〈토 론 2〉

대중교통 및 수송차량 소음 • 진동 시험평가 현황

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1. 대형 버스의 소음 진동 시험 평가 항목 및 대책 현황에 관하여

<table>
<tr><th rowspan="2">NO</th><th rowspan="2">Problem</th><th colspan="2">Test items</th><th rowspan="2">Result</th></tr>
<tr><th>Cause</th><th>Development test</th></tr>
<tr><td>1</td><td>Idle boom & vib.</td><td>i. ACU comp unit
ii. Rear structure sensitivity to vib. Input</td><td>1. Change MTG method
2. Change MTG rubber bush hardness
3. Control belt flap
4. Stiffen the rear structure</td><td><table><tr><th></th><th>Initial</th><th>Present</th></tr><tr><td>FRT</td><td>5.5</td><td>8.0</td></tr><tr><td>MID</td><td>5.5</td><td>7.0</td></tr><tr><td>R R</td><td>5.5</td><td>6.5</td></tr></table></td></tr>
<tr><td>2-1</td><td>Boom in the running condition</td><td>i. T/M MTG
ii. E/G MTG
iii. Other structure path</td><td colspan="2"><table><tr><td>E/G MTG rubber</td><td>Test 1.
Idle shake ↑ (lateral dir)
Boom area ↑</td></tr><tr><td>T/M MTG rubber</td><td>Test 2. Idle shake
(slight increase but acceptable)
T/m noise
i. Sensitivity more than test 1.
ii. Boom area is similar to test 1.</td></tr></table>
Recently, we find the new structure path of boom noise.</td></tr>
<tr><td>2-2</td><td>Noise level & vib. in the running condition</td><td>i.~iii.
Identify with 2-1.
iv. Sound insulation
v. Diff noise
vi. T/M noise
vii. Structural resonance</td><td>Mass damper (9 kg)</td><td>Good but not enough reduce the T/M noise

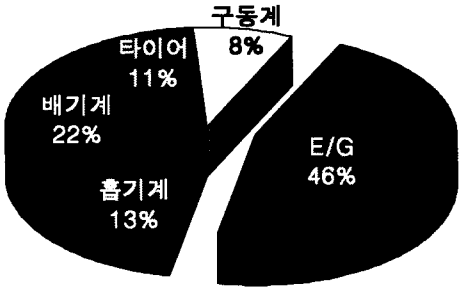
i. Reestablish the contribution appraisal of sound insulation.
ii. The difference of front and rear MTG E/G.
iii. How to isolate the vib.
Between power train and structure.
Between passenger floor and structure.</td></tr>
<tr><td>2-3</td><td>Shake in the running condition (secondary ride Vib.)</td><td>i. Uncontrol unsprung mass
ii. Seat frame</td><td>Stiffen seat frame</td><td>Improve for/aft vib. but Increase vertical vib.

Do not find that E/G bounce contributes to shake.</td></tr>
<tr><td>3</td><td>Air-vent noise</td><td>i. Leakage around Air-vent assembly
ii. Air vel.</td><td>Seal around air-vent assembly</td><td>Good</td></tr>
<tr><td>4</td><td>Wind noise</td><td></td><td></td><td></td></tr>
</table>

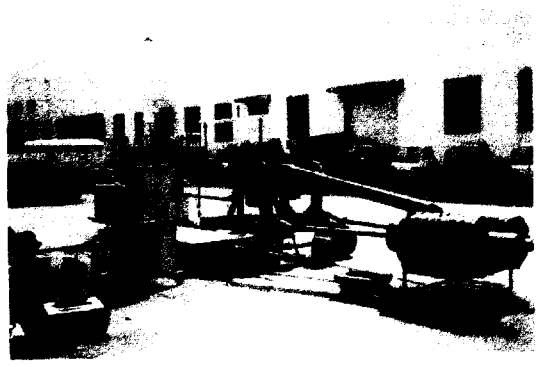
2. 규제 강화에 대비한 대형 버스의 가속 소음 저감에 관하여

- CAE를 이용한 소음 방사 형태의 가시화 (저주파수 대역 500Hz 이하를 중심으로)

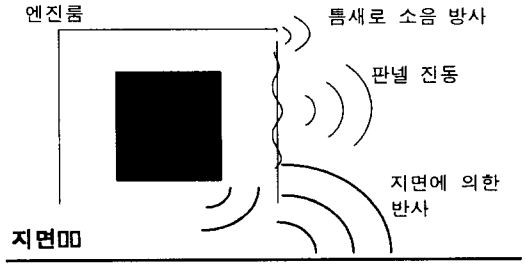
가속주행소음의 요인별 기여도



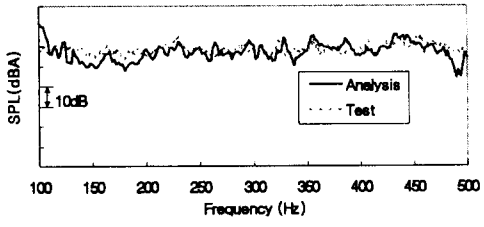
엔진 음향 intensity 측정 (부분 음향 파워)



차외 소음 전달 경로

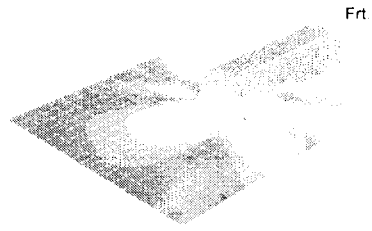


E/G 소음의 방사 형태 계산 및 확인



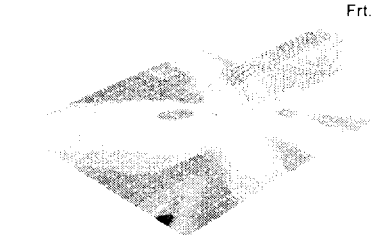
- 저주파수 대역에서의 방사 소음 저감안 효과 파악
  - 소음 카바 영향 파악
  - 반사판 적용의 효과
  - Side hole 영향 파악

E/G under cover가 없는 경우



E/G under cover가 있는경우

반사판이 있는경우



Side hole이 있는경우