Propane, Butane, Propylene, by Emergency Film Group, Plymouth, MA, Hazardous Chemical Series No. 9, 29 min, $395.00.

This well done, beautifully photographed video is designed for emergency response groups, especially fire departments. The tape jacket notes that the following topics are covered:

- Why allowing a fire to burn may be the best tactic
- Water flow rates for cooling tanks exposed to fire
- Boiling liquid expanding vapor explosions
- Monitoring instruments for LPG (liquified petroleum gases) emergencies
- Fire safety analysis for LPG emergencies
- Requirements for safe storage areas
- Controlling vapors with water fog
- ASME and DOT container types
- How vapors behave

The film begins with an introduction to drilling for gas and oil, and a description of how liquified petroleum gas is derived and used. The gases, as noted, have wide use but can be very dangerous as a result of their flammability and explosion potentials.

Propane is discussed first. Propane has a wide variety of uses in the home, for vehicle fuel and as an industrial raw material. The second chemical discussed in the video is butane. It is used as a propellant, refrigerant, chemical feedstock and fuel. Propylene, the third chemical illustrated in the video, is a man-made gas used mainly in the industrial chemical industry.

Propane is odorless and colorless, but sulfur-containing organic chemicals are added as odorants. The LEL and UEL of the gas are approximately 2% and 10%, respectively. Burning temperatures exceed 3500°F. LPG is normally stored as a liquid under pressure. Once released, it expands rapidly to a ratio of 270:1 and through moisture condensation may cause a white water fog. Being heavier than air, the gas may hug the ground. All three gases in the liquid state will float on water and boil.

All three gases have an NFPA flammability rating of 4, the highest level, and a BLEVE can occur with fire-exposed containers. The NFPA health classification of all three gases is 1, indicating a material that is an irritant but having only mild residual injury. All three compounds, however, are asphyxiants as a result of their excluding oxygen.

The NPEA reactivity rating for propane and butane is 0, indicating materials that are normally stable and nonreactive with water. The NFPA rating for propylene is 1, indicating a normally stable material which may become unstable at higher temperature. Propylene also reacts violently with nitric acid and other oxidizers.

Storage areas and safety considerations thereof are described on the video. NFPA or API standards should be followed where inside storage is severely limited. The fire protection needs of large storage facilities are described.

Areas in which these gases are stored, the video notes, should be fenced. Proper safety equipment is described and unloading and loading operations are shown — it is noted that the escape of small amounts of gas cannot be avoided, so all sources of ignition must be avoided.

The video shows a devastating fire in Buffalo, New York, which resulted from a 500 gallon propane tank illegally being used as a storage tank in a building. While being moved, the tank fell and sheared off the valve. The resulting fire and explosion, and the fire ball ended in the destruction of 18 buildings and damage to 55 other buildings as well as the deaths of seven people, five of them the first-arriving fire-fighters. Twenty-five other fire-fighters were injured.

Fortunately, most incidents involving these gases are not so catastrophic. Typical spills only involve small amounts of these gases — generally during transfer operations as a result of overfilling or accidents involving LPG-fueled vehicles.

Having described the problem, the video goes on to describe the safe response techniques for fire fighters — upwind, observation from a distance, use of turnout gear, identification of the hazardous chemicals, and size and shape of storage containers, i.e. DOT portable cylinders and large shipping containers (trucks, railcars).

DOT numbers for these flammable gases (red DOT placed) are:

- LPG – 1075
- propane – 1978
- butane – 1011
- propylene – 1077

Shipping papers should generally show "liquified petroleum gases" for all of the chemicals.

In response situations, odor, it is noted, cannot be relied upon for detection of the gas as the odorant may have been adsorbed by the soil or may have deadened the respondents' sensory organs. Gas meters should be used to measure gas concentrations; respondents should not rely upon the nose.

The emergency response procedures for LPG-exposed victims are given. The importance of prevention of source ignition (including responding vehicles) is noted. How to disperse a cloud using water fog is described. How to stop leaks is described with the admonition to do it carefully. Response to flame-involved containers is discussed — with the potential of a BLEVE emphasized. Fire resulting from leaks, it is said, should not be extinguished unless the leak can be stopped. A controlled burn may be preferable. Signs of BLEVE — bulge in the tank, increased noise, increased volume of fire — are noted. As a final note, decontamination procedures are described.

Although not a fire-fighter, this reviewer does teach a course on hazardous chemical spills. My review of the video leads me to believe that very little of

importance was missed. The material was well written and well photographed. It is an excellent training aid.

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International Directory of Emergency Response Centres, OECD Environment Monograph No. 43, UNEP-1F/PAC Technical Report Series No. 8, United Nations Environment Programme, 1991, 77 pp., Free.

Listed are all the agencies, both governmental and private. This provides assistance and/or information for chemical spill response. Beginning with Brazil and ending with the United States, data are given for:

- telephone number
- telefax/telex
- address
- type of institution
- length of service
- name of contact
- fee
- information provided
- other services

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Environmental Chemistry, by Nigel J. Bunce, Wuerz Publishing Ltd, 895 McMillan Ave., Winnipeg MB R3M 0T2, Canada, 1991, ISBN 0-920063-46-2 (pbk), 340 pp. $33.00; plus answer guide, ISBN 0-920063-38-1, 343 pp., $US17.00 (shipping rate $5 per order).

This is an unusually well organized and written book, nicely illustrated with photographs and diagrams, by Professor Bunce of the Chemistry Department of the University of Guelph. Intended as a introductory textbook for chemistry and biology students, it assumes the reader has studied chemistry and biology, as well as being reasonably fluent in mathematics.

The present status of studies in environmental chemistry are discussed in detail, with updated references and opinions which reflect a understanding not always seen in books of this nature. Starting with the earth's atmosphere, the text progresses on to stratospheric ozone, tropospheric chemistry, indoor air quality and remedial measures to improve it, natural waters, acid rain, drinking water, sewage and waste disposal, chlorinated organic compounds, and environmental metals. Each chapter and section includes questions (that are answered in the answer guide) and 500 references to current literature, as well as presenting background history where appropriate.