Title: VERT dePN – a Quality Verification Procedure for Combined Diesel Aftertreatment Systems DPF + SCR.

Abstract: (min. 300 - max 500 words)

VERT verification procedure of DPF-systems for retrofitting is an international recognized quality trade mark for:

- filtration quality, durability, auxiliary systems and no secondary emissions.

The application of deNO_x-systems inline with DPF becomes very frequent by the OEMs and it penetrates to the retrofitting market. The Swiss VERT-Network consisting of AFHB, EMPA, Matter Eng. SUVA, TTM, UMTEC started the activities under leadership of BAFU, to develop the testing procedures and the quality criteria for SCR and for combined DPF + SCR.

In a close collaboration with the manufacturers several criteria are investigated: NO_x reduction, NO_2 / N_2O / NH_3 – slip, temperature window, dynamic operation, field application, durability and auxiliary systems.

On an international discussion stage a support of R&D will be connected with the development of standards.

Short CV:

BIOGRAPHICAL SKETCH  Dr. J. Czerwinski:
- Study of Mechanical Engineering in Austria
- Assistant on the Technical University, Vienna Ph.D. about combustion in SI-engines
- R & D diesel injection systems, diesel combustion, Voest Alpine Friedmann, Austria
- R & D turbocharging systems, Asea Brown Boveri, Switzerland
- Since 1989, professor for thermodynamics and IC-engines, head of the Laboratory for Exhaust Gas Control, University of Applied Sciences, Biel-Bienne, Switzerland
VERT *) dePN – a Quality Verification Procedure for Combined Diesel Aftertreatment Systems DPF + SCR

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VERT *) Network Partners
TTM  UMTEC  BAFU  ASTRAL
AFHB  EMPA  Matter Eng.  SUVA

Industrial Partners

Contacts & Consulting
PSI  FAD  AKPF
LAV-ETHZ  VITO Belgium
AVL Sweden  NRC Italy

Retrofit of SCR+DPF-combinations
Umtec, HUG, Larag, CH
• Retrofit of SCR+DPF-combinations
• Control via NO downstream
• Fast NO-measurement
• Ammonia water solution
• NOx-conversion >70%

Reactions between NO, NO₂ and NH₃

Standard SCR reaction:
4 NH₃ + 4 NO + O₂ → 4 N₂ + 6 H₂O

Fast SCR reaction:
4 NH₃ + 2 NO + 2 NO₂ → 4 N₂ + 6 H₂O

Slow NO₂ SCR reaction:
4 NH₃ + 3 NO₂ → 3.5 N₂ + 6 H₂O

Ammonium nitrate reaction:
4 NH₃ + 4 NO₂ → 2 NH₄NO₃ + 2 N₂ + 6 H₂O

Secondary Emissions
NO₂, N₂O, NH₃

Secondary nanoparticles
Ammonium Nitrate

Dynamic Engine Dyno
at Laboratory for IC-Engines (AFHB)

Influences of engine load on NOₓ & NH₃

HUG DPF-SCR system, Liebherr 934L, ULSD

1500 rpm

SP3

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*) VERT … Verminderung der Emissionen von Realmaschinen im Tunnelbau