The History Of The Pipelines Department

Introduction

I started my working life in the gas industry in September 1957 as an Indentured Pupil Engineer for the East Midlands Gas Board at Litchurch Gas Works, Derby. After 6 months general introduction to carbonisation I transferred to the Distribution Department as part of my training. I soon realised that, apart from the ability to drive a van around the town and local countryside, the greater independence and responsibility was far preferable than working in a retort house and so I made the move permanent.

My first contact with high pressure pipelines was in July 1962 when I spent time with the EMGB section of the Canvey to Leeds Methane Pipeline project, led by Arthur Knowles, working with two of the surveyors. After graduating from University, I had the opportunity to be the Site Engineer on the Burton to Swadlincote HP pipeline. In 1966 I moved to North Western Gas Board as the Assistant District Engineer, Manchester North, but the lure of high pressure pipelines was too great and I took the opportunity to move to the Grid Maintenance Department at Area Board HQ in Altrincham. In March 1973, I arrived at Hinckley as one of three Maintenance Engineers in the newly formed Pipelines Maintenance Section of the Pipelines Department.

Early Days

In the late 1950s most Area Boards were developing plants to make gas from oil using high pressure reformers with a typical output pressure of 24 bar (350 psi), which was reduced for distribution via the local distribution system as there was little HP transmission.

Early in the 1960s a plan evolved to buy Liquid Natural Gas (LNG) from Algeria. It would be transported in liquid form by ship to Canvey Island where it would be stored, processed and regasified before being transmitted via pipeline to Leeds with branches to Sheffield and Manchester. Initially the aim was to use the natural gas as feedstock in the reformer process.

In those days, the rôle of the Gas Council was coordination and liaison with government; it did not have executive powers. Each Area Board was responsible for building the part of the Methane Pipeline within its boundaries to common agreed standards.

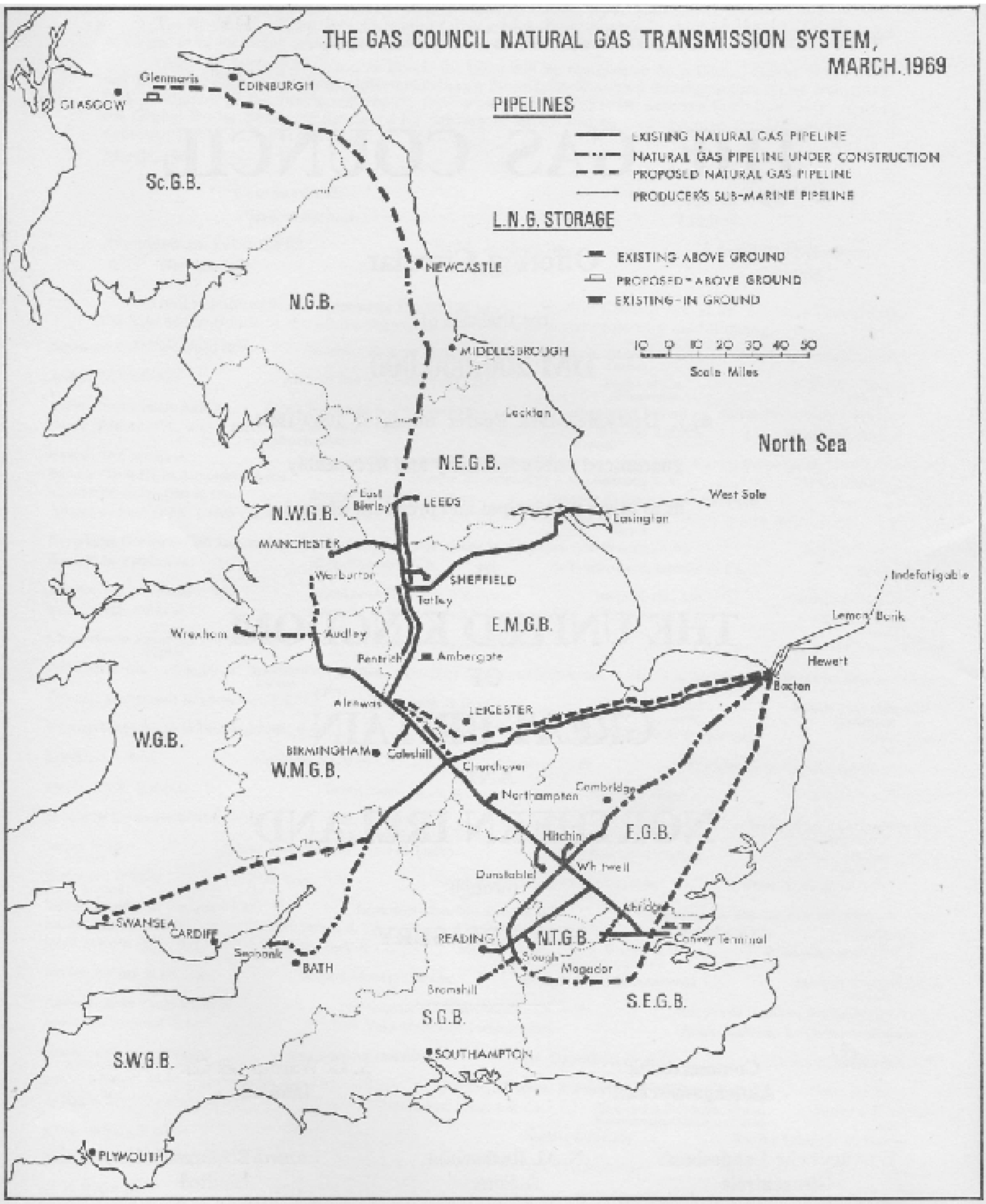
The Methane Pipeline was built during 1963 and finally commissioned in 1964. However, the discovery of oil & gas in the Southern North Sea changed all perceptions, with the subsequent decision to convert the country to "North Sea Gas". This led to a major expansion in the need for high pressure pipelines with the attendant terminals, compressors and pressure reduction stations.

The experience with the Methane Pipeline highlighted the requirement for a central body with the capability of undertaking major capital projects. So G.F.I. Roberts, who headed the Production & Supply Division (P&S) of the Gas Council, established a Construction Department in London to deal with compressor stations and terminals and the Pipelines Department in Hinckley to design, build and maintain all the pipelines of the National Transmission System (NTS) with the associated pressure reduction stations and other above ground installations (AGIs).

The Beginnings of Pipelines Department.

The precise dates of the formal establishment of the Pipelines Department and of the early appointments are lost in the mists of time. No.1 Feeder (Easington to Paull) was built in 1968/69, No.3 Feeder was commissioned in 1969. The South London Ring and the connection to West Thurrock power station were under construction around the same time. The appointments of Russell Emmony, ex-North Thames, as Pipelines Engineer based in London and Arthur Knowles, ex-EMGB, as the Deputy Pipelines Engineer based at Hinckley would be around these dates.

My first recollection of the Pipelines Department at Hinckley is in 1970 when the few staff worked in Bleak House, a brick building on the old Hinckley Gas Works whose entrance was directly off the Coventry Road. They were the only representatives of the Gas Council on the site at the time. At this early stage the Project Managers, including Godfrey Wood, Peter Stephenson, Bill McConnachie, Bob Fitch, David Snell and Ted Entecott, reported directly to the Deputy Pipelines Engineer with a Design Section headed by Vic Sutherland, a Welding Section headed by Percy Letchford, a Corrosion Section with Vic Thurley in charge and Noel Tritton leading the Agricultural section for negotiation with landowners.



[***Taken from a Gas Council Offering Circular for the sale of DM 200,000,000 of Deutsche Mark Bearer Bonds guaranteed by H.M. TREASURY.***
The Offer described plans for the National Transmission and Storage System as follows: The Gas Council has constructed two shore terminals, one at Easington in Yorkshire and the other at Bacton in Norfolk, for the reception of supplies of natural gas from the North Sea.

The Gas Council is constructing a high pressure pipeline system which will have a total length of 2,500 miles (about 4,000 km.). The map shows the pipeline system planned by the Gas Council. The Gas Council is constructing four large frozen ground storage units at Canvey for the storage of liquefied natural gas received from Algeria. The quantity of gas stored in this way will be of value in meeting peak loads. Other units for the storage of gas in either liquid or gaseous form will be constructed at strategic points on the pipeline system throughout the country.]

Organisational Development

The organisation soon evolved to meet the increasing project load. Sometime in 1970 Godfrey Wood moved to Hinckley as the Assistant Pipelines Engineer to set up the Planning Section. This section would be responsible for capital expenditure approvals, purchasing and stores, central acquisition of long lead time items such as pipes and major fittings, contracts and routine administration. Additional Project Managers were appointed.

In 1971 Russell Emmony returned to North Thames as Director of Engineering and Arthur Knowles was appointed Pipelines Engineer. The vacancy caused was filled by Geoff Eccles from WMGB.

November 1972 saw the arrival of David Hamlyn from NWGB to establish the Maintenance Section, the last of the original planned departmental structure. The initial concept was that the Section would undertake all maintenance of the pipelines and AGIs of the National Transmission System (NTS) directly. However, there were major differences in the skills needed for personnel maintaining Transmission installations and pipelines to those of Distribution departments and the old gas works. Increased levels of engineering knowledge and skills were required due to the higher transmission operating pressures. Personnel also needed to be self-sufficient as they worked long distances away from base under little supervision. Due to these differences and the need to have a robust emergency stand-by system, David Hamlyn convinced Arthur Knowles that the actual work should be sub-contracted to Regional Transmission Departments overseen by Pipelines Department engineers. This proved to be a difficult relationship to manage.

When Arthur Knowles retired Geoff Eccles became the Pipelines Engineer and the position of Deputy Pipelines Engineer was not filled. Geoff Eccles remained at Hinckley and closed the London Office, relocating the few London based Pipelines staff.

Around 1973/74 the Frigg gas field in the northern part of the North Sea was being developed. British Gas contracted to buy the large quantities of gas from the field, which meant the construction of a terminal at St Fergus, north of Aberdeen and the necessary pipelines to bring the gas south to the NTS; all by the contract date of 1977.

This meant a huge increase in workload for the department as there were many projects ongoing in the rest of the country. More staff were required, particularly project staff and staff for the Design department. Previously the Project Managers reported directly to the Deputy Pipelines Engineer so, to cope with the extra management workload, Geoff Eccles appointed John Thomas from WMGB as Construction Manager. In turn Bill McConnachie, who was the Senior Project Manager, moved to Perth to take charge of all Frigg-related projects and Peter Stephenson was made Senior Project Manager looking after the rest of the country. In 1976 the Maintenance Section was renamed Pipeline Operations Section to reflect that its responsibilities extended beyond just maintaining regulators and pipelines to all aspects of the pipeline network.

The years from 1975 to 1980 were a busy time for the department but the due date for Frigg gas was met. Activities continued in Scotland and Northern England building additional pipelines and installations.

Around 1980 Geoff Eccles decided to change the responsibilities of the Section Managers. Vic Sutherland moved from Design to Construction, David Hamlyn from Operations to Design and John Thomas from Construction to Operations. However, after about 9 months John Thomas transferred to Plant Operations department as Terminal Operations Manger and I became the Pipelines Operations Manager.

Sometime early in the 1980s Geoff Eccles was appointed Deputy Chairman of the Eastern Region. The position of Pipelines Engineer was not filled. The Section Managers continued to run the department through a Coordinating Committee. When Vic Sutherland retired in 1989, I transferred to the Construction Section and Phill Jones took over as Operations Manager. The department continued to operate in this manner under what became known colloquially as the "Gang of Four" until 1992 when the post of Pipelines Engineer was filled and Colin Higgins arrived from Offshore Construction.

Demise

There were several corporate identities after the privatisation of British Gas, first Lattice then Transco. Within Transco separate business units were established prior to demerging.

Pipelines came under the Construction Division. Sometime in 1992 the Pipelines Operations section was transferred and merged with the Plant Operations Department. The remainder of the Pipelines Department was left in the Construction Division. Groups were established under Business Managers that matched the main business units. The project staff from the London-based Construction Department merged with those from Pipelines to cover all types of projects.

During this period of change staff numbers were significantly reduced giving great uncertainty to the younger ones who wanted to continue working. To maintain the projects new ways of working were implemented with joint contractor/Transco teams managing the contracts.

I left the Company in July 1994 under the voluntary redundancy scheme. I understand that the Construction Division continued for a while and relocated its head office to Reading only to be closed down after a short period.

[Taken from the British Gas plc Offer for Sale, 1986. See also the Appendix.]

Successes and Failures Pipelines had to be laid in all sorts of ground conditions, across rivers and estuaries. To overcome any problems new techniques or technology were developed. Some of these are listed below in no particular order:

* Pipelines are constructed in accordance to a standard. The standard adopted for the Methane Pipeline in 1963 was based on American practice. In 1965 this was adapted for UK situations and published as a series of recommendations by the Institution of Gas Engineers (IGE), now the Institution of Gas Engineers & Managers (IGEM). After further experience and research by the Engineering Research Station (ERS) these were revised and published as IGE/TD/1 in 1970 & 1971. Developments and research continued over the years with Edition 2 published in sections from 1977 to 1984; Edition 3 in 1993 and Edition 4 in 2001. The document continues to exist in further revised forms. At all stages engineers from Pipelines Department participated in or led the development work as well as the hard graft of drafting text. It is true to say that they made significant contributions to the document that is widely accepted as a major international standard.

* The 600 mm (24") diameter pipeline near Yarm, near Stockton-on -Tees suffered catastrophic failure as it was being pressurised with gas during the commissioning process. The subsequent investigations showed that the pipe wall had been damaged by a mechanical excavator whilst the trench was being backfilled. Although the damage had not penetrated the wall, as the pressure increased the strain became too great, so the pipe failed. The work had been carried out after the high level pressure test which is undertaken to prove structural integrity. As a consequence, any pipeline that had been tested was subsequently treated as being "operational" even though it had not been commissioned and any activity was controlled by a "Permit to Work" system.

* Another development with ERS was "High Level Testing" pipelines before commissioning. Early standard practice was to test the pipe hydraulically to 1.5 or 2 times design pressure. Research showed that increasing the test pressure to the equivalent of 105% of the Specified Minimum Yield Strength (smys) for the steel eliminated the probability of failure from defects in the pipe wall caused by manufacture or during the construction process.

* Research work by ERS and steel manufacturers developed stronger materials that were resistant to catastrophic failure and had higher strengths. This allowed the required wall thickness for any particular operating pressure to be reduced thus saving cost in materials and in handling during the construction phase. Additionally, larger diameters became possible, increasing throughput for minimal increase in capital cost.

* Close links evolved with the Engineering Research Station and subsequently with the On-line Inspection Centre (part of British Gas). Joint activities included the development of: the operational aspects of running the "On-line Inspection vehicle" otherwise known as the "Intelligent pig"; the ability to weld fittings onto an operational pipeline without taking it out of service or reducing pressure; techniques to repair the pipe wall damaged by mechanical machinery that did not cause a leak. These included the dressing out of the damage, the installation of a repair sleeve over the damaged area, initially fixed by welding but latterly using an epoxy resin.

* The department was at the forefront in the development of computer systems. Software systems were introduced over the years: to provide a control of maintenance activities on the pipelines and AGIs. This included an inventory of equipment at all sites and gave notice of any planned activity to the Central Control staff in London (also at Hinckley Operational Centre (HOC)) and to the relevant Maintenance Section engineers; Computer Assisted Drafting (CAD) for the Design department to speed the design process and production of the necessary drawings; Computerised surveying techniques which reduced manual calculations and fed results into the CAD system; the development of the National Pipeline Maintenance Centre at the disused EMGB gas works at Ambergate.

Managing the growing NTS it became apparent that the department needed the ability to undertake emergency repairs to the system. Whilst the Department owned some high pressure "stopple" equipment it did not have the skills to undertake the work and used specialist contractors. The decision was made to bring the activity "in-house" to provide a service to all regions and the NTS. For the first time a process was agreed to recharge the costs incurred to the user on a quasi-commercial basis.

The Centre soon became a "centre of excellence" for under-pressure work on high pressure pipelines, later extended to all pressure ranges, welding on live pipelines, the operational aspects of on line inspection and general pipeline repairs on an emergency basis.

* Over the years, project staff learnt valuable lessons about the need to properly reinstate the land, because this minimised compensation claims from farmers. Mixing of top soil with sub-soil caused significant claims from farmers for loss of output, so it became standard to keep the top soil layer separate from the sub-soil when excavating the trench and returning them in the right order.

* From very early days it was soon realised that working over fields in the winter destroyed the quality of the soil, causing large claims for compensation. So it became normal practice to cease pipelining activities between October and March.

* An example of note is the pipeline across Chat Moss just north of the Manchester Ship Canal near Warrington. The route crossed a market garden area which produced rhubarb on a commercial basis. Unbeknown to the project staff, it takes many years for a rhubarb bed to regain its productivity if disturbed. Significant compensation had to be paid before all was well again. The lesson learnt was "never cross a rhubarb patch"!

* The condensate produced during the processing of the gas to/from the Rough Field was sold and this necessitated a 150 mm (6") pipeline to be laid from Easington to the process plant on the south side of the River Humber. Instead of crossing the River Humber in the traditional manner, which would have been expensive and have risked damage to the small diameter pipe, a decision was made to reuse an existing 600 mm (24") crossing that was no longer in commission. After proving that the 600 mm pipe was sound and intact, the 150 mm pipe was pulled through on spacers. This was a much cheaper and safer solution.

* In 1969 during the planning process for the "South London Pipeline" it was obvious that the route would cross the proposed M25 motorway and that it would be laid before the motorway was constructed. Joint agreement was reached between British Gas and the Ministry of Transport that the pipeline would be built in a sleeve which would then be incorporated into a bridge over the M25 at the crossing point. The motorway was finally built in 1975 with the bridge constructed around the operational pipeline, with all the attendant problems. This unique approach was cost effective as it saved the pipe being laid at excessive depths as the proposed road was in a deep cutting.

* The Corrosion Section also led the way in its field. Having been party to the departmental initiative to put pipes crossing roads within sleeves to protect them from damage from other utilities, a trial was initiated to measure the protection a pipe received from the Cathodic Protection system when it was inside a sleeve. The results showed that no protection was achieved, so changes in road crossing design resulted. Initially the annulus between the carrier pipe and the sleeve was filled with nitrogen. Because of the ongoing problems of maintaining the gas pressure 30% smys "thick wall" pipe was used which negated the need for a sleeve. Engineers from the Section also led the development of alternatives to the coal tar wrapping used to protect pipes from external corrosion. This culminated in the adoption of an epoxy coat.

* Until 1973 Central Control, based in London, managed the contract for aerial surveying of the National Transmission pipeline system by helicopter. Once the Maintenance Section became established it took over these responsibilities. Over the years survey results were compiled to monitor cost effectiveness. Several trials were undertaken using various fixed wing planes, including a very odd "bug - eyed" looking Optica with a large front dome.

Another trial used a fixed wing plane to photograph the route with interpreters subsequently using photogrammetric techniques to check for any infringements. However, no change was made to the general practice of survey from helicopter.

It was the responsibility of the Pipelines Dept. to design, build, commission and oversee the operation and maintenance of all the pipelines and associated above ground installations for what became an extensive integrated pipeline system. It was a “One stop shop” which became recognised as a world leader.

People

Many hundreds of people contributed to the overall successes during the 25 years the Department was active at Hinckley and the various fixed or temporary offices around the country. The main managers have been mentioned but it is impossible to name everyone I can remember or whose names have been mentioned to me during my research for this piece without the grave danger of upsetting all those who are not listed.

Epilogue

The British Gas Pipelines Department played a very important role in the expansion of natural gas throughout the country and built a system that has played a major part in the UK economy. All the people involved should feel very proud of their achievements when they look back on their time in “Pipelines”.

I thank all those who answered my questions and contributed information. In some cases, I had different dates suggested for the same event. I have had to approximate some dates as I have not been able to confirm them. So if I have selected the wrong date or quoted any incorrect information, I apologise.

Robin Knott 2015

Pipelines Department 1973 to 1994

APPENDIX

Extract from the British Gas plc Offer for Sale of 4,025,500,000 Ordinary Shares, 1986.

5. The supply network

The supply network consists of high-pressure pipelines for bulk transmission of gas and low-pressure mains for local distribution, together with seasonal supply and gas storage facilities.

(a) The transmission and distribution systems

Natural gas is delivered by producers to five coastal terminals where, after treatment and measurement, it passes into the national transmission system. The national transmission system carries the gas, in large volumes and at high pressure, from these coastal terminals to over 100 locations spread around Great Britain, where it passes into the regional transmission and distribution systems.

The national transmission system consists of some 3,300 miles of pipeline in sizes of up to 42 inches in diameter, operating at high pressure (up to 1,100 lbf/in^2). Fifteen compressor stations have been constructed at various points in the system to restore pressure losses during transmission, thereby increasing the capacity of the pipelines. The compressors are driven by industrial derivatives of high-powered aircraft gas turbines such as Rolls-Royce Avons and RB--211s. Gas then passes into the regional transmission system, which comprises approximately 7,650 miles of high-pressure pipelines. These convey the gas to the main centres of demand.

At these centres gas passes from the regional transmission system to the distribution systems through pressure reduction stations. The pressure is then reduced progressively until the gas reaches customers' meters through individual service pipes, normally at around 0.4 lb/in^2. The distribution systems consist of some 135,000 miles of low-pressure mains ranging from 2 inches to 48 inches in diameter and there are individual service pipes to nearly 17 million customers. British Gas attaches particular importance to the safety and security of supply of the transmission and distribution systems. It applies standards and codes of practice to cover the engineering procedures and activities of the system such as design, materials, methods of construction, testing, commissioning, inspection and maintenance. These standards and codes are based on British or International standards as appropriate and include codes published by the Institution of Gas Engineers.

The transmission and distribution systems are also inspected regularly and routine maintenance is carried out to ensure safe, reliable and economic operations. An increasing number of transmission pipelines are inspected periodically from the inside using on-line inspection units developed by British Gas. A service is maintained 24 hours a day to deal with any plant or mains failures, Public reports of gas escapes or other emergencies. British Gas believes that the transmission pipelines and distribution mains are in satisfactory condition and adequate in all material respects.

In order to ensure that the distribution mains remain in satisfactory condition. British Gas is carrying out a programme to replace certain categories of these mains. Until the l960s distribution mains were predominantly made of cast iron. While many of these mains remain in good condition, a high and increasing proportion of new and replacement distribution mains laid in recent years has been made of medium density polyethylene and virtually all service pipes are now laid using this material. The replacement programme has mainly involved the replacement oi cast iron mains in higher risk locations and was accelerated in the ten years ended 31st March, 1986. In this period a total of 19,300 miles of cast iron mains was replaced. Cast iron currently accounts for approximately 58 per cent. of distribution mains in use and polyethylene for 22 per cent. The continuing programme is expected to result in a further 8,700 miles of distribution mains being replaced over the next five years.

In order to reduce costs and to improve efficiency, British Gas has ln recent years introduced new techniques and equipment designs, several of which have been developed in its own research stations. The costs of excavation and surface disturbance have been reduced by the introduction of narrow trenching techniques for mains-laying and pneumatic "moles", which pull service pipes and small diameter mains either through the ground or through existing pipes. "Live insertion" techniques have also been developed by which smaller pipes can be inserted into existing mains without interruption of the gas supply. In addition, easily replaceable modules are used to regulate the gas flow in distribution mains. These modules are small enough to be installed underground, thereby reducing maintenance costs, the impact on the environment and the likelihood of equipment damage.