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Vibration reduction analysis in mixer grinder using composite materials: A comparative study using ansys

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Abstract
Nowadays vibration analysis is played a vital role in research area. In this paper we are try to reduce the vibration in home appliances mixer grinder. So many composite materials are used nowadays to replace the ferrous material as well as improve efficiency at low cost. In analysis part we did vibration analysis using different materials with composite material and find out, the best vibration reduction material to implement in mixer grinder to reduce vibrations.

Keywords: mixer grinder, composite materials, analysis results

1. Introduction
A mixer grinder is used in kitchen for cutting the vegetable items into small particles, prepare foods and make juices. It's having a gear-driven mechanism to rotate a set of beaters in a bowl containing the food to be prepared. It automates the repetitive tasks of stirring, whisking or beating. When the beaters are replaced by a dough hook, a mixer may also be used to knead. A mixer may be a hand held mechanism known as an eggbeater, a handheld motorized beater, or a stand mixer. Stand mixers vary in size from small countertop models for home use to large capacity commercial machines. Stand mixers create the mixing action by rotating the mixing device vertically: planetary mixers, or by rotating the mixing container: spiral mixers. Mixers for the kitchen first came into use midway through the nineteenth century; the earliest were mechanical devices. The demand from commercial bakers for large-scale uniform mixing resulted in the development of the electric stand mixer. Smaller counter-top stand mixers for home kitchen use soon followed. When selecting a mixer, the purchaser should consider how the mixer will be used. Electric mixers with more speed options give the user more control over the development of the mixture.

2. Composite material
In this project we are find out the vibrating damping component material from ASM hand book. Comparing various materials used in mixer grinder for heavy duty applications based on application the following material is choosing.

3. DC-10 product features
DC-10 is a visco-elastic sprayable liquid sound damping compound used to reduce noise radiated by vibration or shock excited metal surfaces, suitable for use virtually anywhere such surfaces are found. Ideal for architectural and mechanical equipment applications such as treating ducts, mixing boxes, sound-proof doors, and metal partitions- especially in the new construction field where it is mandatory to use non-combustible or nonsmoker generating materials to meet local fire codes and ordinances.

DC-10 properties
- Available 5 gallon containers (56.25 LBS)
- Light Tan color
- Resistant to water, solvents, acids & corrosive gases
- Average curing time of 4 to 24 hours at room temperature
- Density = 105 LB per ft3
- Temperature range of 0° F to 225° F
- Meets ASTM E162 Class I fire rating
- Water based Non-Toxic and odorless
- VOC per EPA Method #24 = 0 LBS / Gallon
- Loss factor of .066 at 200Hz on 20 gauge steel
- Protect From Freezing
- Painting is recommended for outdoor use

Analysis results
In analysis point of view already used materials are taken for harmonic analysis to analyse the vibration produced in mixer grinder rotor as well as its accessories.

4. Aluminum

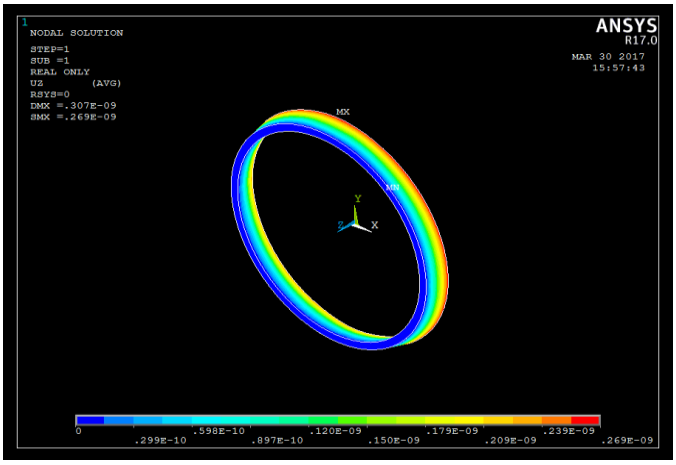

Fig 1: Aluminium

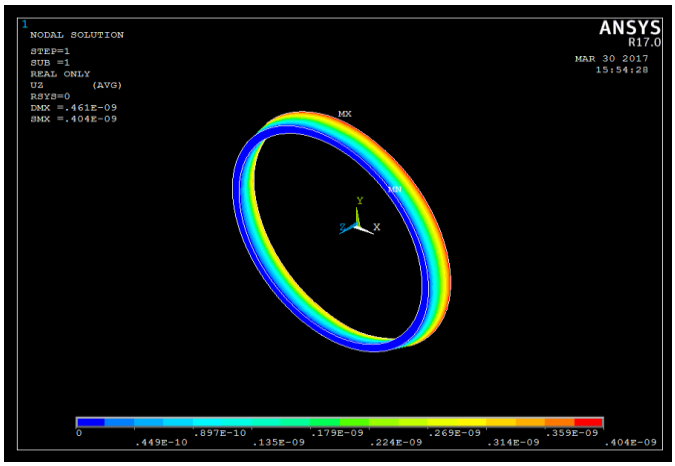

Fig 2: Aluminium

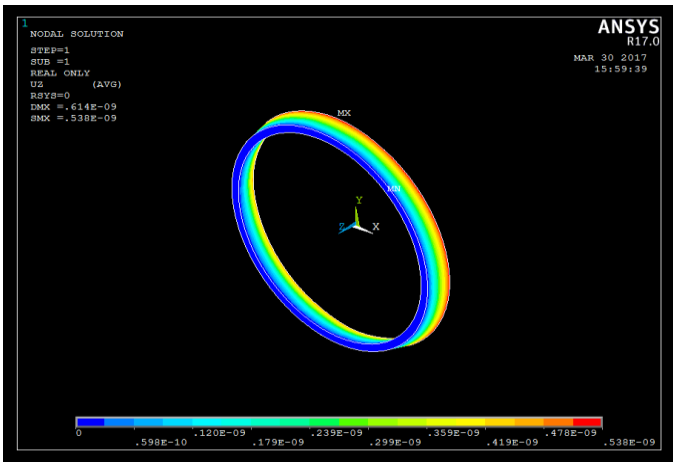

Fig 3: Aluminium

5. Copper

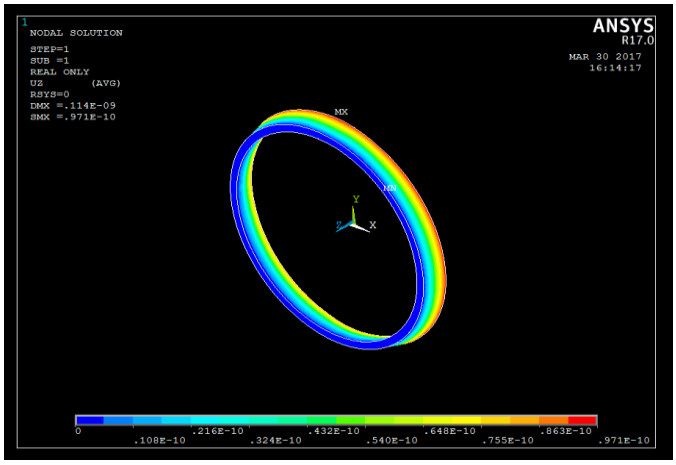

Fig 4: Copper

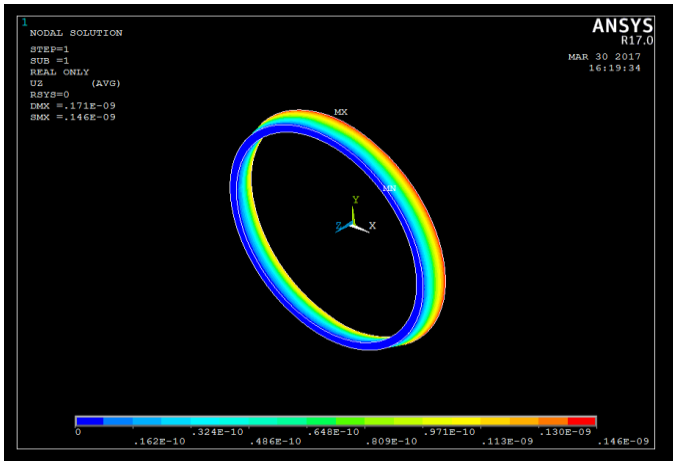

Fig 5: Copper

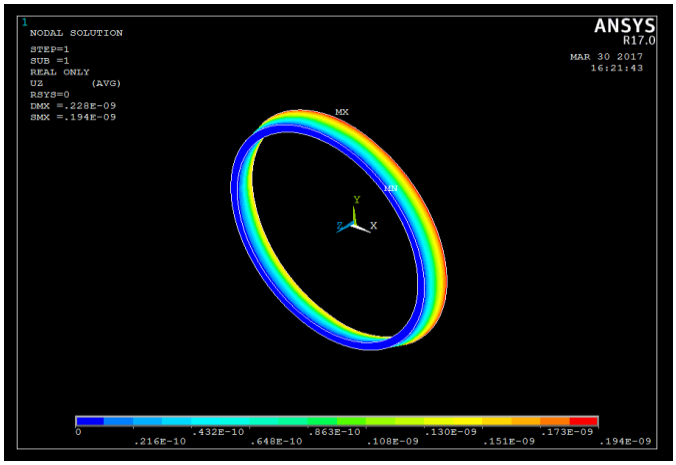

Fig 6: Copper

6. Stainless steel

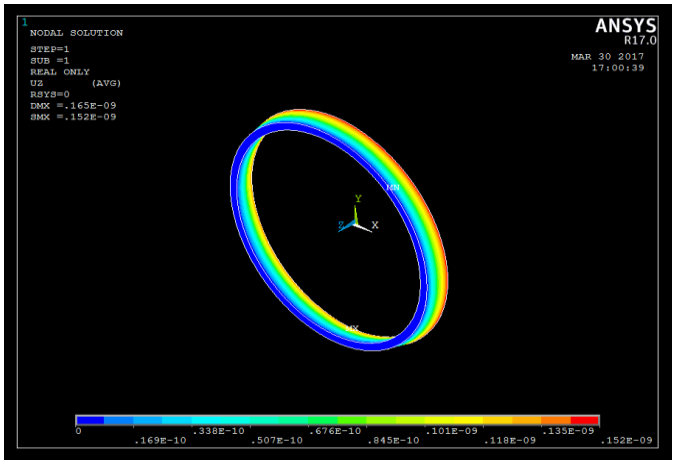

Fig 7: Stainless steel

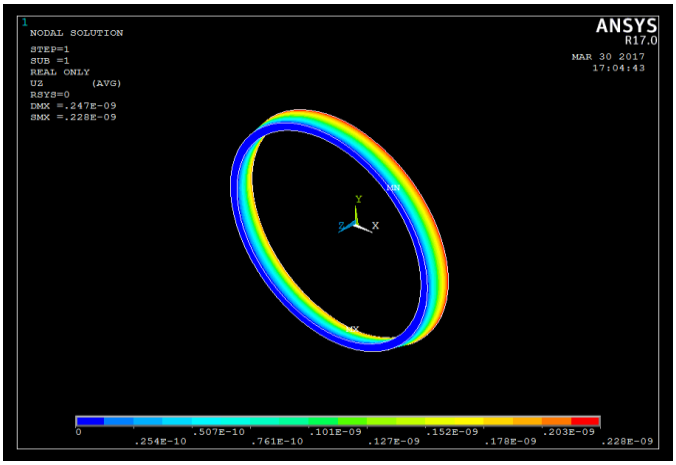

Fig 8: Stainless steel

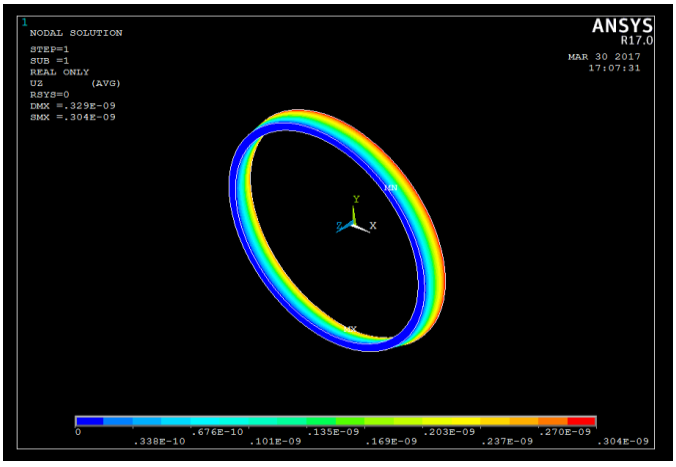

Fig 9: Stainless steel

7. D-10 Material

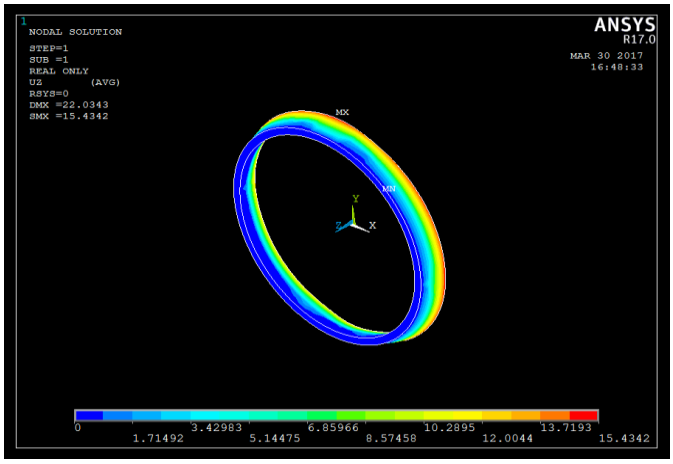

Fig 10: 1D-10 Material

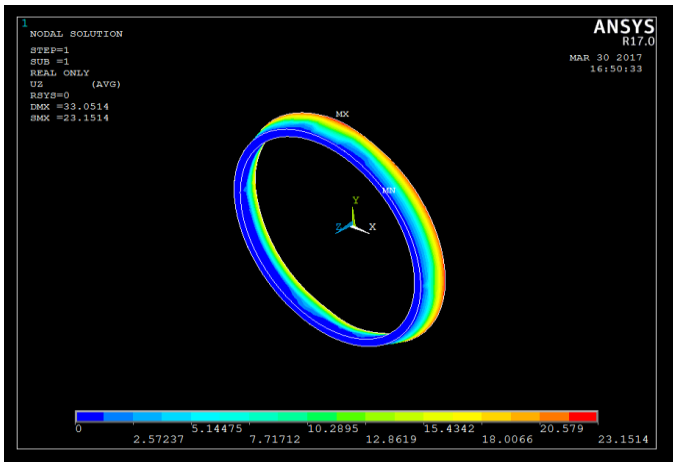

Fig 11: 1D-10 Material

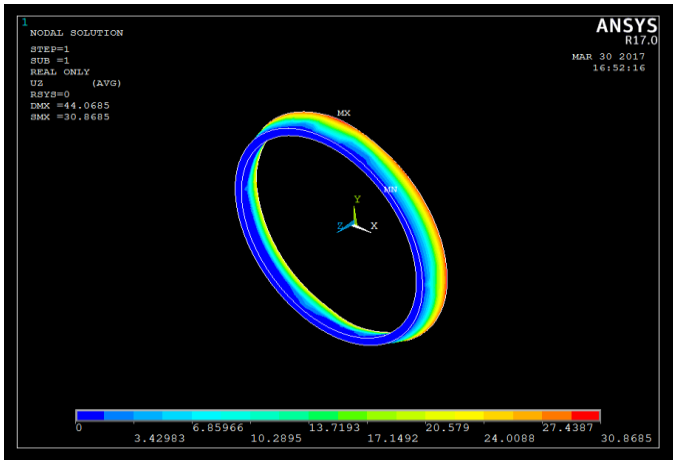

Fig 12: 1D-10 Material

From the above said diagrams we are concluding the composite material absorbing maximum amount of vibrations and produce less amount of noise.

8. Conclusion

The bottom line in noise and vibration control, as in virtually all other engineering efforts, is cost-effectiveness, which translates into achieving workable, inexpensive solutions to complex problems. Maximum advantages of reducing noise and vibration at the source can be realized by careful planning, thoughtful design, and proper choice of materials and structures specifically engineered for the task. This technological state of the art in damping materials and systems is such that it is possible to design products that operate more quietly, with less vibration and greater precision, without being necessarily more expensive or difficult to build.

9. References

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2. ASM properties and selection-Nonferrous Alloys and special purpose materials.
3. ASM material characterization volume 10.