

LOW-EMISSION LOCOMOTIVE PROJECTS



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OUTLINE



- 1. SCR demo on Metrolink EMD locomotive**
- 2. DPF-SCR demo on Metrolink EMD locomotive Head-End-Power (HEP)**

SCR: Selective Catalyst Reduction (NO_x, PM)

DPF: Diesel Particulate Filter (PM)

1. SCR ON METROLINK # 865 EMD F59PH LOCOMOTIVE

- Demo SCR converter – uses 24 off-the-shelf truck catalysts
- Heavy-duty urea injection from trucks and off-road
- Contractor: Engine, Fuel, and Emissions Engineering

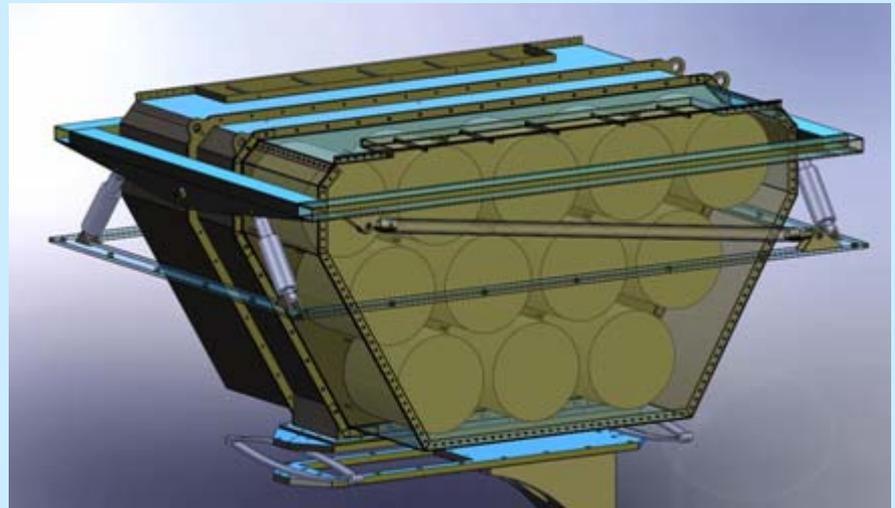


SCR ON METROLINK # 865

**SCR
converter
replaces
silencer**



**Turbo
outlet**

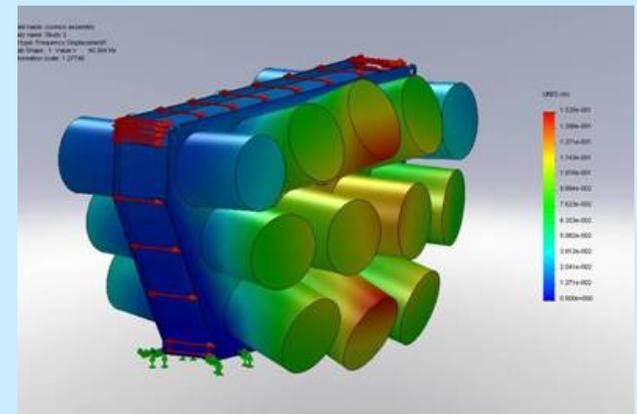


Improved SCR design

- Stronger housing
- Increased support
- Flexible turbo coupling
- Revised urea injection

DEMONSTRATION TO-DATE

- Installed SCR – 2/21/2009
- Substrate cracking after 600 hours
- Vibration analysis: resonance at idle
- Added connectors between base plates
- Reinstalled SCR; in operation since 5/28/2009



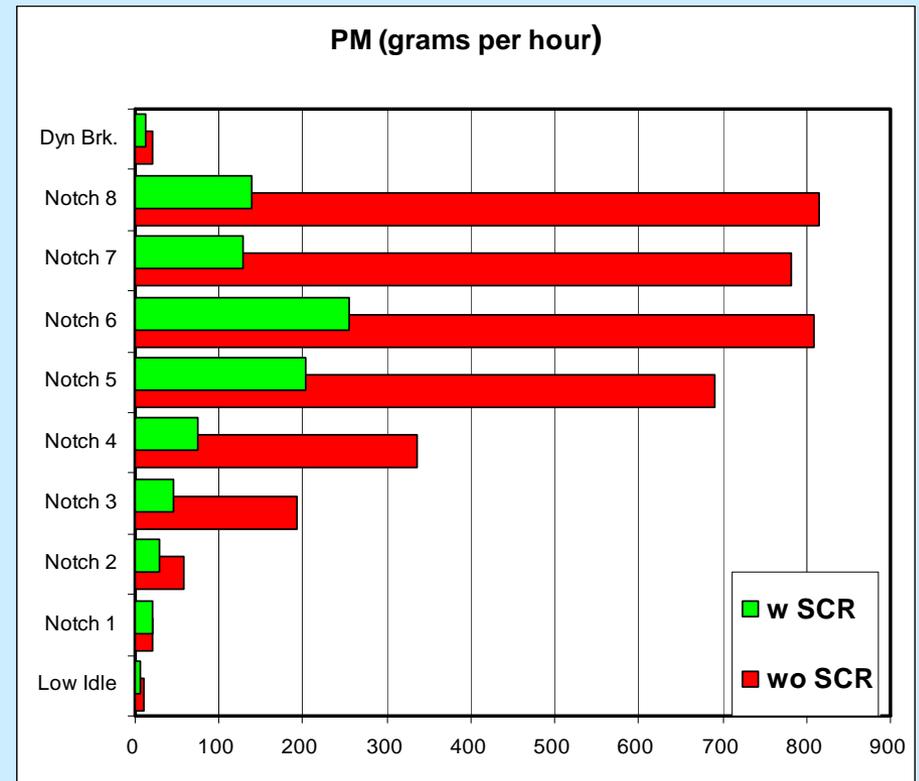
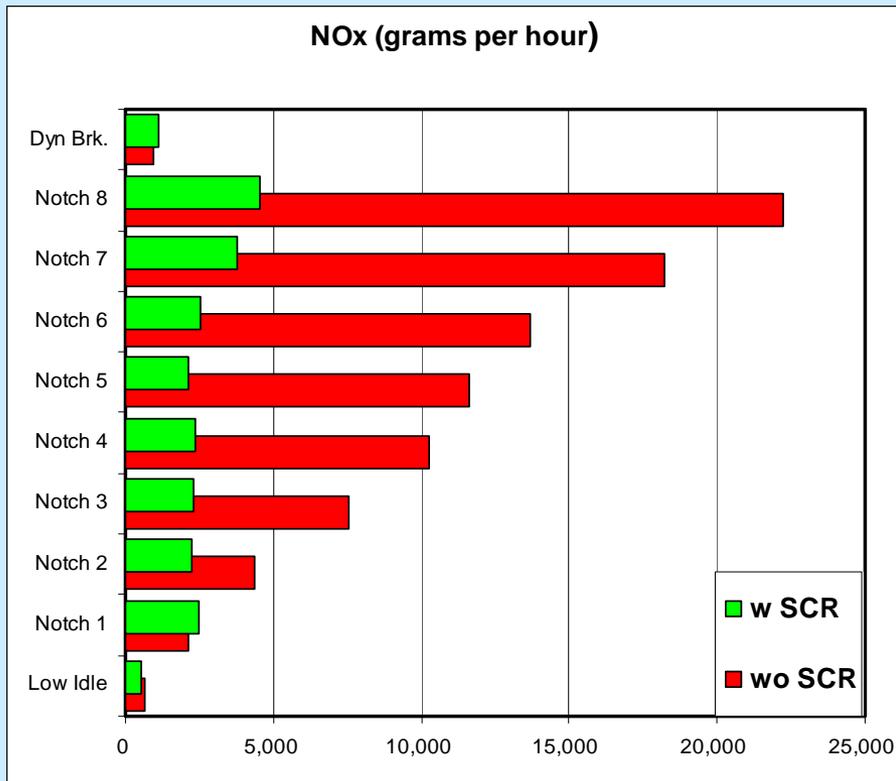
SCR EMISSION TESTING AFTER 100 HOURS OF OPERATION

Emissions measured with RAVEM System
40 CFR 92 protocol and weighting, g/hp-h

	<u>NOx</u>	<u>PM</u>	<u>HC</u>
Baseline	9.2	0.34	0.2
SCR	2.6	0.08	0.0
	-72%	-76%	-100%

- Ammonia slip <5 ppm, low levels of N₂O
- Urea rate at 6% of fuel consumption

EMISSIONS BY NOTCHES



2. DPF + SCR ON METROLINK HEP EMD F59PHI LOCOMOTIVE

- Head End Power (HEP) unit provides passenger hotel power (~500 HP)
- HEP account for about 25% emissions due to continuous full power running
- Demo Hug Engineering combination DPF + SCR System (urea)
- Contractor: Miratech Corp.



DPF+SCR ON CAT 3406 HEP METROLINK # 883



Cat
3406
HEP

Urea
tank
on left
floor
& wall



with
DPF
+ SCR



Urea
Totes



STATUS – DPF + SCR ON HEAD END POWER

- Unit installed with electronic controls, datalogger and dial-up link 2/17/09
- Baseline and de-greened testing completed 3/17/09
- Design Issues
 - Higher temperature than original design (>500°C)
 - Higher temperatures led to off-spec performance

STATUS - CONTINUED



- **Design Modification**
 - **System reprogrammed to stop urea injection at 500°C**
 - **Below 500°C, the system is reducing NOx by 88-93%**
 - **During maintenance, DPF clogged due to low temp yard operation**
 - **DPF bricks replaced**
- **1000-hr emission testing to begin Sept '09**

SCAQMD TECHNOLOGY ADVANCEMENT



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