

Going underground for an innovative nitrogen supply solution

By Theo Martin, Business Manager BOC Bulk Gases

BOC has engineered a ground-breaking solution to reliably provide 99.99 per cent pure nitrogen to an Australian vegetable oil-producing facility. The nitrogen will assist in maintaining the integrity and freshness of the oil. It is probably the first time this solution has been used anywhere in the world.

Key aspects of the vegetable oil producing solution included:

- Supplying nitrogen through a 40 mm copper pipe inside a 400 metre long PVC pipeline.
- Using pressurised, inert nitrogen as a protective layer between the PVC pipeline and the copper pipe, making the latter impervious to corrosion (whilst copper is more corrosion-resistant than iron alloys, such as steel, it is still not totally corrosion-resistant).
- Using copper for the pipe and PVC for the pipeline, rather than conventional materials. This contributed to the solution's cost effectiveness.
- Using state-of-the-art Coriolis mass flow meter technology to measure the nitrogen transfer, unusual and innovative in these circumstances, as these flow meters are typically used for liquids where the fluid density is very high.

The solution was made possible by the neighbouring locations of BOC and our



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client. The principles involved in the solution are applicable across all industries. We customised existing facilities on our site, and addressed the fact that the pipeline had to travel underground through sandy and salt-water infused soil.

How it was done

The use of nitrogen in the annular space between the 100 mm wide copper pipe and PVC pipeline helps stop any leaks from occurring and assists the pressurised PVC pipeline maintain its round shape, despite being under one metre of soil.

The copper pipe containing the client's nitrogen is pressurised to approximately

1000 kPa. The annular space between the copper pipe and PVC pipeline, using dry inert nitrogen, is pressurised to 80 kPa.

Short sleeves of Black Bradflex support the copper pipe every three to four metres, lifting the copper pipe off the base of the PVC pipeline in the unlikely event of water ingress. It also cushions the ('floating') copper pipe if it moves due to pressure variances.

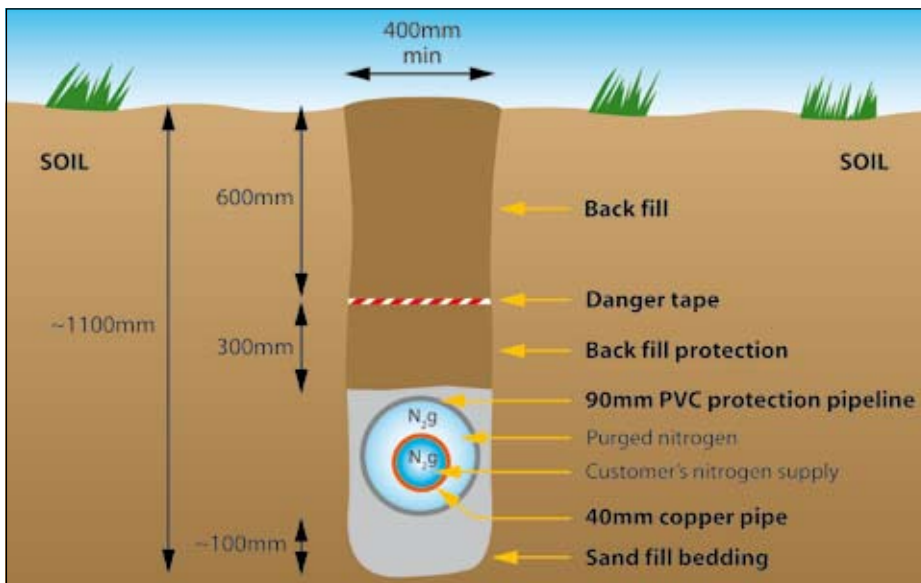
The gas metering needs to be very accurate over a wide flow range as the client consumes nitrogen for numerous applications such as inerting, sparging (low flow rates) and 'pigging the line' (high flow rates). The Coriolis mass flow meter technology used is highly effective, despite its application being somewhat unorthodox in this context.

BOC calibrated the flow meter technology for use on nitrogen gas where the fluid density is very low, thus ensuring high accuracy and repeatability demanded by such a 'custody transfer' application. The client has access to data logging of these flow rates and pressures. This allows them to better understand nitrogen consumption patterns.

The large BOC nitrogen storage vessel that holds the nitrogen before its transfer to the client is filled on a regular basis. So not only can it meet all projected client needs, but has a good buffer stock should it be required on short notice for unanticipated needs. The nitrogen stored in the vessel in liquid form is transformed into gaseous nitrogen, through a vaporiser, before transfer through the pipe.

There was a strong safety aspect to the solution. Firstly, as the pipeline runs underground, there is very limited above-ground infrastructure for workers to be aware of. And secondly, the solution involved no equipment or delivery vehicles coming onto the client's site. Additionally, no space on the client's site was taken up with nitrogen storage equipment.

Not only was this an innovative approach to a challenging issue, it was also cost-effective, and is reliable and safe. BOC expects to continue supplying nitrogen to our client at pressure levels that exceed their expectations. ■



An illustration of the strong safety aspect of delivering nitrogen by pipeline.