Safety and efficient supply – 'from start to finish'

Assisting and empowering healthcare professionals through support and ongoing training helps to ensure the safest possible operation of medical gas pipeline services. Here Catherine Sullivan, Marketing, Hospitalcare and Medical Engineering Services at BOC Healthcare, discusses the issues surrounding the safe running of this vital healthcare service, and outlines the Medical Gas Pipeline System services and expertise the company offers to help hospitals and other healthcare facilities ensure a safe, reliable supply.

With an enviable safety record, the UK sets the global gold standard for the understanding, installation, and management of medical gas systems. Medical gas is administered to at least 60% of patients during their stay in hospital, whether as anaesthesia, during intensive care and resuscitation, as pain management, or for the treatment of respiratory conditions. To ensure that it is used safely, safety has to be an integral part of both the design of the entire Medical Gas Pipeline System (MGPS) that delivers the gas, and of its ongoing operation and management by hospital staff.

Originally, the majority of medical gases were supplied in cylinders, but as technology and hospital design has advanced, this has been largely replaced by the MGPS, though cylinders may still be used in hospitals for convenience, emergency supply, or patient transport.

The MGPS reduces the problems and potential hazards associated with the use of gas cylinders – such as porterage, storage, and noise, and provides a safe, convenient, and cost-effective system for the provision of medical gases to the clinical and nursing staff at the point-of-use. However, although an accepted and essential part of the modern hospital, and vital to patient care, the MGPS in a hospital contains gas under pressure, which can present a hazard to staff and patients.

Careful design and expert installation

The MGPS requires careful design, carried out in conjunction with the hospital, and followed up by expert installation and maintenance by an experienced supplier. This is the safest and most effective way to address the engineering challenges presented by the medical gas pipeline system, but the human element also has to be considered. Hospital staff handle and administer medical gases every day – frequently in difficult and challenging situations or when time is at a premium, so it is essential that everyone understands their responsibilities and operational procedures to minimise any risks to themselves or their patients. A moment of carelessness, an overlooked precaution, or a simple mistake, could lead to an accident, injury, or loss.

Four basic tenets of supply

HTM 02-01 provides us with four basic tenets of supply: safety is achieved through the consistent management of adequacy, continuity, identity, and quality. This must be supported by appropriate ongoing training for all staff managing or administering medical gas. When it comes to something as important as the safe delivery of medical gases, and to facilitate the continuity stipulated by HTM 02-01, it makes sense to work with one partner that has a global reputation, and can provide a holistic end-to-end service, all based around a thorough understanding not only of HTM 02-01 and other relevant guidance, but also of how the NHS operates. From advising on initial needs, and designing and installing a solution, to providing regular training and support, BOC Healthcare works with hospitals and hospices to ensure the safest possible delivery of medical gases, reducing risk and taking inconvenience away from the client by delivering a comprehensive consultancy service.

More than just cylinders

The company has been a leading innovator in the field of medical gases for all healthcare settings for over 125 years, and has worked with the NHS since the service's inception in 1948. It has been instrumental in developing and introducing many important innovations, including:

- The lightweight integral valve cylinder – to facilitate easy delivery of medical gases.

- ENTONOX (nitrous oxide/oxygen mixture) for pain relief in painful procedures, and for mothers during childbirth.
- HELIOX21 medical gas mixture to ease the work of breathing in acute respiratory distress.

An emphasis on safety runs through everything we do – more important even than commercial concerns, we are committed to continually striving for the safest installations and operation of MGPS. To this end, in addition to developing and supplying medical gases, BOC offers a wide selection of specialist services that can help reduce the risks associated with using such gases in a clinical environment. From carrying out a comprehensive audit and detailed risk assessment, through to project managing changes or organising staff training, BOC's Medical Engineering Services (MES) team brings all medical gas management issues together, and offers a complete solution tailored to individual needs, with an unwavering focus on safety.

Over the past three years, 1,500 people have attended the Authorised Person and Competent Person full course and refresher courses in the UK and overseas, with over 10,500 people in total attending BOC training courses.

'Turnkey' installation of a medical gas supply system and pipeline by BOC – 'before' and 'after'.

An 'end-to-end' service

Hospitals today do not always have the internal engineering resources they once had, and increasingly look to consultants to advise and guide them and carry out work. BOC's Medical Engineering Services Department, established 13 years ago, helps hospitals to provide the highest levels of patient safety by establishing outstanding quality in the complete chain of events for gases – from supply plant to safe delivery to the patient. The MES team provides a comprehensive range of services in three main areas to assist and enable healthcare professionals to safely manage the supply and distribution of medical gases:

- Risk Management.
- Gas Facilities Management (GFM).
- MGPS training courses.

This three-pronged approach ensures total continuity in the design, installation, and management, of the MGPS, which in turn ensures optimal safety throughout and support in establishing and maintaining compliance with HTM 02-01. Bespoke services can be provided to suit hospital requirements, delivered by a partner with experience across the whole range of services and systems.

Risk Management

BOC's Risk Management service offers a range of consultancy services that ensure sites meet HTM 02-01 requirements. The first step is a comprehensive audit – a detailed assessment of how medical gases are managed in the setting allows the identification of potential risks and shortcomings in areas such as plant capacity and condition, distribution systems, and provision of equipment and emergency back-up, allowing hospitals to see the risks they face. Once this is complete, a risk assessment provides an impartial and pragmatic view of risk, developing solutions, and establishing a solid foundation upon which to build. After the risk assessment has been completed, the next step is to start managing and reducing the level of risk to as low as is reasonably practical, minimising non-conformity and paving the way for best practice. BOC can then support hospitals with the creation of operational policies to enable the extraction of best practice procedures and information, and the development of specification and design for specialist contractors.

The company can also provide 'As-fitted', isometric, and schematic drawings, ensuring that hospitals have a visual

overview and resource to allow complete control of their medical gas infrastructure, as well as compliant documentation. Drawings representing the MGPS are the primary tool of the Authorised Person (AP) in the management of the medical gas system. The drawings and associated detail must be completely reliable, as lives could be put at risk if errors are left undetected.

Two types of AP

The AP (MGPS) is required by HTM 02-01 to provide functional and technical management of the MGPS where the gases are carried and distributed within a pipeline system. BOC can provide two different types of AP:

- If a healthcare establishment needs extra assistance on site, or is not big enough to warrant its own engineer, we can provide an Operational AP (MGPS) on its behalf.
- During a large MGPS installation project, a Construction AP (MGPS) can provide invaluable project management support, handling the day-to-day monitoring of MGPS sub-contract installers, and allowing the hospital AP to continue its many daily duties.

As a final step, BOC's Authorising Engineer service enables an Authorising Engineer to also be brought in to assess and appraise the hospital's familiarity with the MGPS prior to sign-off by the chief executive.

Gas Facilities Management (GFM)

Operating as expert consultants for all medical gas systems, BOC's GFM team offers bespoke medical engineering systems, from design to installation. These full turnkey solutions ensure that hospital liquid oxygen supply systems are always installed correctly, are fully compliant, and operate with optimum efficiency, creating the safest possible environment for patient care. Close liaison with the AP (MGPS) throughout ensures that the individual has a thorough knowledge and understanding of the system being installed.

The GFM team starts by meeting with estates personnel to discuss the project's requirements – with years of experience of working with the NHS, the team has a thorough understanding and appreciation of NHS expectations of suppliers working on site. The design team will then develop a bespoke solution that ensures that the facility is fully compliant with the recommendations set out in HTM 02-01. This includes vessel and pipeline system sizing calculations, flow rate and pressure drop calculations, plinth design, selection of location (in line with BCGA Code of Practice 36 and other relevant guidance), and operational requirements such as alarms, maintenance, and use.

Managing the installation

Once the in-house Technical Engineering department has approved the design, BOC manages the installation of the medical gas supply systems and pipeline, which could also include electrical supplies and installations. Upon completion, qualified staff carry out all testing and commissioning, again to HTM 02-01 requirements. BOC Medical Engineering Services can also provide 'As-fitted' drawings, including production of valve registers, valve numbering, and tagging, to help the hospital maintain an accurate overview of the MGPS, as required in HTM 02-01, as well as a wide range of upgrade options.

A similar turnkey solution can also be offered for medical gas storage projects, should medical gas cylinders also be kept on site. Improving the standard of medical gas storage facilities reduces manual handling issues and incorrect selection of the appropriate gas product, and assists in stock control. We will visit the site, develop a bespoke, compliant solution, and also project manage and deliver a total turnkey solution for safer secure storage, including advising on selection of location, installation and delivery service, and new signage.

Backfeed kit

We have also introduced a new product and service to our range. The BOC Backfeed Kit (and service) – an invaluable method of supplying medical oxygen and medical air to wards and departments when the main pipe infrastructure is being isolated, extended or altered – is also available as an option. This service starts with an assessment of the hospital's requirements to ensure that the

relevant capacity is allowed for, and means that clinical users can be confident that the supply will be maintained during works. The equipment provides an easy-to-use, lightweight, and secure solution, which is an invaluable resource for the AP (MGPS) to manage the MGPS safely and effectively. Customers using the backfeed service gain from an 'end-to-end service', elimination of the risk associated with large cylinders, no high-pressure connection, and the elimination of unsafe storage practices in patient environments.

The backfeed kits have proved very popular, with one technical services manager saying: "We have found the backfeed kits very easy to use – especially in terms of moving them around the hospital. The cylinders are mounted with their own trolley, which reduces handling issues and noise. The higher capacity cylinders also result in fewer changeovers. Using the backfeed kits for programmed works has been very beneficial."

The Medical Gas Safety Course is structured to emphasise the roles, responsibilities, and procedures required to ensure best practice in the safe use and application of medical gases and associated equipment, and can be tailored for nursing staff, community nurses, midwives, porters, or instructors.

MGPS training courses

HTM 02-01 states: 'The safe operation of a medical gas pipeline system relies on skilled staff who understand the system and who can liaise with clinical users to ensure continuing patient safety.'

BOC Healthcare is a BTEC-accredited Training Centre, continually investing in and developing a range of courses to enable attendees to comply with current codes of practice and legislative requirements. Over the past 3 years, 1,500 people have attended the Authorised Person and Competent Person full course and refresher courses in the UK and overseas, with over 10,500 people in total attending BOC training courses. All courses take safety training right back to basics, stressing its importance throughout. A thorough understanding of correct hospital procedures is vital if medical gases are to be managed safely, and hospitals are to be compliant with the best practice requirements of HTM 02-01. The courses can be delivered on site, or at BOC premises, to make attendance as easy as possible. All members of BOC's training team are experienced communicators, and can thus address any queries attendees may have in a clear and knowledgeable manner. The course combines tuition, course notes, practical sessions, and assessment, with the varied content ensuring that the session is lively and interesting, as well as informative. By communicating complex issues in understandable and accessible language, tailored to suit the skills base of the audience attending the session, the trainers ensure that everyone leaves feeling confident about both their responsibilities, and about guidelines and legislation around the use of medical gas systems.

Courses' structure

The Medical Gas Safety Course is structured to emphasise the roles, responsibilities, and procedures required to ensure best practice in the safe use and application of medical gases and associated equipment, and can be tailored for nursing staff, community nurses, midwives, porters, or instructors. Cryogenic Safety Training is also available. The Medical Engineering (MGPS) courses also offer comprehensive or refresher training for APs and CPs. As one participant, Tom Hyde, chief engineer (North), at HCA Joint Ventures, noted: 'I would like to thank you for a very insightful course. I found the knowledge that I have acquired very useful, and I look forward to putting it into practice and developing my skills in this area to the high standards that comply with HTM 02-01.'

BOC appreciates that it is not always easy to release staff to attend training, and also that many people employed in healthcare environments work irregular hours. To address this, we have developed a comprehensive range of 'e-learning' packages, designed specifically for hospital staff. This provides essential but flexible managed training via the Internet, allowing staff to learn about basic safety in their own time.

'As fitted', isometric, and schematic drawings are all available.

Prioritising safety

Safety, of course, has to be integrated into every element of the MGPS design – from the siting of medical gas storage facilities, and the provision of detailed As-fitted drawings and warning signage, through to the development of a bespoke operational policy. Working with a partner like BOC Healthcare – that combines understanding of the medical gas pipeline system from start to finish with a thorough knowledge of the way that healthcare facilities operate – ensures that medical gases are delivered in the safest possible way. hej