffin, Gary D. Langolf , “hand-arm frequency-weighted vibration effects on tactility”,Elsevier,International Journal of Industrial Ergonomics, 6 (1990) , pp75-82.
[5] Robert G.Radwin,Thomas J.Armstrong , “Vibrayin Exposure for Selected Power Hand Tools Used in Automobile Assembly” Am.Ind.Hyg.Assoc.J.51(9), september 1990, pp 510-518.
[6] Health and Safety Executive, “Reducing Risk of Hand-Arm Vibration Injury From Hand-Held Power Tools”, Information Document HSE 246/31.
[7] Hand-Arm Vibration - Fact Sheet,September 2012, pp1-3
[8] Vibration solutions, “How to approach a vibration problem”, ISBN 978 0 7176 0954 3, pp 6-9. V.B.Bhandari Machine design Volume –I.