
Porous media simulations in automotive noise and vibration

Norimasa Kobayashi

TOYOTA MOTOR CORPORATION



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KTH Royal Institute of Technology
Stockholm, Sweden

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Outline

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Introduction

- Vehicle NV performance have been conflicted for a long time with weight which has direct influence on fuel efficiency demanded for customer satisfaction and environmental requirement of society.
- Various investigations have been carried out to find the optimal solutions. One of the required technologies is to balance acoustic characteristics with weight and cost of acoustic trim such as a floor carpet and a dash silencer.
- No single CAE solution exist to simulate NV performances in all frequency range. Automotive OEMs have been developed or introduced CAE technologies for each frequency range to get compromising solution of acoustic trim as well as vehicle structure.
- This article shows several examples of development and investigation for enhancement of CAE technologies involving porous trims which have great importance on NV phenomena.

Summary

- High-frequency range: SEA + TMM is a promising tool for vehicle air-borne noise prediction and sound package optimization.
- Mid- frequency range: FEM is applicable tool for vehicle structure-borne noise simulation, thanks to dedicated PEM module and high power parallel computing.
- To increase accuracy of trimmed body FEM, un-clarified physical law should be solved and more detailed models would be needed but still on going.
- Acoustic trim optimization using FEM is still challenging task. Some sort of parametric study have to be required. More innovative solutions for power flow / balance control would be developed in the near future.
- In order to improve vehicle NV performances, more effective materials such as meta-materials have to be developed immediately.

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Thank you for your attentions !



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