Ensuring Safety in Ammonia Fueled Vehicles

5th Annual Ammonia Fuel Conference 2008

Focus Areas

- Passenger Vehicles
- Increased Ammonia Transport
- Refueling Stations
- Public Acceptance

Risks of accidental release of ammonia in passenger vehicles

Primary Areas of Concern

- Collisions
- Fuel tank integrity
- Fuel tank overfill
- Internal fuel lines in the car

- Much can be borrowed from the LPG design principles
  - Pressure-liquefied gas under similar conditions
  - Similar in storage, distribution, and handling

Basic Safety System

- Pressure relief system
- Ammonia detectors
- Prevention of excess flow
- Prevention of trapped liquid
- Fuel delivery system emergency shutdown

Maintenance

- Release in service centers
- High possibility of exposure
- Authorized service centers for NH3 fuel systems
- Safety measures & equipment in service centers
- Service centers education program
- No user serviceable components

Risks of increased transport of ammonia by road tankers to the refueling stations

- Tank rupture due tank integrity
- Tank rupture due to accidental impact
- Rupture due to fire
- Apply existing practices on a larger scale
- Require higher level of training, inspection, and maintenance

Risks of handling ammonia at refueling stations

- Adopt existing transfer practices
- Greater emphasis on training and component integrity
- Elimination of incidental emissions

- Tank to vehicles
  - Fill line from storage tank to cars
  - Overfill prevention
  - Dry disconnects after fueling
  - Check valve system
  - Purge system
  - Interlock system
    - To allow flow if properly connected
    - Prevent drive-away while connected
  - Eliminate self-serve in favor of trained attendant

Risks of handling ammonia at refueling stations

Acceptance of ammonia as a fuel

- Human body produces 17,000 mg/day
- Human liver can convert 130,000 mg of ammonia into urea each day
- 25 ppm TWA = 370 mg/day

Essential chemical produced by all mammals

Acute Exposure

- Dose related
- Detected by humans at 5 ppm
- No adverse effects below 50 ppm
- 300 IDLH value

Chronic Toxicity

- No chronic health effects found from low level ammonia exposure
- Ammonia is naturally present at high levels in humans

Hill Brothers Chemical Co. Ammonia Safety Training Institute (ASTI)

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