SGN staff with the new Osprey unit (left to right Gary Scott, Stuart Cook, John Roberts)

Keeping up the pressure

By Kevin Wallis and Alex Webb, from Southern Gas Networks, and Neil Summers, from Abriox

Across Great Britain the gas distribution networks (GDNs) face a constant challenge of guaranteeing security of supply to their customers while ensuring the highest levels of safety. As the GDNs seek to optimise operating pressures in order to reduce leakage with an eye on environmental impact, there is a requirement for accurate, steady state models to reflect the pressure activities across the networks.

These models underpin a large number of financial decisions relating to asset investments. However, on occasion, poor pressures are reported within the network. These can be as a result of various causes from water ingress in the mains, to historical asset record inconsistencies.

In order to remediate these poor pressures, it's necessary to identify the cause of the problem quickly. The most efficient way of pinpointing where the issue lies is to fit data loggers to record pressures at strategically important locations surrounding the affected area. These pressures, when compared with expected figures (produced through a model scaled to the demand requirements of the day and time of the recordings) can help locate where any restriction may be present.

Historically, the typical process for addressing poor pressure issues would involve a site visit to install loggers at suggested locations, followed by a return to the same site one or two weeks later to download the data. Throughout this period, it would be expected that operating pressures throughout the network - or at least locally - would be raised to ensure security of supply for customers.

GDNs also rely on pressure monitoring to maintain the accuracy of their network models through

Once installed, the Osprey is configured using a mobile phone

a rolling annual cycle of pressure validation, model build and updating. Pressure validation is carried out over the winter months, when demand on the gas network is greatest. Pressure data for a specific date and time, typically identified from peak 'send-out', is logged at various points in the distribution network and entered into the model. The validation date/time is not known until the end of the winter. This means huge amounts of data are collected but only a tiny fraction of it is actually used.

Once the model has been validated (shown to correspond to real-life data), it is released to the planners and used as the basis for investigations into any pressure issues as well as decisions on new infrastructure and pipe replacements.

INNOVATIVE SOLUTION

Gas distribution network SGN identified that advances in low power electronics and telecommunications could assist in interfacing directly with actual pressure performance on the network. As well as potentially reducing the time taken to receive pressure data and reducing manpower, costs of deployment and downloading data, it would also be desirable to extend the calibration interval and improve the battery life and data storage capacity of the loggers. To achieve this, SGN invested some of their Network Innovation Allowance (NIA) funding to partner with remote monitoring specialists Abriox.

The resulting concept was to have telemetry-equipped loggers that could be deployed at strategic points to report pressure data wirelessly and potentially sync automatically with the SGN network planning team's models. This would confirm correct installation, eliminate manual hand-offs and greatly improve process efficiency, further improving the speed at which data could be received. Dramatically increased battery lifetime (to five years) and data storage (to 10 years) offered the potential, in time, for permanently installed units to eliminate the manual movement of loggers. The use of an automatic data file transfer, which identified the highest peak day send-out, would also speed up the validation process considerably.

Abriox's key technical innovation was an on-board GPS module. The geo-positioning benefits of GPS are well known; data would be automatically assigned to the correct location, as well as ensuring that a logger could always be found in the field and retrieved. A less well known benefit is the highly accurate timing GPS provides, which would ensure that each datum was precisely time-stamped. At a stroke, this combination of "timed and spaced" data would eliminate the need for manual adjustments and corrections, meaning field data could be entered

> "The highly accurate timing GPS ensures that each datum is precisely time-stamped

automatically and directly into the validation model.

THE FIELD TRIAL

Throughout 2013-14, SGN installed a number of Osprey Pressure Validator units under field trial conditions across two distribution networks (one in Scotland, one in the south of England) in order to assess the technology and outputs against current logger systems. Abriox provided communication software and training was provided to operatives and network planners prior to the field trial commencing. As part of the field trial, Osprey units were trialled under a number of different operational scenarios within a number of typical logger housing installations, such as meter boxes, posts and bollards.

All key technical success criteria were realised including:

- The time taken to install a pressure validation measurement point was reduced by more than 50 per cent
- Time-stamped, location specific data using GPS. Accurate location through GPS was verified by cross-checking with Ordnance Survey location. At the end of the trial, all units were successfully located.
- Overall sensor accuracy of +/-0.15 per cent
- Automatic and on-demand transmission of data via GSM (Global System for Mobile) to a new pressure management website for display, interpretation and archiving of the results. No data transfer failures occurred and all field locations attained sufficient signal coverage.
- Real-time and historical analysis of data to support emergency response to poor pressure problems as well as ongoing long-term investigations.

Following a detailed financial assessment, SGN believes there are cost benefits to be realised from this technology. Some financial savings were harder to quantify but had potential notable benefits. These included:

- Accuracy of measurement with, in time, reduced leakage through lower network pressures.
- Time saved in checking data to ensure that a specific logger is reporting from the correct location and at a specific time.
- Elimination of data loss through product failure.
- Reputational benefit from faster resolution of pressure-related incidents through increased customer satisfaction .

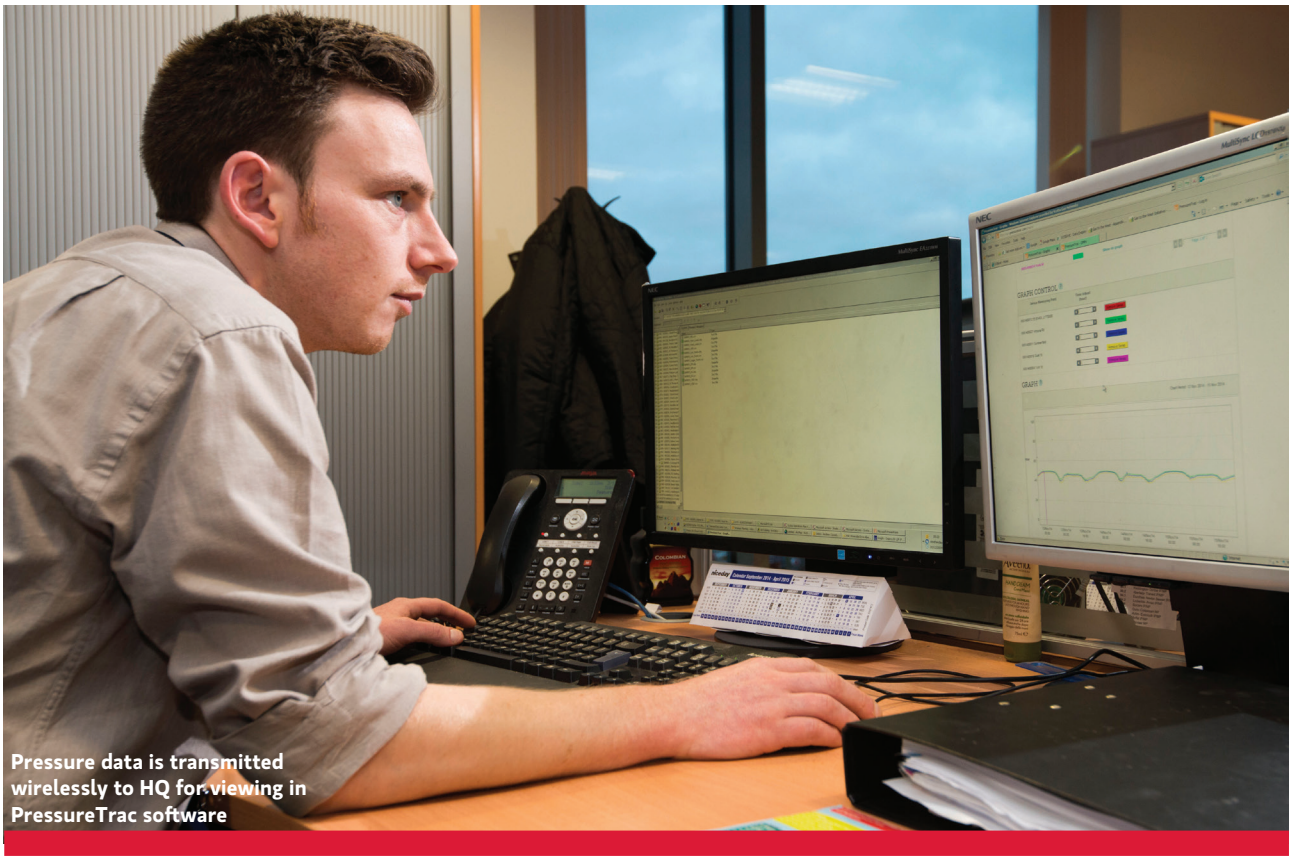
CONCLUSIONS

Following the successful field trial, SGN is now introducing a number of Osprey units into its business. These units will support the annual validation programme and will prove invaluable in depot operation activities in SGN's Scottish and southern gas distribution networks.

SGN have fully engaged with the other GDNs and have disseminated learning as part of their commitment to maximise the benefits of innovative logger technology.

SGN are committed to embracing innovation and the principles laid down by Ofgem to work in the most efficient way. ■

■ SGN are looking for innovative ideas that have the potential to add value to their business. Submit your ideas through their Ignite scheme: *ignitescheme@sgn.co.uk*



Pressure data is transmitted wirelessly to HQ for viewing in PressureTrac software