

NGVAMERICA

Natural Gas Vehicles for America

Vehicle Incidents & Lessons Learned

Natural Gas Vehicle Technology Forum

February 22, 2018



About NGV America

NGV America is the national organization dedicated to the development of a growing, profitable, and sustainable marketplace for vehicles powered by natural gas and for using more natural gas in transportation.

200+

NGV America represents 200+ companies, LDCs, fleets, OEMs, environmental and government organizations.



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Who is NGVAmerica?



Shell
LNG



South Jersey Gas



Technology & Development Committee

Safety

- Manufacturing Facility Training / Accreditation
- CNG Fuel System Inspection Intervals
- Incident Investigations & Root Cause Analysis
- NGV Maintenance Facility Modifications

Sustainability

- Emissions & Environmental Messaging
- Research & Development

High Horsepower

- LNG
- Marine & Rail
- Research & Development
- Emissions & Environmental Messaging

Incident Investigation & Root Cause Analysis

- Partner with US DOT on incident investigations
- Goal is to understand root cause and make sure that codes and standards have appropriate coverage
- Incidents:
 - Central Jersey Waste (Hamilton, NJ) – January 26, 2016
 - Nashville Filling Station (Nashville, TN) – May 31, 2016
 - Paint Booth Facility (Dodge Center, MN) – January 11, 2017
 - Stillwater, OK – June 16, 2017
 - Ford Econoline Midship Tank (Milwaukee, WI) – July 18, 2017
 - Columbus, NE – October 20, 2017
 - Wichita, Kansas – January 15, 2018

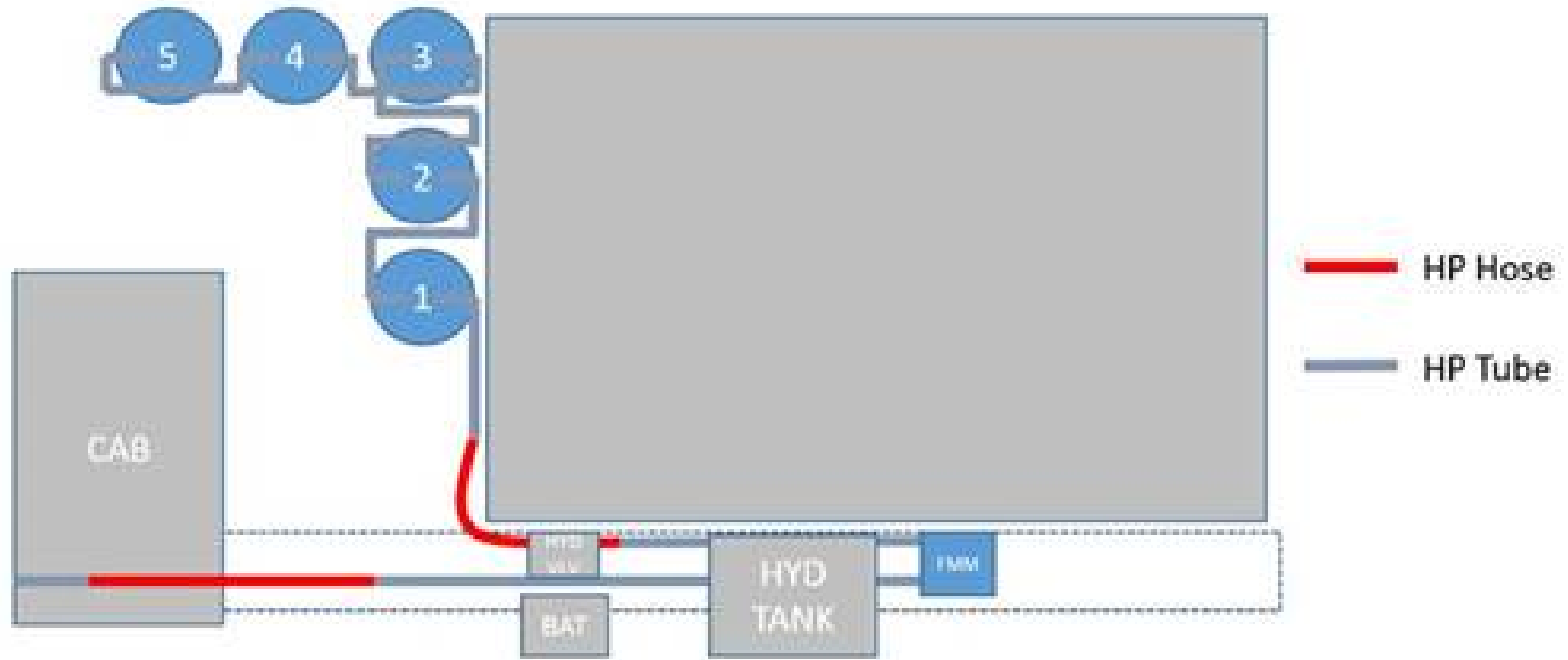
Central Jersey Waste

- January 26, 2016
- Hamilton, NJ
- Five cylinder design - 'L' layout
- Fire initiated near battery box
- Four of the five cylinder PRDs activated
- One cylinder ruptured, causing extensive damage to a nearby home

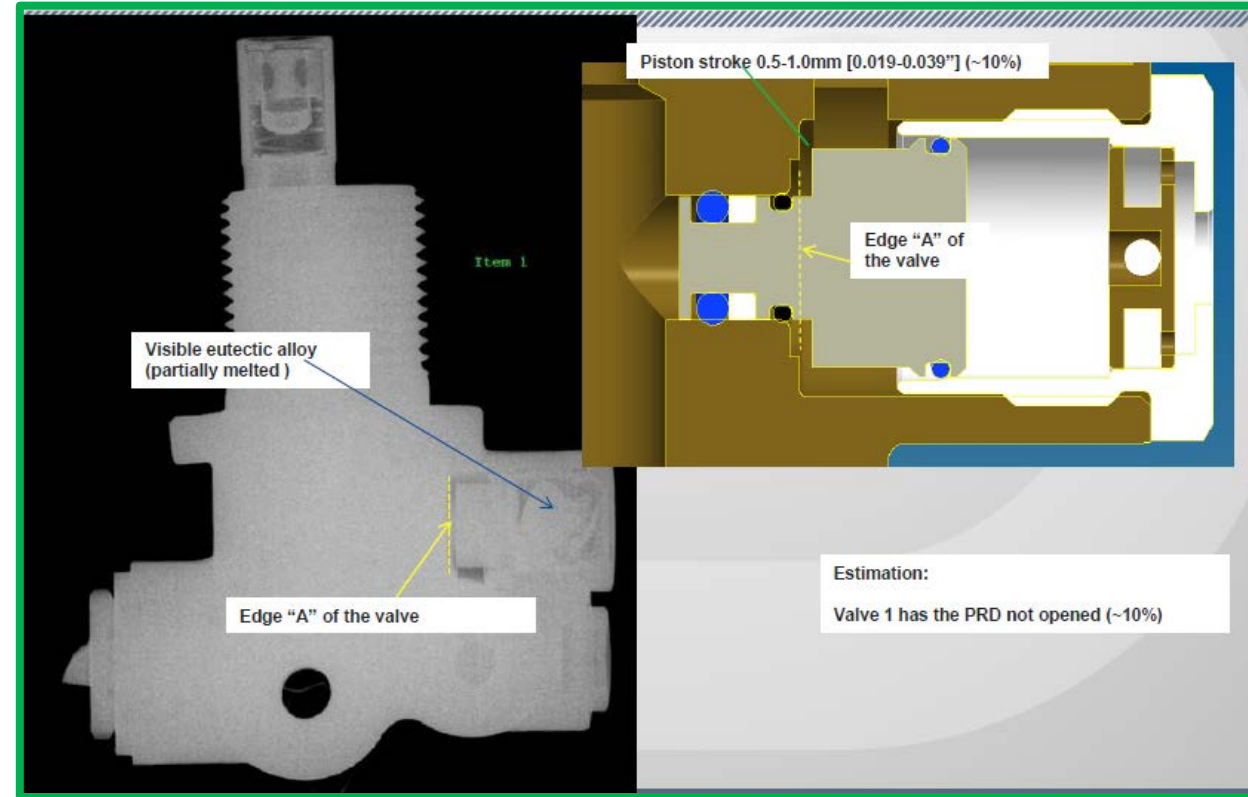
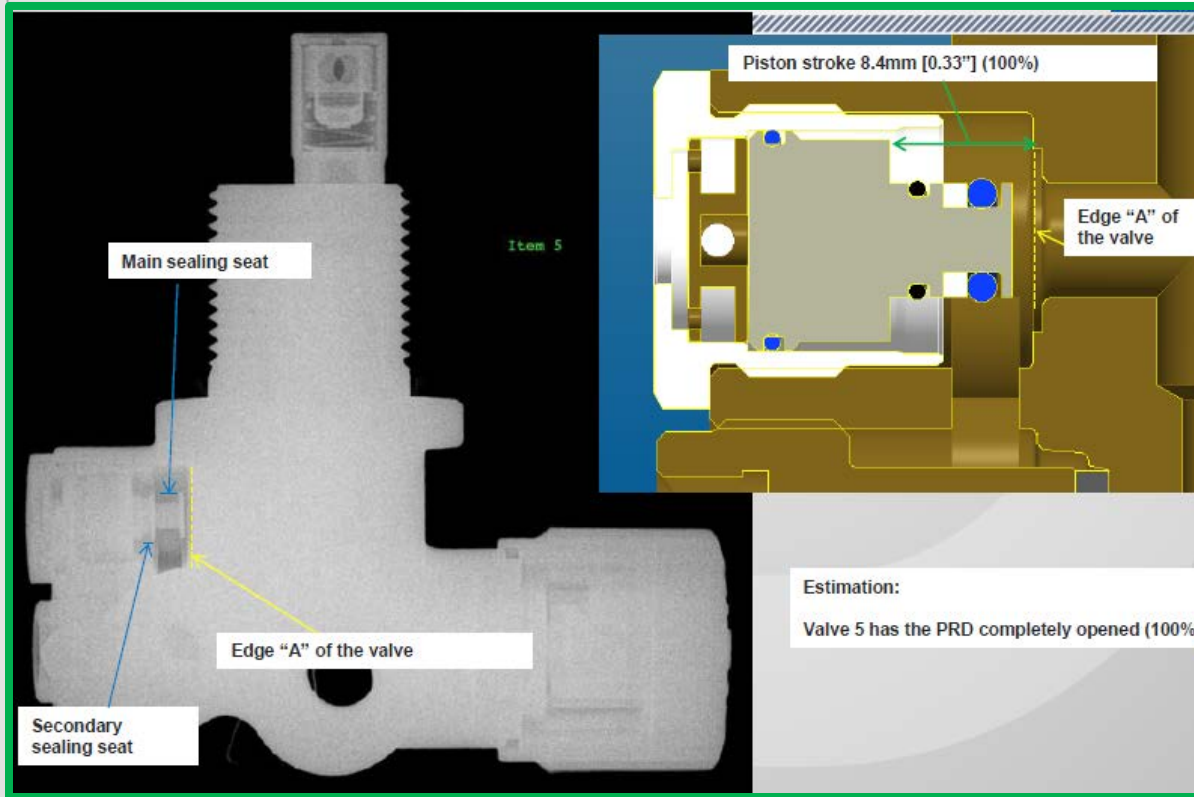


Central Jersey Waste

System Layout



Central Jersey Waste



Central Jersey Waste

Next Steps:

- Destructive testing of PRDs
 - Measure flow rate (capacity) of five subject T-PRDs per clause 7.13 of ANSI PRD 1-2013 – nitrogen gas at 10 bar \pm 1 bar. Compare with design qualification values.
 - Disassemble samples 1, 4 and 5 subject T-PRDs
 - Visual examination of internal condition of samples 1, 4, and 5 subject T-PRDs, including sampling of eutectic alloy, determine mass of remaining eutectic material compared to nominal value.
 - Perform dimensional checks of internal parts per design drawings.
 - Perform metallographic and compositional analysis of eutectic material of samples 1, 4 and 5 subject T-PRDs.
- Feed results back to industry
 - NGV America Technology & Development Committee
 - CSA/ANSI PRD1 TSC
 - CSA/ANSI NGV3.1 TSC
 - CSA/ANSI NGV6.1 TSC
 - NFPA 52

Nashville Filling Station / Class 8 CNG Truck

- May 31, 2016
- Nashville, TN Filling Station
- Two side-mount saddle tanks
- Driver hit something “substantial” with right front steer tire about 15 miles prior to stopping at the filling station
- Between 500 and 700 psi of CNG on vehicle at time of impact
- As driver was filling, passenger cylinder let go, causing damage to vehicle, station and driver who was thrown off of the right front steer tire



Nashville Filling Station / Class 8 CNG Truck

- Fleet has refreshed its training for drivers
 - If driver believes that an object may have hit a CNG container, he or she shall pull over to inspect that there is no damage to the CNG fuel system
- NGV America inspection guidance document
 - Any signs of damage should result in a more in depth inspection



Paint Booth Facility – Dodge Center, MN

- January 11, 2017
- Paint Booth facility
- Refuse truck with CNG tanks on top of hopper
- Leak in a high pressure hose in a heated paint booth
- CNG fuel system was full at the time of leak
- The leak caused an explosion in the facility, resulting in damage to the paint booth, vehicle and six employees at the facility



Paint Booth Facility – Dodge Center, MN

Next Steps

- Facility Evaluation, Personnel Training, Testing of Personnel, and Facility Compliance to Codes
- Reminder of importance of understanding properties of fuel and codes & standards



Ford Econoline Midship Tank – Milwaukee, WI

- July 18, 2017
- 1998 Ford Econoline filling at a Milwaukee DPW station
- 3,000 psi fuel system at 3,600 psi station
- The underbody midship cylinder ruptured (the two rear-of-axle cylinders were later detonated by the bomb squad), causing severe damage to the driver's legs.
- The 3600 psi fill connector was still attached to the van after the incident.



Other Incidents



http://www.stwnewspress.com/news/none-injured-in-fiery-collision/article_e4abda92-a9b3-53be-93ad-d6b1b15ec4eb.html

- 2012 Toyota Tundra CNG powered
- Tundra hit a streetsweeper
- June 16, 2017
- Stillwater, OK



- Dual fuel cement truck
- Overpressurized via time fill
- October 20, 2017
- Columbus, NE



<http://www.kwch.com/content/news/Crews-fighting-S-Wichita-building-fire-469410793.html>

- Fleet Maintenance Shop
- CNG leak, fire at heaters
- January 15, 2018
- Wichita, KS

Incident Investigation & Root Cause Analysis Work Group

- **Notify NGV America** of incidents involving natural gas vehicles where the system vented or if it did not respond as designed
- The Work Group consists of the US Department of Transportation, industry partners, and national labs
- Goal is to understand the cause of incident and reduce future occurrences by making sure there is appropriate coverage in codes and standards

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