Discretionary Reward Scheme 2009/10

Cut the carbon!

In reality around 95% of our shrinkage relates to leakage from our low pressure distribution networks. When released into the atmosphere methane, which is the main component of natural gas, becomes an even more harmful greenhouse gas than carbon dioxide (CO_2). This is why we are committed to continually reducing our level of shrinkage and minimising our emissions to air. By improving the measurement, management and integrity of our networks we have again exceeded our target of a 2% reduction in natural gas emissions.

Ensuring that we operate each network at the lowest practical pressure is crucial since the higher the operating pressure the greater the leakage. By developing our knowledge of the mathematical relationship between pressure and flow, it has been possible to better match pressure settings to demand while reducing leakage and without compromising security of supply.

$$dP \propto Q^2$$

Change in pressure is proportional to the square of the flow (gas demand)

Approximately half of our networks have automated pressure management systems. They constantly modify and minimise the operating pressure. The remaining networks are controlled manually and we have developed a 'setting methodology' that takes into account managing the predicted gas demand, while minimising the frequency of site visits.

This year using the methodology we have managed to trim pressure settings in 40 more networks ranging from Reading in Southern to Kilsyth in Scotland, bringing equivalent savings of around 15,000 tco_2.

Improving integrity

Applying the correct leakage management technique is a vital step in reducing leakage and minimising the impact on the environment. Being able to differentiate between pipe materials now allows us to identify different joint types and to take action to reduce leakage to atmosphere and improve network intergrity.

We have carried out a trial in Orpington, Kent where conditioning agents (joint swellants) have been introduced to specific networks to target the lead yarn joints. The conditioning agent swells the yarn within the joints reducing leakage to atmosphere, resulting in a 25% drop in public reported gas escapes within the area. In addition annual leakage has reduced by 560 tco_2 equivalent. We are now looking to target several additional areas for this technique in the next year, particularly in south London.

The **overall savings** arising from the above initiatives and the ongoing mains replacement programme has led to **reduced emissions of 90,000 tonnes of CO_2** which is equivalent to more than **half a million flights** between Edinburgh and London Heathrow

Winning the war on leakage

Key to measuring and managing leakage is understanding our asset base. Following on from last year's very successful spun iron project we have moved to differentiate further between spun cast and pit cast iron gas pipes laid post World War II. There are significant differences in these materials that impact on the way they fail, influencing the repair and refurbishment techniques we employ to prevent leakage.

Following on from last year's project to differentiate between spun cast and pit cast iron pipes in our major cities, we have extended the project to review smaller areas that now require significantly more analysis.

Working closely with a contractor and applying the same innovative process using WWII aerial photographs and field work, we completed the next phase enabling us to update a further 13,000 pipe records, not only improving the measurement of leakage, but enhancing strategies for leakage management.

Example of WWII photography used

Scotia Gas Networks

Gas of the future – Biomethane

We have broken new ground and in the process are contributing to the UK Government's climate change targets, by working with partners Thames Water and Centrica to deliver the UK's first 'green gas' project to take biomethane produced from sewage waste into the gas distribution network.

As part of the waste disposal cycle, household sewage at Thames Water's Didcot Sewerage Works, is broken down by micro organisms in a process known as anaerobic digestion to produce raw biogas. This biogas, is currently flared to atmosphere and the energy wasted. Using technology new to the UK the partners intend to clean and enrich the raw biogas before injection into the existing gas network. It is expected that this innovative 'waste to gas' project will be able to produce around 100m^3/hr of biomethane; enough to supply gas to around 100 homes.

Didcot leads way with Poo Power

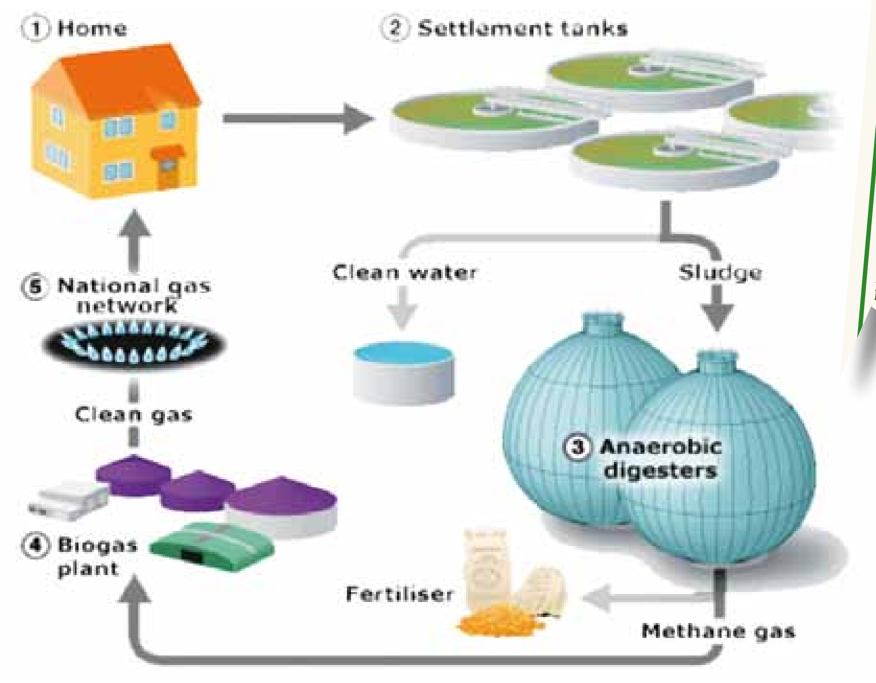
Project manager Peter Taylor at Didcot Power Station

NOBODY likes to dwell on what happens after we flush the toilet.

But from this summer, human waste deposited in Didcot loos will end a 23-day-long journey by helping to heat local homes.

...off and sent to an anaerobic digester – a turbo-charged composter which heats the waste to break it down and release gallons of valuable methane. The waste decomposes over 18 days, leaving thick, odourless waste, and gas.

Extract from the Oxford Mail



During 2009 the feasibility study was completed and appropriate contract arrangements between the partners agreed, together with the completion and approval of plant designs. Technical difficulties related to the gas specification were also resolved and the project is now on schedule to be delivering the first biomethane to the network on 23 August 2010.

To deliver this exciting project and bring gas on stream as scheduled will require the application of innovative techniques to build a scrubbing plant to remove impurities, as well as ensuring the gas is sufficiently enriched in order to meet the strict standards that allow it to be used in our homes and industry.

We are delighted to be involved in this UK first and will further develop this technology and share our experiences so that larger volumes of biomethane at alternative sites can be commissioned into the network. This will reduce environmental landfill, reduce damage to the ozone layer and decreases the reliance on imported fossil fuel gas.

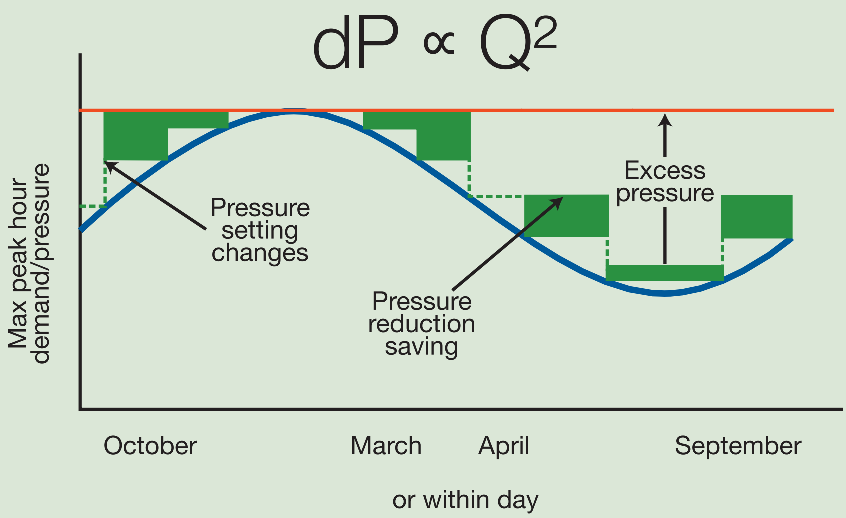
Anaerobic digesters at Didcot Sewage Works

Scotia Gas Networks

Discretionary Reward Scheme 2009/10

It's all about **pressure**

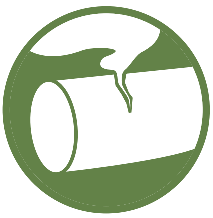
We are obliged to ensure security of supply to our customers in a 1 in 20 winter event. This means the pressure within our networks must be sufficient to meet consumer demand even during the most extreme weather conditions. The chart (right) is a simplified visual explanation of how we've applied the relationship between change in pressure and demand in order to reduce our pressure settings within manually controlled networks. We have introduced more setting changes in targeted networks and improved the timing of these changes, ensuring the pressure is rarely higher than it needs to be. The section shaded in green represents the additional saving this year.



Reviewing the **asset**

Our unique Condition Review Group, (CRG) reviews mains that cause operational and environmental issues through having higher than average leakage histories.

The leakage model applies a statistical average level of leakage to every pipe, however, through the CRG we are replacing mains at the high end of the leakage spectrum something not captured in the leakage model or the environmental incentive mechanism.



Blowing in the **wind**

Falmer Pressure Reduction Installation (PRI) situated on the South Downs in Sussex supplies gas to the local network. The electrical supply to the site was by cable laid through 1.5km of the South Downs, an area which is recognised as being of 'significant archaeological importance' and 'outstanding natural beauty'.

When the electrical supply failed, we took the opportunity to review the site's electrical supply requirements with due consideration to reducing any potential environmental or archaeological impact.

Following consultation with local government and other key stakeholders, we undertook the installation of a wind turbine. The turbine is installed within our existing site and meets the total electrical power requirements of the PRI, allowing continuous remote monitoring and measurement of the various site parameters.

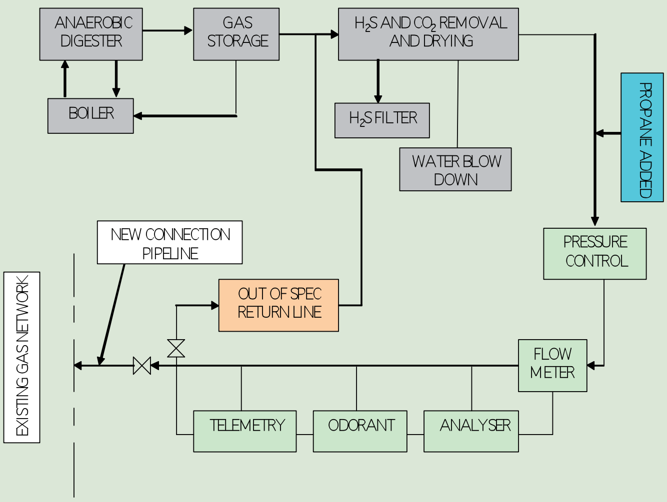
Scotia Gas Networks

The **Biomethane** process

The UK currently lags behind the rest of Europe when it comes to producing energy from renewable sources. From producing around 2% today, the Government is committed to producing 15% of the UK's energy from renewable sources by 2020. When you consider that studies have shown there is enough feedstock in the UK to satisfy 50% of our current domestic gas demand, then it is clear that biomethane could indeed be the gas of the future. The success of the Didcot trial will be paramount in pointing the way forward.

To transport gas in the network its content and characteristics must conform to the stringent specification required by the Gas Safety (Management) Regulations 1996 (GS(M)R). A particular challenge within the UK is posed by the normal need for natural gas to have an oxygen content less than or equal to 0.2%. This is a more demanding specification than is required elsewhere in Europe, where countries such as Sweden and Germany have already proven that conveying gas with an oxygen content of around 1% will not effect the safety of the network or the operation of appliances. It may be that the UK specification is too strict and in the meantime a derogation and relaxation of the current gas quality specifications has been granted in order to progress our trial project.

SGN Graduate Trainee, Jamie McAinsh (left), receiving his award at the IGEM Young Persons Paper Competition for his winning presentation 'Biomethane – Gas of the Future'



In agreeing the derogation with the HSE on oxygen specification, we have also developed a post commissioning gas sampling regime. This will monitor the performance of the whole biomethane plant, including its gas scrubbing capabilities and the effect that the agreed additional oxygen content will have on the existing gas network pipes.

To do this we had to survey all the existing services within the predicted area of influence and note their condition pre commissioning. At the same time the opportunity was taken to find out more from customers about their gas usage patterns which has allowed us to get a more accurate measure of gas flows in the network.

Understanding **biomass**

Biomass – any organic material; food, sewage, animal slurry, energy crops, etc that can decompose to make a fuel.

Anaerobic Digestion – the process by which the organic material is broken down. The gas produced is called biogas which has a methane content of about 65%.

Enrichment – the process of adding a gas [propane] to bring up the lower calorific value of the biomethane to meet the same energy values as that of fossil derived gas, so that the customer purchasing their gas is not disadvantaged.

Biomethane – is similar in nature to natural gas and is created by cleaning and removing impurities such as hydrogen sulphide, siloxanes and carbon dioxide from the biogas.

Scotia Gas Networks