

Informal document No.GRB-47-4
(47th GRB, 19-21 February 2008
Agenda item 3 (a))

**CLEPA presentations supporting
justifications of informal
documents GRB-47-2 and
GRB-47-3, proposing
amendments to R51 and R59.**

Content

1. Absorbing fibrous materials
2. Noise reduction systems with variable geometry
3. New driving-by test of R51 in R59
4. Particularities for automatic transmission
5. Static noise test

1. Presentation on absorbing fibrous materials.

Introduction of the concept of component design family.

Influence of the various silencer characteristics on the fibrous material life expectancy.

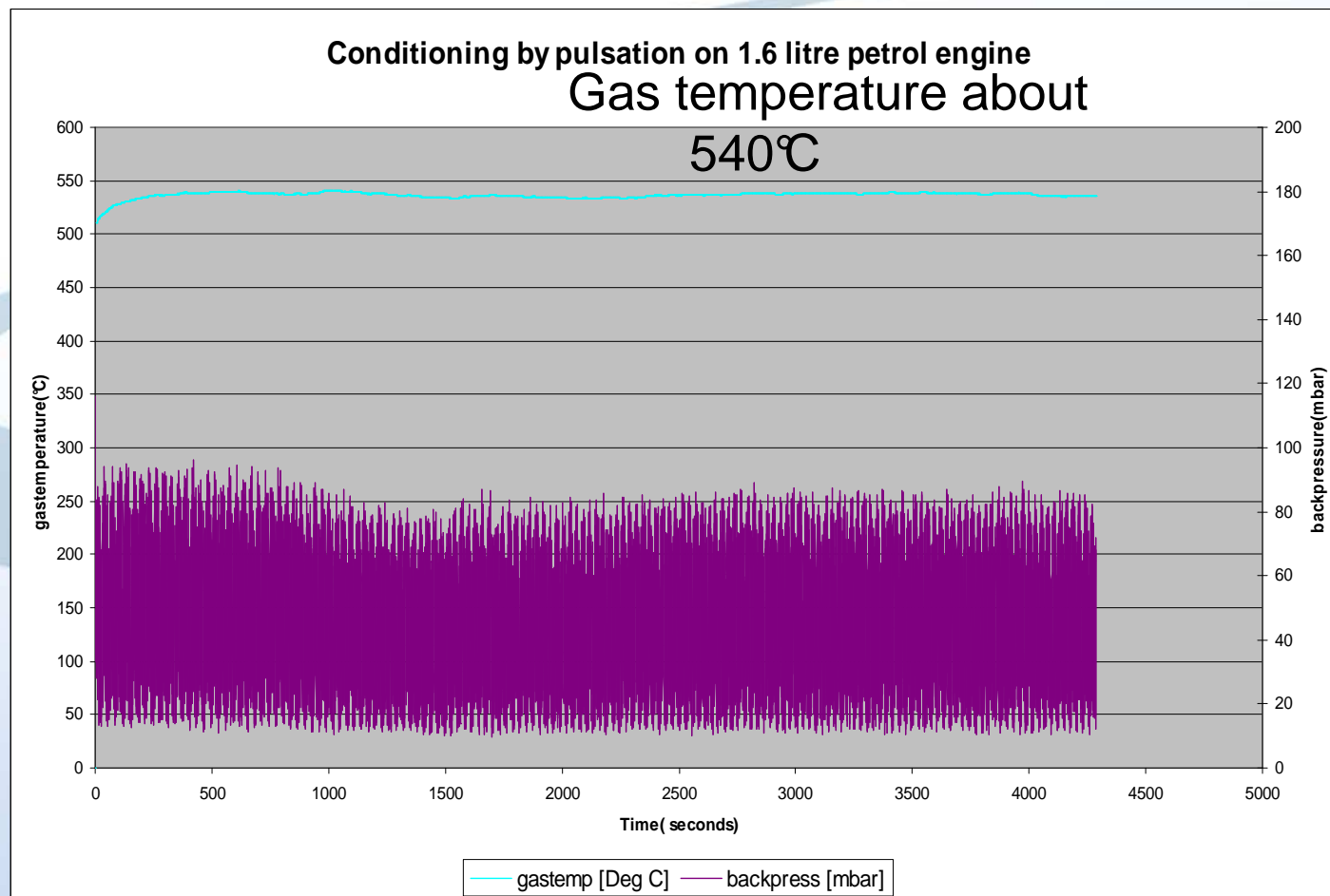
Current legislation

- Exhaust systems containing fibrous materials
- Wool retention should be demonstrated by:
 - Continuous road operation for 10.000 km
 - Conditioning on a engine bench
 - Conditioning by pulsation (2500 cycles)

Current legislation

- Continuous road operation for 10.000 km
 - The vehicle should be representative of the type in respect of which type approval is requested
- Conditioning on a engine bench /
Conditioning by pulsation (2500 cycles)
 - The engine should be of at least the same cylinder capacity and rated power maximum.

Test data : Conditioning by pulsation



Temperature resistance fibrous materials

- Fibrous materials used in exhaust systems may have different temperature resistance characteristics :

Limit of use

Type A	570°C
Type B	650°C
Type C	650°C
Type D	780°C
Type E	725°C
Type F	650°C
Type G	600°C



C L E P A
*European Association of
Automotive Suppliers*

Conditioning by pulsation

- The result of the test may depend on the type of the fibers used (e.g. basalt wool, E type wool, Biosil wool, etc)

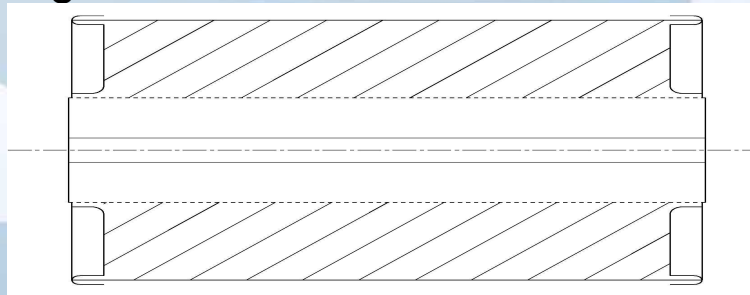
Conditioning by pulsation

- Further parameters which could influence the result of the test :
 - Binder material specifications
 - Average fiber dimensions (thickness, length)
 - Minimum bulk material packing density (kg/m^3)

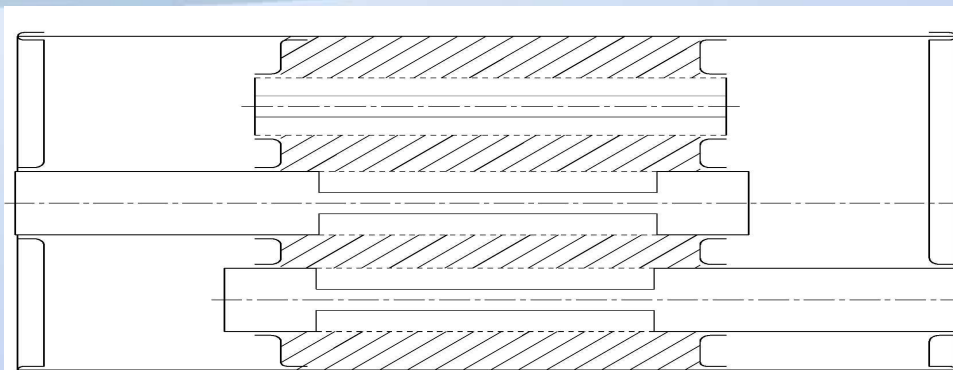
Pulsation resistance fibrous materials

- The exhaust gasses in contact with the fibrous material have or have not a net gas flow through this material

- Straight-through flow silencer



- Silencer with flow through the fibrous material



Conditioning by pulsation

- The presence of a net gas flow through the fibrous materials may influence the test result.

Proposal

- Definition of the concept of a «component design family» based on the above mentioned relevant design characteristics.

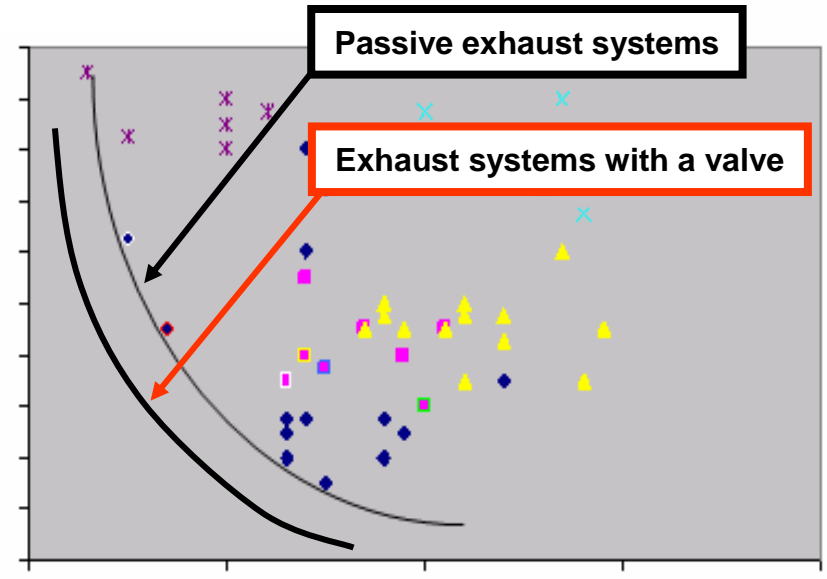
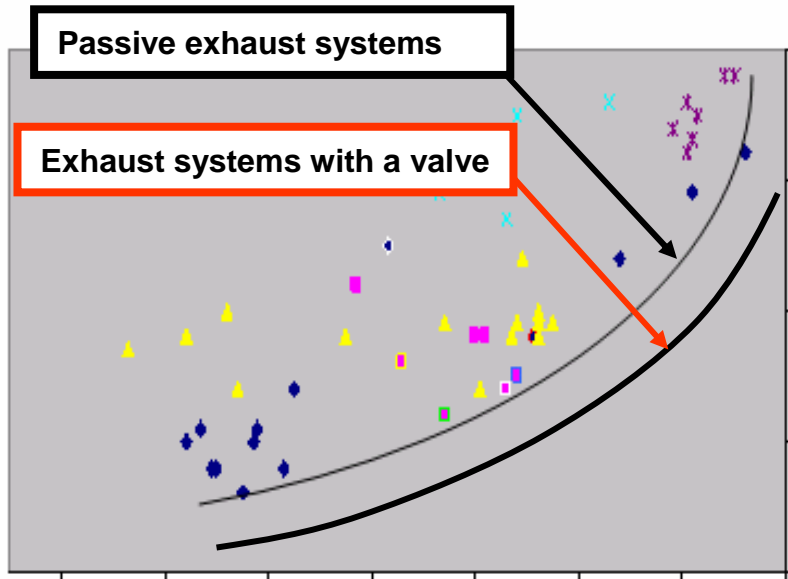
oooooooooooooooooooooooooooo

2. Presentation on the concept of
« noise reduction systems with
variable geometry »
with regards to the implications of
ASEP within R59. This includes
data on the potential effects of
valves in exhaust systems.



Valves in exhaust systems : general overview of possible acoustical efficiency improvements

Engine noise



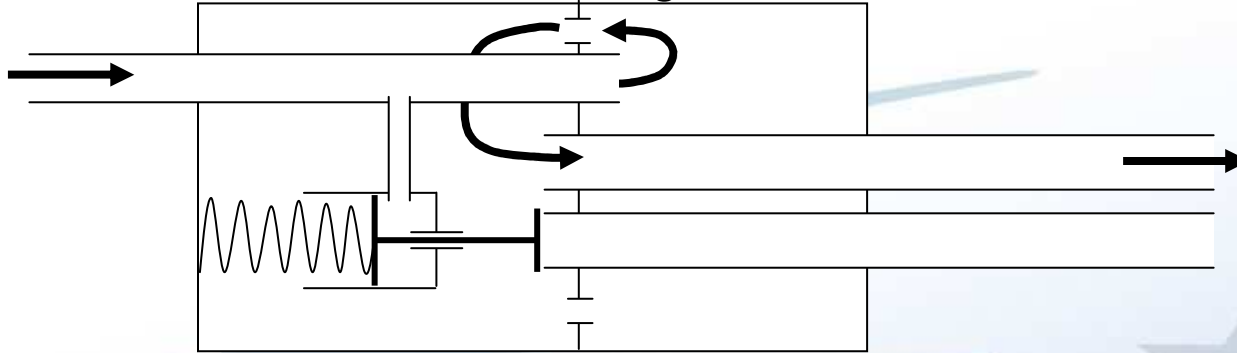
Back
pressure

Flow noise

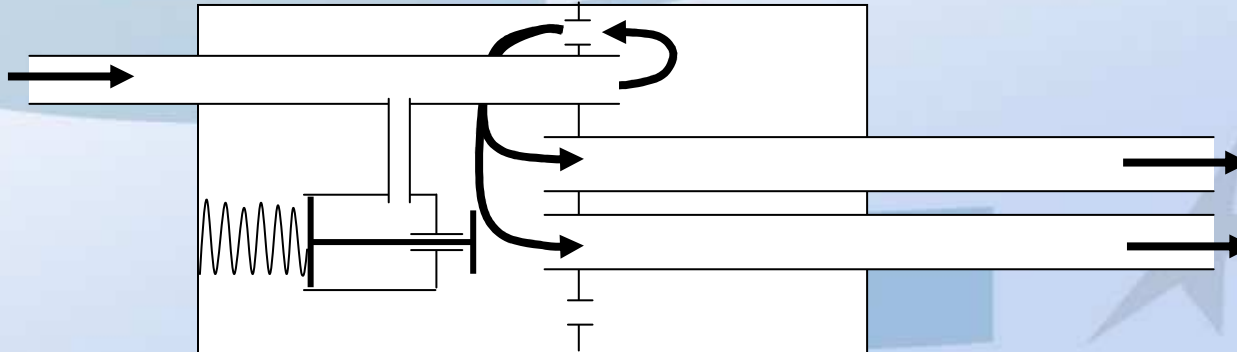


Example of a silencer equipped with an auto-actuated valve

- Valve closed at low exhaust gas volume flow

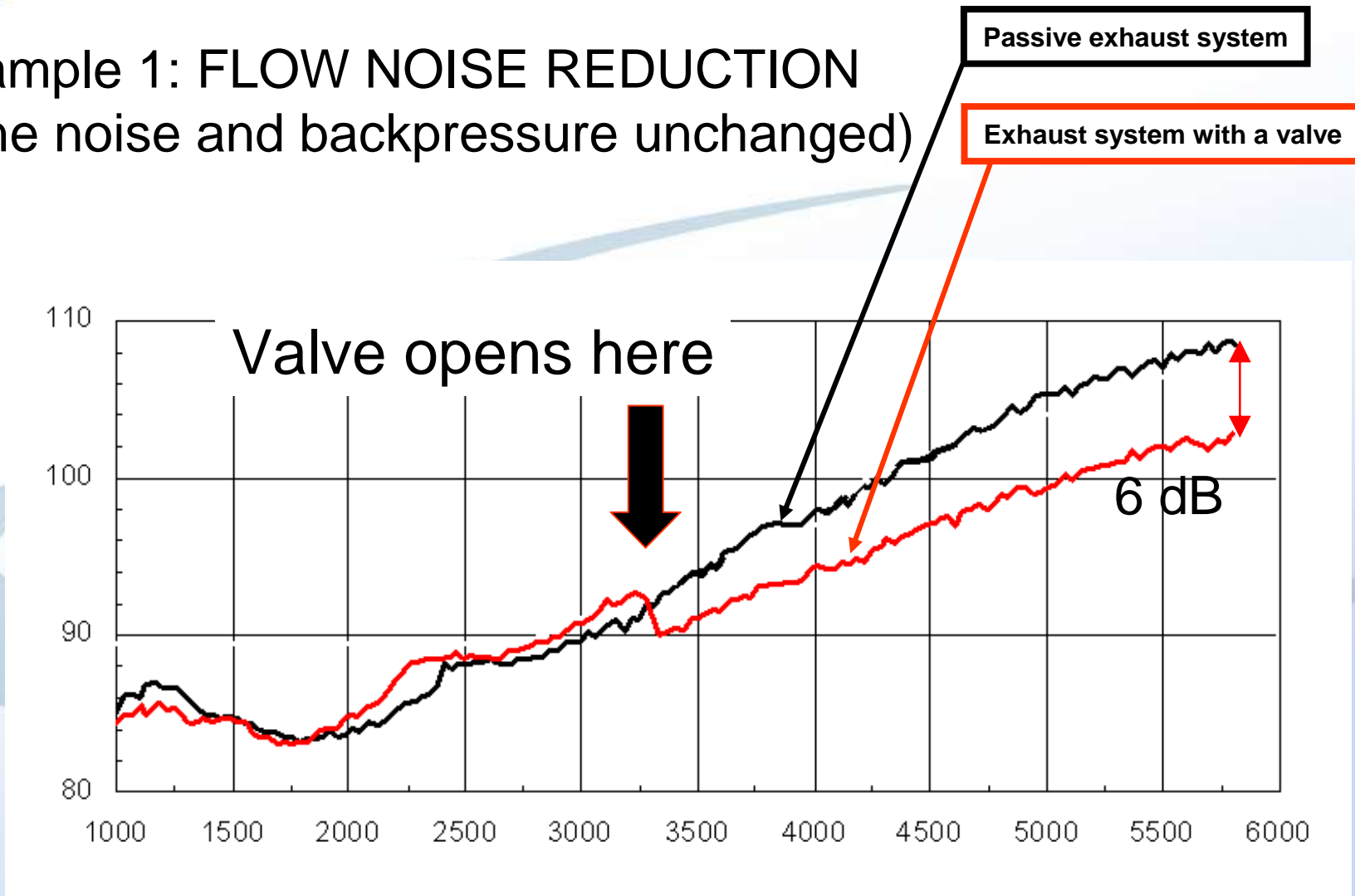


- valve opens automatically at high exhaust gas volume flow



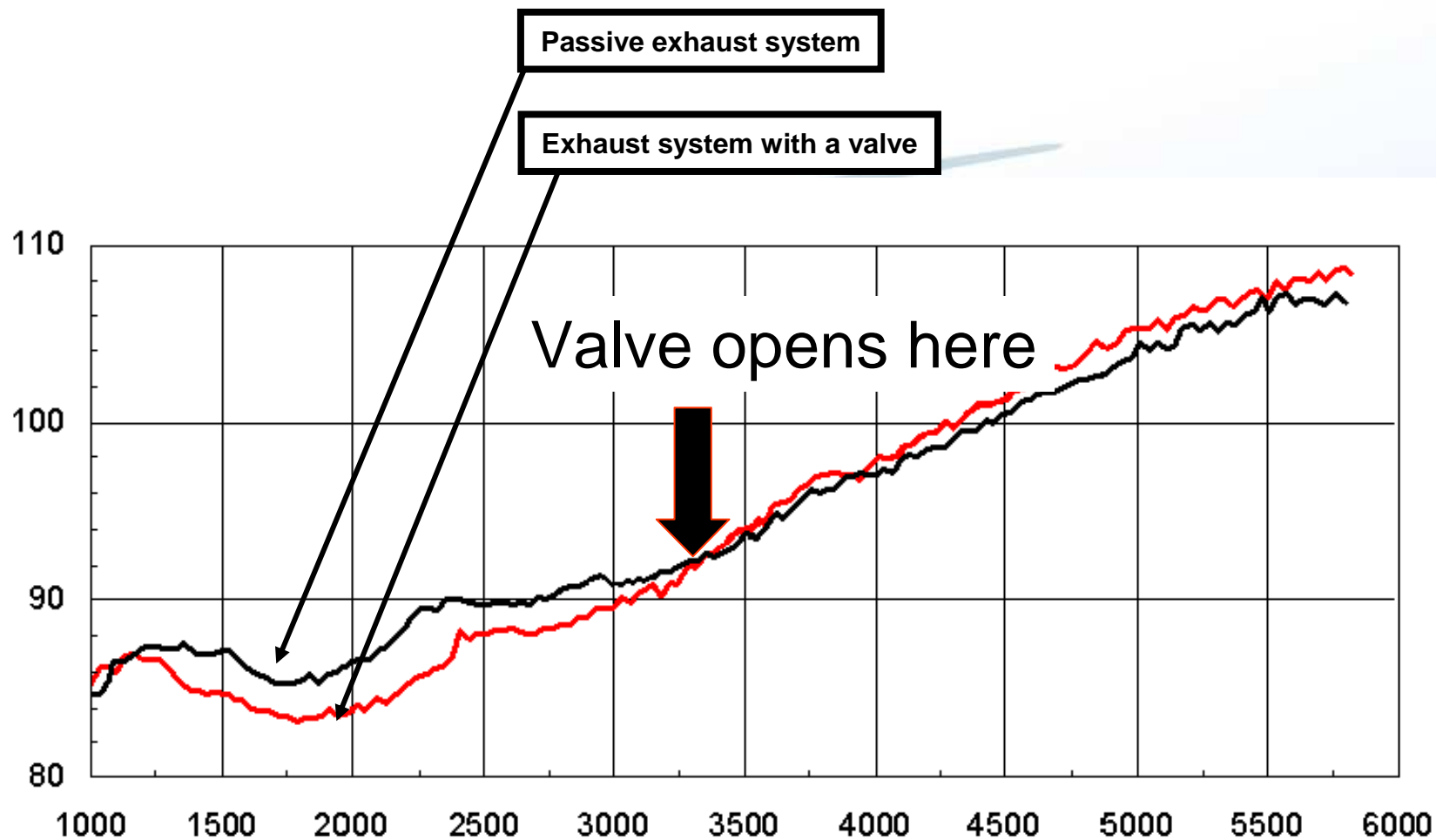


Example 1: FLOW NOISE REDUCTION (engine noise and backpressure unchanged)





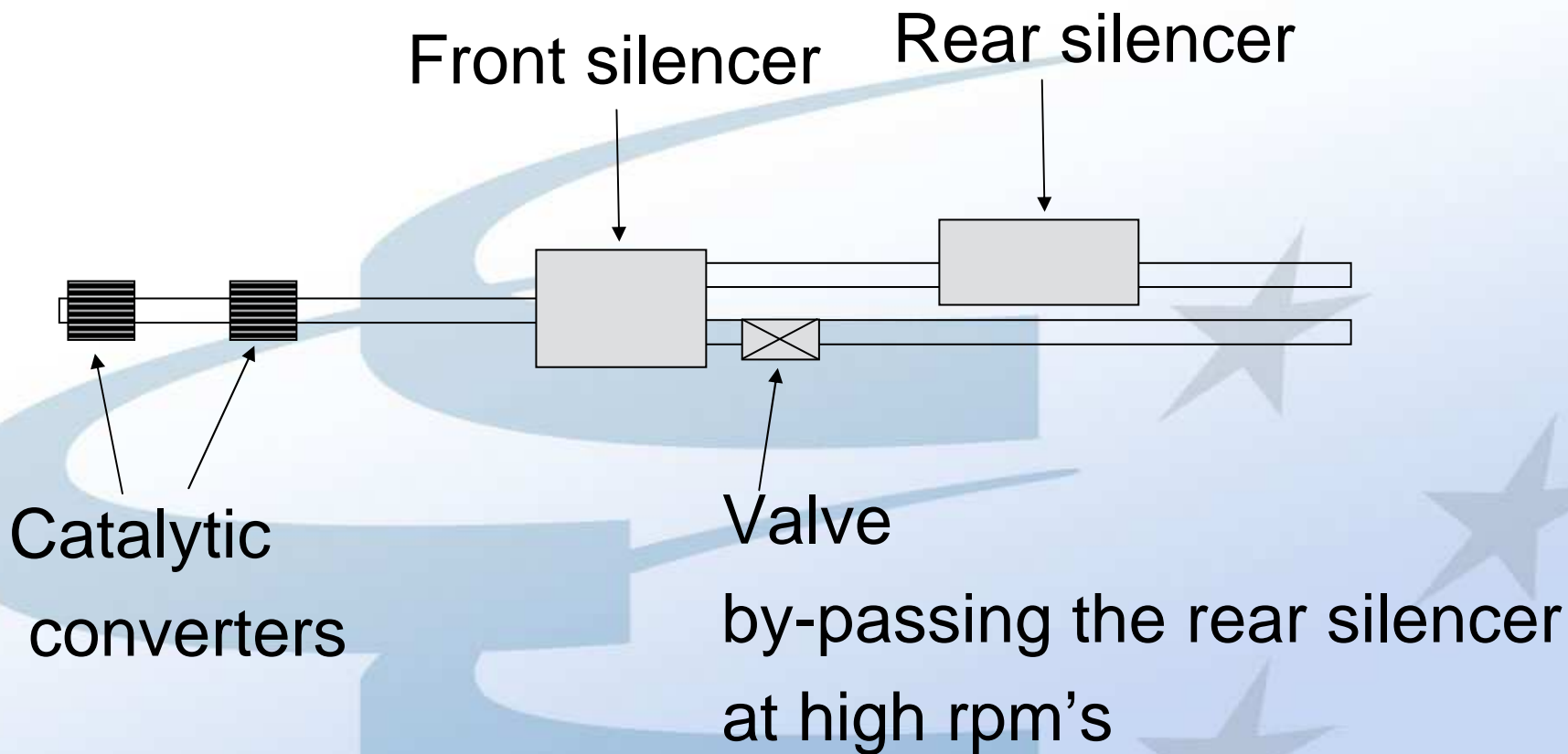
Example 2: ENGINE NOISE REDUCTION (flow noise and backpressure unchanged)



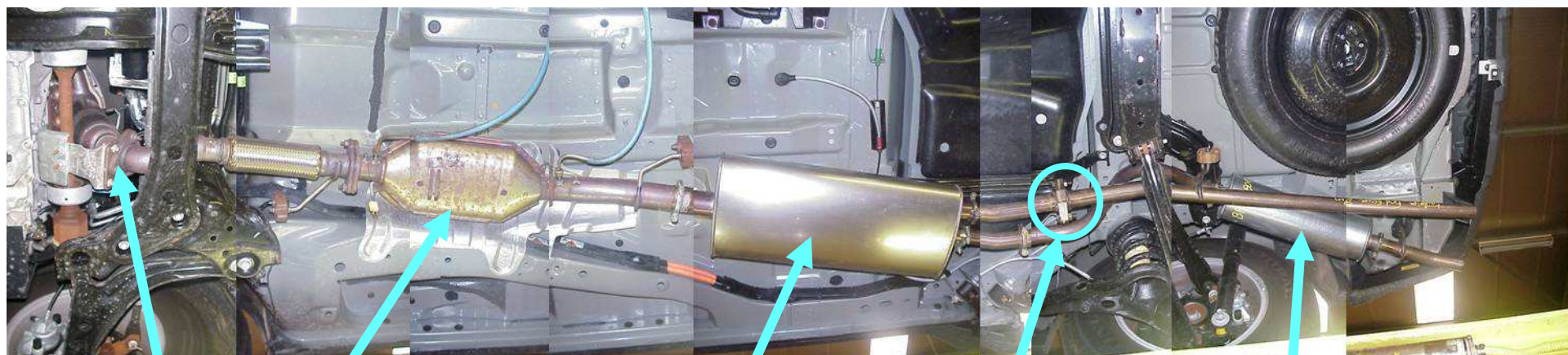


CLEPA
European Association of
Automotive Suppliers

Example of an exhaust system equipped with an auto-actuated valve and with BY-PASS OF THE REAR SILENCER



View on the measured prototype exhaust system



Catalytic
converters

Front silencer

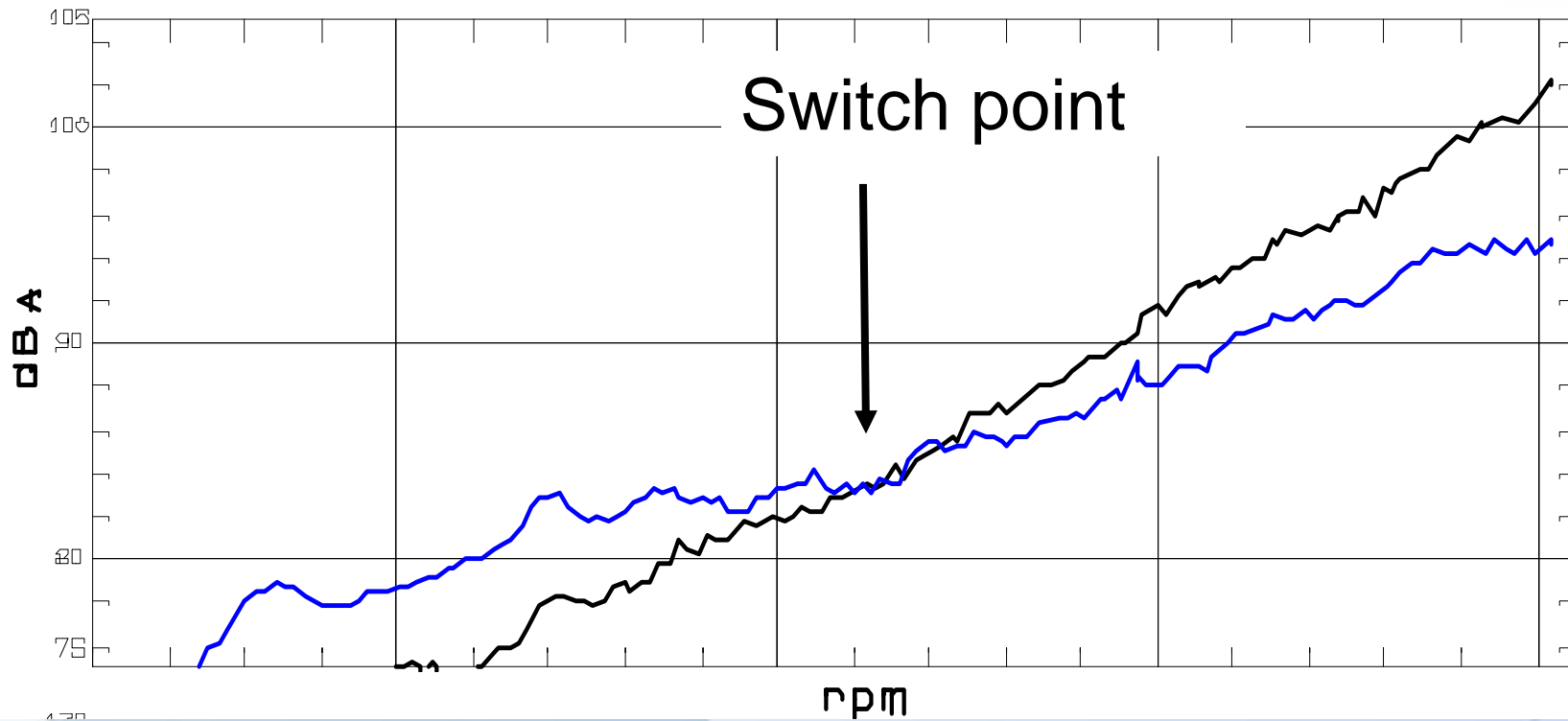
Valve

by-passing the rear silencer
at high rpm's

Rear silencer



Test results



— by pass closed

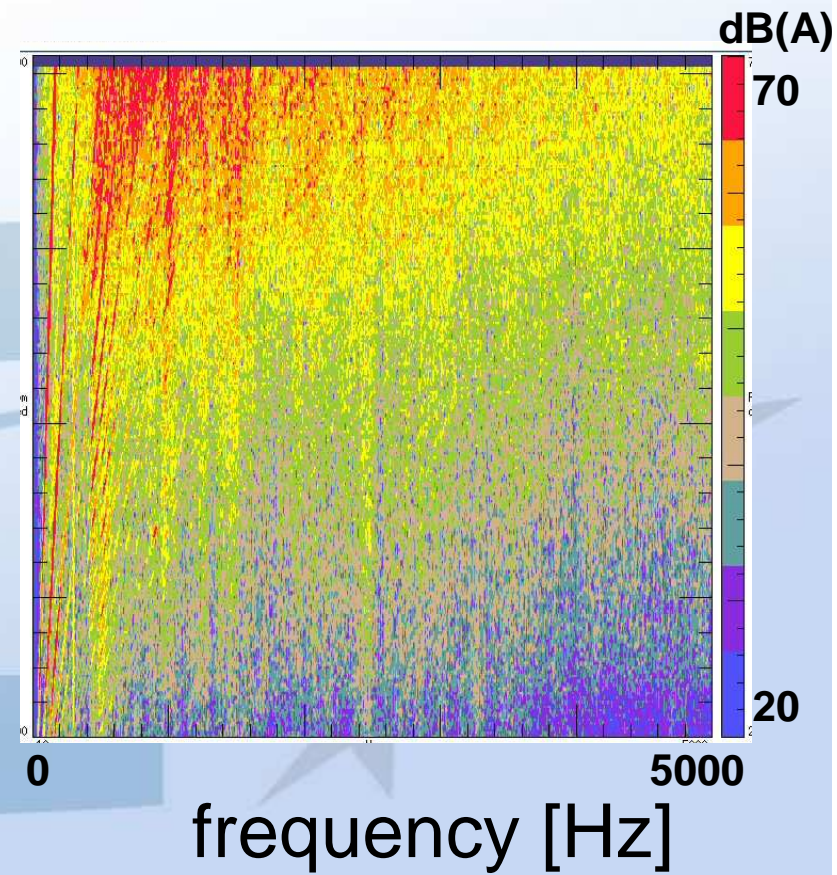
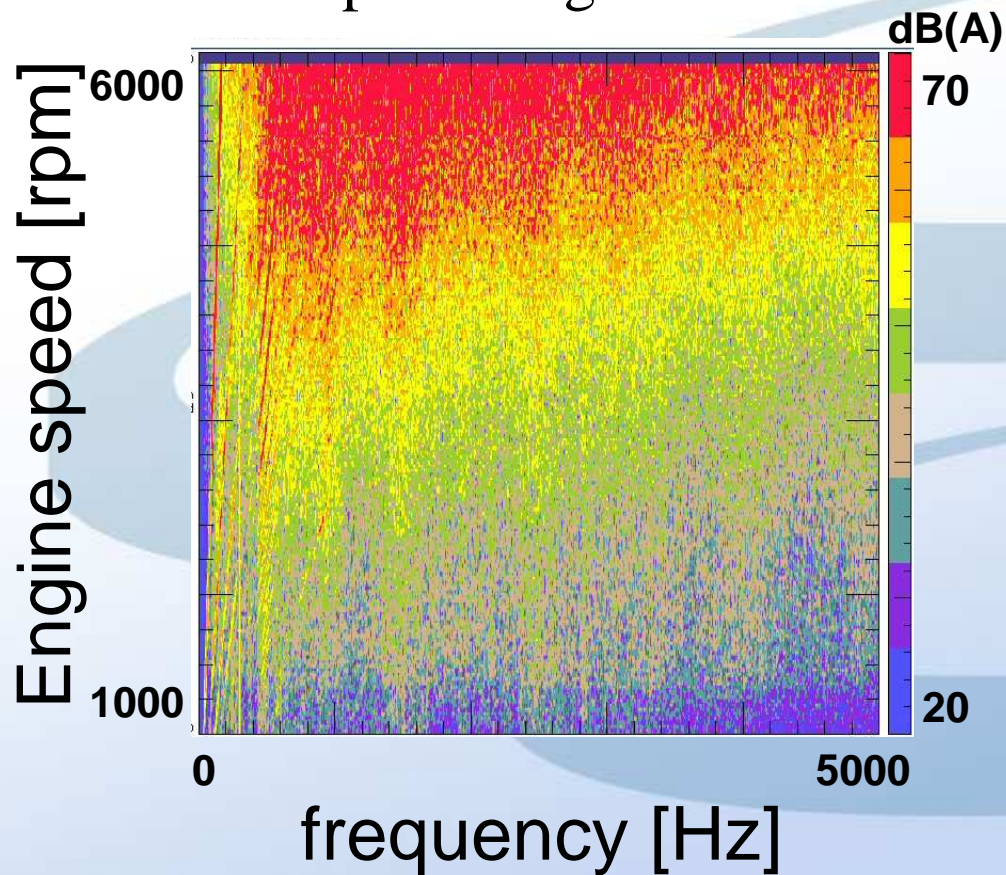
— by pass open

Test results

by pass closed

by pass open

- Campbell diagram: colours indicate sound level



- The examples clearly show that the technology of noise reduction systems with a variable geometry may have a very positive contribution to exhaust noise abatement.
- But, by inverting the valve commands in the example which was shown, a very negative result could also be achieved.
- CLEPA proposes that for replacement exhaust systems, containing components with variable geometry, the technical service may request to verify the acoustic noise reduction functionality by performing the ASEP tests.

- A large number of passive replacement exhaust systems (fixed geometry) are currently under test. So far all test results have shown remarkable compliance with the ASEP requirements. These results will be shown during the meeting. The testing program continues and CLEPA will report on the conclusions in the ASEP working group.



3. Recall of the presentation given by CLEPA on the application in R59 of the new driving by test method of R51.

Conditions of measurement

- Tyres
 - The use of special noisy tyres is not allowed in the comparison test because of the potential acoustical masking effect on the exhaust noise. Only tyres in line with the legal requirements for in traffic use are acceptable for the comparison test.
- Environmental temperature
 - No limitation on the minimum environmental temperature has been set. The influence of temperature on exhaust noise contribution being minimal.

Conditions of measurement

- Measurement accuracy
 - The current R59 regulation results in some practical inconsistencies and confusions with regard to the measurement accuracy and rounding off practice to the nearest integer dB(A) value.
CLEPA proposes a simplified and uniform rule, taking into account the 1 dB(A) measurement inaccuracy.
- Test vehicle acceptability
 - A vehicle is acceptable as a test vehicle if it satisfies the requirements for COP. This rule will bring R59 in line with directive EC 70/157.

Conclusion

- The new driving-by test method R51.03 and the current test method R51.02 show practically identical relevance when applied to the comparison test between OE and replacement parts in R59.

oo



C L E P A
*European Association of
Automotive Suppliers*

4. Presentation about the particularities of automatic transmission for the drive-by test in R59.

Automatic transmission

- In Par. 3.1.2.1.4.2 of R51 concerning vehicles with automatic transmission tested with non-locked gear ratios, it is indicated that it is permitted for the car manufacturers to establish and use electronic and/or mechanical devices to prevent a downshift. This is unpractical for replacement parts approval tests.

The following results show that a comparison test allowing a downshift gives similar comparison results as a test without downshift.



CLEPA
*European Association of
Automotive Suppliers*

5. Justification for the CLEPA amendment proposal of the static noise test procedure in R51/R59.

Static noise test

- The following graph illustrates the poor reproducibility of the current static noise test. This results in problems with in use compliance testing. A slightly modified testing procedure will prevent this inconsistency.



STATIC NOISE OEM TYPE APPROVAL TESTS

