Experiments in active noise control in buildings.
Local and global approaches.

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ISACBAT :
ISolation ACtive du bruit dans le BATiment

This project (2001-2005) aims at studying active noise control solutions in buildings, in order to reduce traffic noise emissions. Applications in ventilation ducts, double walls or shutter boxes.
Active ventilation duct

- insertion in an outer wall: “Z” shape
- ensure a sufficient air flow: 45x14 cm²
- absorption in medium and high frequencies
  - Synthetic foam

Industrial partnership:
- Close s.a.
- Abason - BANP
Active ventilation duct

Tests according to ISO 140-3
Active ventilation duct

Sound reduction index

- Wall
  Rw = 56 (-1 ; -3 )

- Wall + VENTAC OFF
  Rw = 48 (-2 ; -7 )

- Wall + VENTAC ON
  Rw = 56 (-2 ; -5 )
Active shutter box:
in the reception room
Active shutter box: in the emission room
Active shutter box: results

Error microphone

Reception microphone: at 3m from the box
## Active shutter box: results

<table>
<thead>
<tr>
<th></th>
<th>Error microphone</th>
<th>Micro at 1m</th>
<th>Micro at 3m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control off</td>
<td>93,4 dBlin / 86,3 dBA</td>
<td>85,1 dBlin / 76,7 dBA</td>
<td>71,8 dBlin / 64,1 dBA</td>
</tr>
<tr>
<td>Control on</td>
<td>80,9 dBlin / 73,8 dBA</td>
<td>72,2 dBlin / 64,1 dBA</td>
<td>61,7 dBlin / 53,8 dBA</td>
</tr>
<tr>
<td>Attenuation</td>
<td>12,5 dBlin / 12,5 dBA</td>
<td>12,9 dBlin / 12,6 dBA</td>
<td>10,1 dBlin / 10,3 dBA</td>
</tr>
</tbody>
</table>
Active shutter box: upper position of the loudspeakers
Active shutter box: upper position of the loudspeakers
Active shutter box: upper LS results

Error microphone

Reception microphone: at 3m from the box
## Active shutter box: upper LS results

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<tr>
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<th>Micro at 1m</th>
<th>Micro at 3m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control off</td>
<td>90,3 dBlin / 83,3 dBA</td>
<td>80,9 dBlin / 72,1 dBA</td>
<td>74 dBlin / 66,4 dBA</td>
</tr>
<tr>
<td>Control on</td>
<td>79,1 dBlin / 72,4 dBA</td>
<td>70,1 dBlin / 62,6 dBA</td>
<td>66 dBlin / 57,9 dBA</td>
</tr>
<tr>
<td>Attenuation</td>
<td>11,2 dBlin / 10,9 dBA</td>
<td>10,8 dBlin / 9,5 dBA</td>
<td>8 dBlin / 8,5 dBA</td>
</tr>
</tbody>
</table>
Local active control:
1st configuration

- MIC 1
- MIC 2
- MIC 3
- HP1
- HP2
- HP3
- Reference microphone

Attenuation:
- 15 dB(A)
- 10 dB(A)

Distance:
- 30 cm
- 50 cm
- 2 m
Local active control: 1st configuration

Error microphone: attenuation 14.9 dB(A)

Field microphone: attenuation 14.8 dB(A)
Local active control: 2nd configuration

Attenuation

10 dB(A)

Noise source

Reference microphone

2m

30 cm

MIC 1

MIC 2

MIC 3
Local active control: 2nd configuration

Error microphone: attenuation 12.9 dB(A)

Field microphone: attenuation 10.7 dB(A)
Local active control:
3rd configuration

Noise source
Reference microphone

MIC 1
MIC 2
MIC 3

Attenuation
5 dB(A)

HP1
HP2
HP3

30 cm
2m

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Local active control : 3rd configuration

Error microphone :
attenuation 6.2 dB(A)

Field microphone :
attenuation 5.2 dB(A)
Local active control : conclusion

-The best attenuations are obtained between 100 Hz and 400 Hz, with the loudspeakers situated between the noise source and the error microphones and radiating in the sense of the noise propagation;
- Attenuations of 10-15 dB(A) on a zone covering a diameter of 1m can be achieved.
- This is really audible, for sines, white noise and aircraft noise.
- Future works : virtual position for microphones
Conclusion