Temperature Compensation and Full Fills

- Defining a full fill with temperature compensation
- Greater understanding of heat of compression
- Dispenser Controls and safety protocols
- Understanding tank types and affects on full fill
- Drive perception of full and temperature compensated fuel gauges
- Gas composition affects on temperature compensated full fills
Tank Safety – CNG End of Life Characterization

• Very common to have tanks in service past their manufacturer's defined useful life.
• Tanks are generally designed with a large margin of safety.
• Understand the safety risks of the tanks in service past their useful life (no tank failures recorded to date were due to fatigue of tank).
• Initial testing at Digital Wave Corporation to better understand risks:
  o All transit tanks from LA Metro (non-harsh application)
  o All tanks that were burst tested met the pressure requirement defined for initial manufacture
  o Unable to complete the fatigue cycling tests due to budget
• Would like to continue testing once able
  o Tanks at end of life from more severe use
  o Fatigue cycling to better understand risk
CNG Tank Requalification

• After better understanding tank integrity at the end of useful life, explore tank requalification for service.
  o Non destructive testing method to requalify tanks
    – Modal acoustic emission analysis
• Benefits of tank requalification
  o Safety
  o Cost reduction to end user/owner
• Concerns of tank requalification
  o OEM business
  o CSA voiced concerns
Gas Release Analysis

- Understanding garage safety and other tank leak/venting implications
  - Fuel system line cracking
  - Tank over pressure from external fire
  - PRD fails to open
  - Tank fitting failure
Smart Technology and Tank Monitoring

• **Tank Monitoring**
  - Understanding the life of the tank
  - Alert if a failure is imminent
  - Tank temperature and size
  - Integrated OBD and telematics devices

• **Real-time communication and monitoring**
  - Communication with infrastructure

• **Tank to infrastructure communication**
  - Safety
  - APIs for databases
  - Efficiency improvements
Other topics

• Lower cost storage is critical
  o ARPAe adsorbed technology research
  o CEC storage projects for CNG

• Fuel Quality
  o Dealing with composition variability

• RNG