

NCDOT and the Path To Advanced Propulsion

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Current NCDOT Rail Operation

- Currently six (6) locomotives serving Piedmont passenger rail service
 - two daily round-trip services between Raleigh and Charlotte, NC
 - 173 miles / 278 km each way
- Two additional rebuilt locomotives by summer 2016 and a third round trip by end of 2017
- NCDOT recognizes that locomotives can be a significant source of air pollution

What Can Be Done?

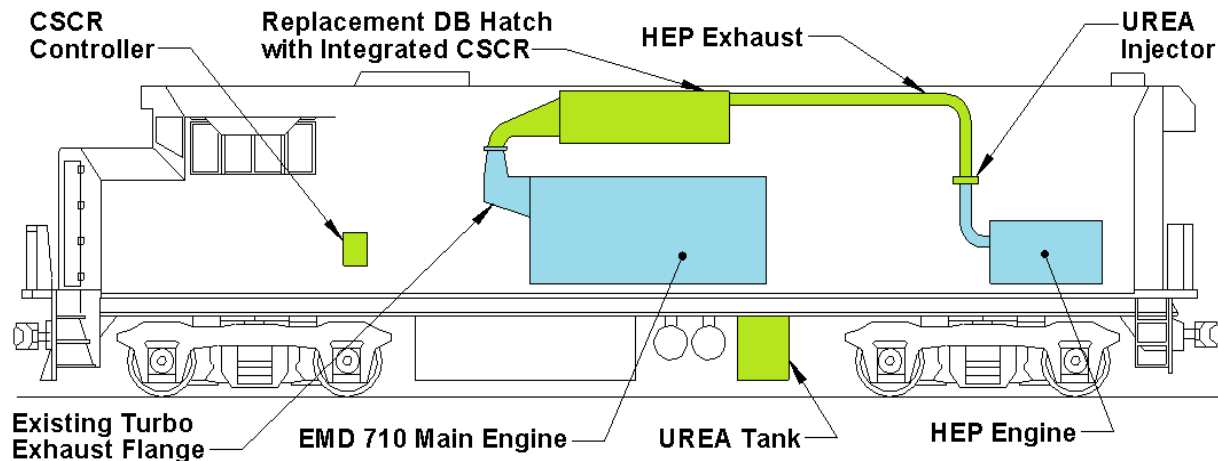
- Replacement equipment
- Uneconomical and unfeasible to purchase new locomotives
 - \$6 million per locomotive
 - locomotives are only 3-5 years into expected 30 year life
- Retrofit existing equipment
- No commercially available system that retrofits onto F59 PH or PHI

Emerging Technologies

- Selective Catalytic Reduction (SCR)
 - Some past application in marine and construction industries; emerging in rail industry
 - engine exhaust combined with urea to further mitigate emissions
- Natural gas power
 - Natural gas becoming much more available; cleaner than fossil fuels
 - Gas and hybrid diesel/gas engines being developed

Blended Aftertreatment (BATS) System

- Rail Propulsion Systems has developed a specialized SCR system, known as a Blended Aftertreatment System (BATS) that retrofits onto an F59PH locomotive
 - should achieve Tier 3+ / Tier 4; likely even better with biodiesel
 - substantially more economical than purchasing new locomotive
- Currently partnering with NCDOT for pilot system installation at RPS facility in Anaheim, CA
- First in-service system in place by September 2015

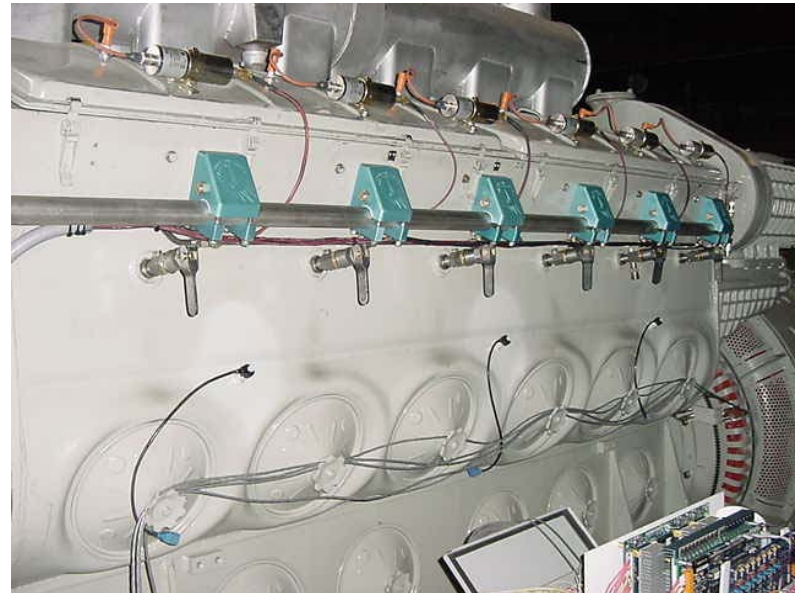


A Great Fit For Hybrid Diesel/CNG Engines

- NCDOT's third round trip service will reduce available turnaround time at Charlotte facility
- NCDOT plans to introduce locomotive / cab control unit (CCU) combination to reduce turnaround time
 - CCU is effectively a locomotive body with the engine removed
- The back-to-back configuration and available space in the CCU formerly occupied by the engine provides an ideal space for installation of hybrid engine equipment
 - can fairly easily be upgraded to ZEBL or hydrogen-powered system

Further Upgrades

- New locomotives being built “natural gas ready”



Conclusion

- Mr. Dave Cook from Rail Propulsion Systems to follow with additional technical information

- Any Questions?