

STEPHEN BROWN
Technical Adviser, OFGEM

Employment history and qualifications

Stephen David Brown, BSc CEng MIGEM

1976-1994: Employed by British Gas - ultimately as District Engineering Manager.

1994-2003: Employed by Shell Gas Direct – ultimately as Customer & Technical Services Manager

2003 to date: Employed by Ofgem as Technical Adviser.

Natural gas hazards and risks

1. LPG (predominantly propane) is significantly heavier (1.5x) than air and therefore is liable to pool at low points such as drains and cellars.
2. Natural Gas (predominantly methane) is significantly lighter (0.6x) than air and therefore more easily dissipates into the atmosphere.
3. This is a well known issue ie LPG cars are not allowed through the Channel Tunnel and they are banned from some underground car parks.
4. LPG has a lower auto ignition temperature (450 deg C) than Natural Gas (540 deg C) so there is a slightly higher risk of auto ignition with LPG laden atmospheres if very hot surfaces are present.
5. LPG also a higher calorific value (energy content per unit volume) of approx 95 MJ/m³ than Natural Gas (approx 40 MJ/m³) and so requires a smaller volume of gas in a given volume of air to cause an explosive mix.
6. The explosive mix parameters are defined by LEL - Lower Explosive Limit and UEL - Upper Explosive Limit
7. Natural Gas – below 5% (LEL) gas in air will result in the free gas burning – a flash flame. Similarly above 15% (UEL) – there is insufficient oxygen in relation to the gas to cause an explosion. However between 5% and 15% gas in air constitutes the ideal conditions for an explosion.
8. LPG – the corresponding values are between 2% propane in air (LEL) and 10% propane in air (UEL). Thus the threshold is lower but the band is narrower.

9. Natural Gas is capable of being liquefied by cooling to -160 deg C. UK is in part supplied with Liquefied Natural Gas (LNG) by specialist ships to LNG loading ports. This is a highly efficient form of transport and storage as LNG occupies only 1/600 of the volume of vapourised Natural Gas at Standard temperatures & pressures (15 deg C /1013.25mbar). However the LNG is always vapourised before it enters the national or local gas transmission system.

10. Neither methane or propane have a natural smell so odouring agent is added to both natural gas and LPG to enable leaks to be detected physiologically.

11. Transmission pipelines transport gas at very high pressures and so they are built and maintained to very high standards. For technical reasons they do not need to carry odourised gas and so the odourant is only added at the point of offtake from the transmission system into the distribution system. Odourising of natural gas therefore only takes place when it is in vapour form.

12. LPG is delivered as a liquid with its odourant already added and it is possible for the gas to become de-odourised (known as odour fade) and therefore when vapourised less likely to be detected physiologically. This odour fade can be caused by the presence of air, water or rust inside LPG tanks.

REGULATION OF NATURAL GAS NETWORKS AND USER PREMISES

Responsibility falls to 3 groups:

13. Gas Transporters (GT) – Licensed by Ofgem. Transport gas through transmission and distribution gas networks.

14. National Gas Transmission System (NTS) owned and operated by National Grid. This system transports gas from beach terminals and storage entry points to the distribution networks at NTS offtake points.

15. Gas Distribution Networks. In 2005 National Grid (ex-Transco) sold four of their eight gas distribution networks to new owners : Scotia Gas Networks who own Scotland Gas Networks and Southern Gas Networks; Northern Gas Networks (NE England); and Wales & West Utilities (Wales/SW England). These gas distribution networks broadly start at the NTS offtake points and end at the Emergency Control Valve (ECV) which is situated adjacent to the meter regulator and meter.

16. Gas Shippers (broadly equivalent to wholesalers) contract with gas transporters to ship gas through network. Licensed by Ofgem
17. Gas Suppliers (broadly equivalent to retailers) contract with the shippers and consumers. Licensed by Ofgem. Unless the consumer has made alternative arrangements, the Gas Supplier normally arranges meter services at the consumer's premises.
18. Under the Gas Act 1995 (as amended) [ICL/05502- 05616], licenced gas shippers and licenced gas suppliers are prohibited from being licenced gas transporters. Therefore shippers and suppliers do not operate transmission or distribution pipes.
19. Gas meters are normally owned, operated and maintained by a Meter Asset Manager (MAM) OFGEM approve MAMS, oversees the MAM Code of Practice (CoP) and audits the performance of MAMs against that CoP. MAMs normally contract with either the customer or gas supplier to provide the meter installation and ongoing maintenance.
20. Gas meters are installed / removed by Ofgem Approved Meter installers (OAMI).
21. The legislation covering gas transporters is primarily:
22. The Gas Safety (Management) Regulations 1996 (GSMR) [ICL/05617 – 05637] and the Pipeline Safety Regulations 1996 (PSR) broadly cover the gas network up to and including the ECV.
23. The Gas Safety (Installation & Use) Regulations 1998 [ICL/04473-04500] broadly covers the pipework downstream of the ECV including the meter regulator, meter, installation pipework and appliances.
24. The Pipeline Safety Regulations 1996 [ICL/04523-04545] covers the operation and maintenance of pipelines (not just natural gas).
25. The Pressure Systems Safety Regulations 2000 [ICL/04546-04568] are intended to cover the risks associated with higher pressure pipes (not just natural gas) and manage the interfaces between different operators of pipes who may be dependant on pressure control systems and safety equipment upstream or downstream of each other. It requires co-operation and written schemes of examination to ensure the risks of the whole system (both upstream and downstream of the ECV) are managed, regardless of the number of operators in the chain.

Emergency response

26. GSMR requires that a single emergency number be available for reporting gas emergencies (eg 0800 111 999). This number is operated and co-ordinated by National Grid and the emergency response requirement is seamlessly disseminated to the relevant gas transporter to resolve. If the emergency is due to the gas transporters network, they will undertake the necessary remedial work. If the emergency is downstream of the ECV, the gas transporter may undertake very minor repairs but normally their responsibility is to make safe by turning off the ECV, undertake additional safety checks and provide the appropriate advice to the consumer regarding the requirement for any further repairs.

27. In event of an injury or death being suspected to have been caused by carbon monoxide from the usage of natural gas, the attending gas transporter is required under GSMR to pass sufficient details to the appropriate gas supplier so they can submit a Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR) [ICL/04301-04303] report to HSE. If required to do so, the gas supplier will undertake a CO investigation into the cause of the incident resulting in death or injury

NATURAL GAS PIPEWORK INTEGRITY

Maintenance of pipes

28. Under GSMR, all gas transporters are required to each compile a safety case that details sufficient information to demonstrate that their proposed operations are safe and that risks to the public & employees are as low as reasonably practical. Their safety cases must be accepted by the HSE before their operations can commence and the safety case must be adhered to.

29. Pipeline Safety Regulations – Regulation 13 creates a duty on operators to maintain pipelines. If vulnerable pipes are buried or inaccessible and there is no practical methodology to maintain them, this could be considered to be a breach of the regulations.

30. Following ongoing concern about iron gas pipes which are subject to corrosion or sudden fracture and how these are maintained, the PSR were amended in 2003 to include Regulation 13A whereby if operators set out an HSE approved iron gas mains replacement programme and adhered to it, this could be used as a defence against the PSR duty to maintain.

31. This resulted in the '30/30' programme ie to replace all iron (not steel) gas mains within 30 years if they are situated within 30 metres of a building. This programme commenced in 2002 and all gas networks are continuing with this, having risk assessed and prioritised all known mains subject to this replacement programme.

32. Service pipes : gas distribution networks have their own replacement programmes broadly based on condition.

BUILDING STRUCTURES

33. The type, design and methodology of construction of a building are not normally considered when assessing and prioritising the risks of gas mains. However consideration is given to the risks posed by natural gas mains that are close to high concentrations of population with higher implications of failure e.g. public or multi occupancy buildings, blocks of flats, shopping centres, large buildings with cellars, amount of open ground between mains and those buildings etc.

34. Network companies are aware of the risks of gas in tower blocks and these would be considered and mitigated as appropriate.

I confirm that the contents of this statement are true

Witness signature

Dated
