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Natural Gas Vehicles Consulting
...Safety, Performance & Economics

Fundamentals and practice of CNG safety

Workshop presented by Dr Hien Ly

1. Why a CNG Safety Workshop?

Energy suppliers, vehicle owners/operators and governments around the world are supporting the use of clean energy to counter rising environmental concerns and the escalating prices of petroleum fuels. Compressed natural gas (CNG) has proven itself to be a cost-effective, reliable, safe and environmentally friendly fuel.

The safety of CNG products has been steadily improved with the introduction and ongoing updating of international standards and regulations, together with growing technical experience gained from field practice. Nevertheless, safety incidents have occurred in almost every country that uses CNG vehicles.

Safety incidents do not impose just a simple cost on the CNG business. In many cases they have resulted in human injuries or loss of life, as well as significant operational disruptions and economic losses.

The majority of the incidents are preventable, given the present stage of development of the CNG industry. It is through the effective dissemination and use of knowledge and experience that CNG safety incidents can be prevented.

This **four-day CNG Fundamentals and Practice of CNG Safety** Workshop provides a major opportunity for participants to gain the knowledge necessary to maintain and enhance their CNG refuelling and vehicle safety, through active exchanges of experience and knowledge between the presenter and the participants.

To our knowledge this will be the first workshop of its kind that deals with all CNG systems – vehicles, on-board fuel cylinders, refuelling stations, their characteristics, their operation and maintenance, and standards and regulations issues.

2. Workshop Description

The fundamentals and practice of CNG safety increasingly need to be disseminated throughout the CNG industry in view of the rapidly growth of the CNG vehicle market,

and the need to maintain and enhance the safety of CNG refuelling stations, vehicles and vehicle workshops.

The author has produced this workshop package to cater to a wide range of stakeholders in the CNG industry. It is a **four-day** full-time course covering the widest possible range of safety issues involving regulatory frameworks, refuelling stations, vehicles, vehicle workshops, on-board cylinders, design, construction, operation and emergency response programs.

Site visits to local CNG vehicles and facilities will enable workshop participants to relate the presented materials to actual facilities and operating procedures. If **site visits** are included the workshop duration will be **five days**.

The author draws on his nearly three decades of working in all aspects of the CNG industry including technical, commercial and regulatory work. Using his data base of incidents spanning more than two decades in several countries, he has produced interactive exercises based on real life case studies.

After the main presentation, when participants will have been made familiar with the fundamentals and practice of CNG safety, the participants will be led from the circumstances of the incidents and their consequences to the development of feasible causes and remedial measures. These exercises will be conducted using case studies worksheets which will be handed out to the participants at the beginning of the workshop.

At the completion of the workshop participants will have the completed worksheets as constructed from the original investigations of the case studies. The participants may keep them for later use at their workplaces.

3. Sources of Know-How Used in the Workshop Material

This **Fundamentals and Practice of CNG Safety** Workshop draws on the presenter's decades of work on:

- CNG refuelling and vehicle projects
- Technical research and development into CNG vehicles, high pressure gas cylinders and CNG refuelling stations
- The investigation of CNG safety incidents
- CNG safety consulting
- CNG standards and regulations at the national and international (ISO and ECE) levels
- Case studies of CNG safety incidents in several countries

4. Case Studies

A variety of CNG safety incidents in several countries will be discussed in the workshop to highlight their causes and measures to prevent their occurrence.

Workshop participants will be encouraged to share their own experience and their effective/successful solutions.

The workshop participants will be exposed to the multifaceted nature of the effort to maintain the safety of CNG, from product design and quality, inspection and maintenance, to regulatory framework and their implementation. Every stakeholder has an important role to play, be they the vehicle or refuelling station owner/operator, the designer, or the government regulator.

5. The Workshop Presenter's Profile – Dr Hien Ly

The presenter, Dr Hien Ly, is an Australia-based CNG expert with more than 30 years of CNG experience in New Zealand and Australia. He has authored numerous reports and papers on CNG, and consulted large Australian CNG vehicle fleets on safety issues.

He has presented papers at several national and international NGV conferences, as well as holding introductory CNG training courses in Australia and other countries.

Dr Ly has investigated a number of safety incidents in Australia, and is an avid observer of incidents in several countries for many years. He has access to CNG safety incident databases in several major countries.

Dr Ly has worked on CNG standards in New Zealand and Australia since the early 1980s, and served in ISO CNG standard working groups since 1989, as a consultant to the International Association for Natural Gas Vehicles (IANGV).

Dr Ly is at present chairman of Standards Australia's committee AG 009 (CNG refuelling stations).

6. Who Will Benefit from Attending?

- CNG vehicle fleet owners and operators
- CNG refuelling station designers and operators
- CNG equipment/system distributors and service providers
- CNG vehicle conversion and service workshops
- CNG vehicle and refuelling station approval agencies
- CNG vehicle inspectors and CNG cylinder inspectors
- Natural gas and power utilities
- Pressure equipment and workplace safety regulatory authorities
- National standards committees responsible for CNG standards
- Road transport authorities
- Civil defence and emergency services, the police and fire departments
- Risk assessors and auditors
- Technical colleges with CNG training courses
- Safety researchers

7. Workshop Program ·

DAY ONE

1. Properties of natural gas and CNG
2. Examples of different types of CNG safety incidents
3. International CNG standards and regulations
4. CNG vehicle system installation
5. CNG vehicle certification

DAY TWO

6. Design and safety of CNG vehicle workshops
7. CNG refuelling systems
8. CNG refuelling Safety Management Plans (SMP)
9. CNG refuelling station safety and maintenance
10. CNG vehicle safety practice (including CNG trailers used in mother-daughter systems, vehicle workshops, overnight parking areas, indoor parking and operating in indoor/underground passenger terminals)

DAY THREE

11. CNG refuelling station safety practice
12. Safe CNG cylinder practice
13. Periodic inspection of CNG vehicle systems
14. Periodic inspection of on-board CNG cylinders

DAY FOUR

15. Safety against CNG vehicle collision, fire and explosion
16. A regulatory framework for CNG safety
17. Implementing an effective emergency response programs
18. Discussion on the causes and measures to prevent the types of incidents presented at the beginning of Day One, using the knowledge gained at the workshop
19. Open forum on issues raised by workshop participants for further discussion/ clarification.