# **Application of an SCRT® system at modular plant** based on On-Road-Technology

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## What does SCRT<sup>®</sup> mean? Combination of CRT<sup>®</sup> + SCRT<sup>®</sup>



**CRT<sup>®</sup> soot filter:** Continuos Regeneration Technology + Soot reacts with NO<sub>2</sub> to CO<sub>2</sub> and N<sub>2</sub>

SCR DeNOx: Selective Catalytic Reduction Injection of urea – reduction of NO and NO<sub>2</sub> to N<sub>2</sub>

**Main application at HJS:** Retrofit of busses, 500 Busses running with HJS SCR







Idea:

Use of mass production SCRT<sup>®</sup>-system's components for stationary engine running with vegetable oil



- ✓ EURO III-busses meet EURO V- / EEV-Standard
- Reduction of pollutant emissions
  - Over 99% soot particles, incl. fine particulate matter

## Challenge:

- Vegetable oil > less soot more  $NO_X$
- Aging behaviour with unknown ingridients in vegetable oil
- Urea / ammonia distribution determines NO<sub>X</sub> reduction
- Stationary condition. Allways full load. Makes control more easy but aging increases
- Engine Volvo TAD1642GE/1643GE, prime power 485/536 kW
- Cost efficient SCRT must have 1 urea pump and 1 control unit but 2 SCR catalysts in parallel.
- Mixing of exhaust gas and urea on 2 branches is essential for succes!
- Back pressure 80mbar new, 150mbar with oil ash in filter

## Solution:

- 2 containers; bottom, engine; top, exhaust gas aftertreatment and heat exchanger
- 2 CRT<sup>®</sup> in parallel,
- 1 urea injector in a common mixing zone
- 2 SCR catalysts in parallel



- ✓ Modular system design with DPF<sup>®</sup>- and SCR-Unit
- Absolutely low-maintenance and economical

















## **Realisation**:

- CFD calculation of urea injection in mixing zone
- urea must distribute in the two branches in the same relation as the gas does. Otherwise SCR will not work.
- Calculation were done for a robust design with disturbance in symmetry caused by manufacturing process.
- Calculation were done for unequal flow through soot filters. (filter A / filter B = 40% / 60%)



• Calculation of hydrolysis. Is there enough time to convert urea in ammonia? • Need of a mixer in tube after injector



Urea injector and mixer



Exhaust gas passing injector and mixer



Injected urea vanisch to ammonia

1000 –	
900 -	

## Installation:

• 30 engines are equiped with SCRT<sup>®</sup>

- Emission tests show reduction far under legislation limit
- NO<sub>X</sub> emission can be tuned by urea dosis
- Ash cleaning intervall of soot filter is 8000h, back pressure increase up to 150 mbar in 8000h
- SCR catalysts show aging of 20% after 8000h, but emission targets are still fullfilled.



Emission level with SCRT<sup>®</sup> vs. raw emissions of engine





Urea dosis and NOx emission level

### **Conclusion**:

A stage2 engine running with palm oil can fulfill stage4 emission targets using SCRT<sup>®</sup>-technology. Emission systems and technologies used in automotive applications can be adapted and used with stationary engines running 8000h a year. The controlling software can be simplified. Parts from mass productions can be used with little changes.





