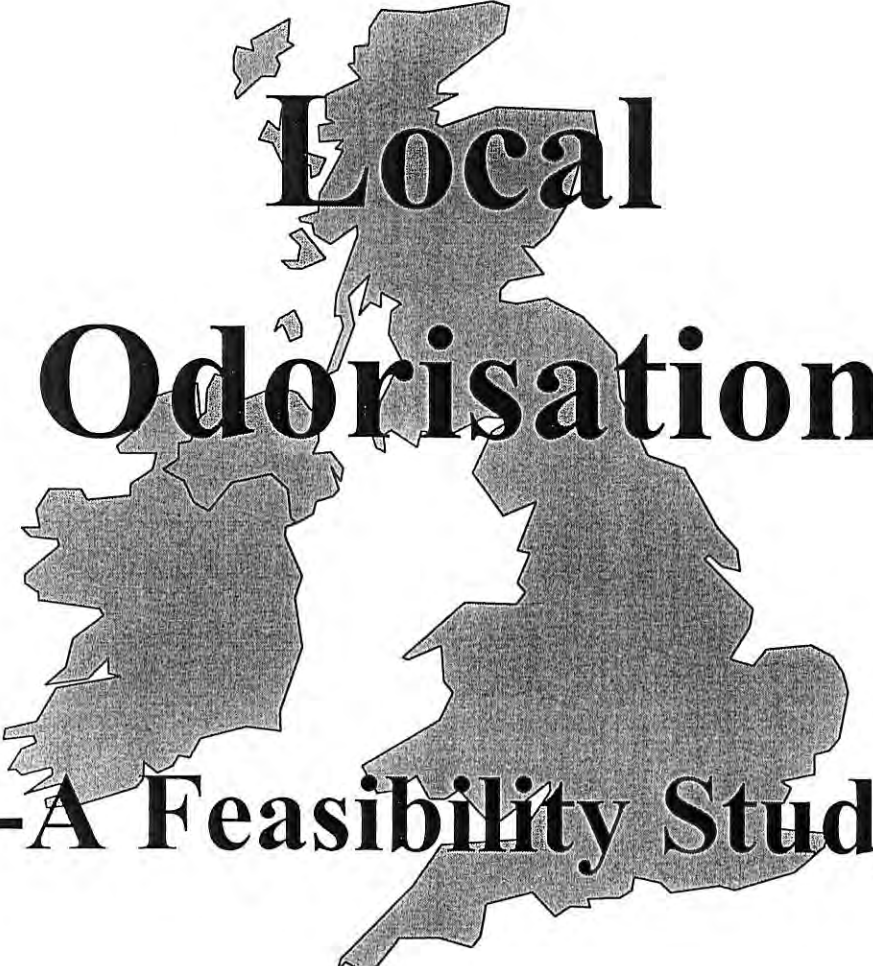


British Gas
TransCo

A large, textured map of the United Kingdom, including Great Britain and Ireland, serving as a background for the title text.

Local Odourisation -A Feasibility Study

East Area Process Group
Hinckley

January 1997

A report on the feasibility of

Local Odourisation

at the NTS offtakes.

prepared by - Process Engineering
Lead Area - East

Approved for issue.

Process Engineer B. Rowles copy 20

Date 27th January 1997

SUMMARY.

The feasibility study concludes that :-

- * The project is technically possible.
- * Can be completed by October 1998.
- * Can be accommodated on existing Transco owned land.
- * There are no regulatory constraints.
- * Risks on site remain acceptable and no further safety improvements are required.
- * A contingency to cover increased PREs during commissioning and early operation will be required.

The study includes:-

- * A conceptual process design.
- * A hazard analysis and quantified risk assessment (QRA).
- * A Project Risk Assessment.
- * Programme to meet the October 1998 deadline.
- * Cost estimate (+10% -30%)

The study considers :-

- * Planning issues.
- * Purchasing strategy.
- * Odorant supplies.
- * UK legislation.
- * Benefits and disadvantages of local odourisation.
- * Operation and maintenance requirements.

Critical activities to ensure 1998 completion are :-

- * An immediate decision on purchasing strategy re European contract regulations.
- * Placement of purchase order/letter of intent with the preferred vendor by 1st April 1997.
- * Completion of site deeds survey to determine existence of restrictive covenants.

If the project proceeds a key recommendation is:-

- * Convert Feeder 3 from Bacton to local odourisation by October 1997.

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cont'd

Appendix.

- 1 Conceptual design.
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1.0 INTRODUCTION AND SCOPE.

This report which has been prepared for the Transco Management Team (TMT) examines the feasibility of installing local odourisation equipment in the UK by October 1998.

Natural Gas which will be exported to continental Europe through the Bacton to Zeebrugge Interconnector, commencing in October 1998, must be unodorised and local odourisation is one way of achieving this requirement.

The current practice is that all gas entering the NTS is odorised at the reception terminals, St.Fergus, Teesside, Easington, Theddlethorpe, Bacton and Barrow (N&S). Odourisation is also carried out at the other network entry points; the LNG and salt cavity installations and the onshore fields, when these facilities are operational.

The Interconnector Board (UK) have approved (Dec. 1996) the installation of a £40 million gas treatment plant (GTP) at the Kings Lynn site to remove the odorant from the NTS gas to enable it to be transported to the continent. Local odourisation is proposed as an alternative method of making unodorised gas available for the Interconnector.

This study addresses the overall feasibility of the project, starting with an assessment of the technical viability and then considering some of the wider implications including the benefits and disadvantages that a change in odourisation practice would bring to the UK.

2.0 PROJECT DESIGN PHILOSOPHY.

The Gas Act 1995 no longer requires gas above 7 bar pressure to be odourised and this is stated in the Gas Safety (Management) Regulations which came into effect on 1st November 1996.

In principle therefore, legislation now only requires gas in the distribution system to be odourised.

There are approximately 100 offtakes on the NTS supplying gas into the Local transmission system (LTS) which operates up to 38 bar and approximately 2,400 pressure reduction stations (PRS) on the LTS. These installations reduce the pressure of gas from the LTS in order to supply the Distribution system which operates at a maximum pressure of 7 bar.

The design philosophy of this project is to install odourisation equipment at the 105 NTS offtakes such that gas transmitted in the 6000 km of steel pipelines operating at pressures up to 75 bar will not be odourised. Gas in the LTS and Distribution system will continue to be odourised.

The proposal does not therefore take full advantage of the new regulations, but to do so would require the provision of 2,400 sets of odourisation equipment and the identification of suitable locations for them.

Restricting unodourised gas to the NTS satisfies the prime requirement, namely to provide unodourised gas for the Interconnector and for direct connections to the NTS, but will not allow users in LDZs operating above 7 bar, the choice of unodourised gas.

One feature of the NTS offtake locations which is important in the consideration of these proposals is the generally large land area associated with each of them. This is sufficient in all except three cases (of the 85 sites checked in detail to-date), where there are minor potential problems to overcome to safely accommodate the sizes of plant required and comply with full safety distances. (see appendix 4).

The odourant injection requirements have been calculated, based on design gas flows at each offtake, which in all but one or two cases are above actual maximum recorded gas flows. Total odourant plant capacity has been designed for 520 MScmd whereas the present potential maximum 1996/7 peak day flow is forecast at 445 MScmd.

Some key requirements of this project are dependent upon the implementation of the 'flow weighted average calorific value project (FWCV).' These include upgrades of site gas flow metering, provision of pressure let down equipment for analysers and blanket gas, and enhancements to telemetry for remote signalling.

Offtake details, including design flows appear later in the report and are referenced where appropriate.

3.0 FEASIBILITY REQUIREMENTS.

For the project to be viable, the following minimum criteria must be met. (NB These are overriding conditions and exclude any benefits which might arise in the UK as a consequence of a change of odourisation practice).

- 3.1 The project must be technically possible.
- 3.2 There must be no regulatory (safety or environmental) constraints.
- 3.3 There must be no planning constraints.
- 3.4 Transco owned land must be available at each offtake on which to build the plants.
- 3.5 The project must be complete by October 1998.
- 3.6 The risk of distributing unodourised gas must be no greater than at present.
- 3.7 Local odourisation must not result in increased PREs.
- 3.8 The safety and security of the odourant plant operation and storage must not pose threat to the public or employees.
- 3.9 The integrity of the plant operation and storage must not pose a threat to the environment.
- 3.10 Operational requirements and responsibilities must be clear.
- 3.11 Maintenance requirements and responsibilities must be clear.
- 3.12 Odourant injection must take account of indigenous sulphur which is present in some gas supplies.
- 3.13 Odourant delivery and offloading tankers must be available to match the requirements of the new equipment.
- 3.14 Completion of key elements of the FWCV project are required by Dec. 1997 at the latest.
- 3.15 Purchasing strategy constraints - European Journal Notice etc. - must not prevent commitment to suppliers later than April 1997.
- 3.16 A 'Project Risk Assessment' must evaluate the overall risk of failure, based on the risks associated with each of the foregoing criteria.

4.0 PLANT AND EQUIPMENT.

The plant and equipment selection is based on the evaluation and use of commercially available and field proven odorant injection equipment.

The procurement philosophy, which will be discussed later is based on a 'total system' supply from a single vendor.

Standard, small self contained odorant injection equipment packages are available from a number of sources. These include Lewa and Burdosa in Europe and YZ Industries in the USA. City gate odourisation is common in Europe and the aforementioned equipment from Lewa and Burdosa is widely used there. In general the size of this equipment is smaller than the Transco requirements and both manufacturers are primarily suppliers of injection pumps rather than total systems. The American company, YZ Industries equipment is more appropriate to the scale of the Transco operation and they have experience of vessel sizes up to 40 tonnes. Also, because of the way that odourisation technology has developed in the USA, total system supply is their normal business.

YZ Industries, on whose equipment the Transco technical evaluation is based, have over 1000 units operating in the field in the USA, Canada, Columbia, Spain and soon in China and Poland.

Boston Gas in the USA introduce odorant into their network at 28 locations using YZ equipment. A visit to Boston Gas to share their operating experience and to the YZ manufacturing facility in Snyder, Texas formed part of this assessment.

4.1 Design Basis.

The basic principle of the design is that odorant is injected into the gas in proportion to the gas flow. The odorant required by gas supplies which contain indigenous sulphur is less than for sulphur free gas so odorant injection control will be effected by the use of total sulphur analysis.

4.1.1

Odourisation is based on the use of BE odorant.

4.1.2

Odorant injection pump sizing is based on injecting 16 kilograms of odorant per million cubic metres of gas (16kg/mscm) for the full design flow capacity of each offtake.

4.1.3

The odorant storage vessels have been sized for a fill lifetime of 120 days, based on design gas flows at the nominated odorant injection rate. (Design gas flows are currently 20% greater than present potential maximum peak day flows and 40% greater than the 1996/7 peak day flow plan forecasts).

The operating profile (Figure 1) of the offtakes is such that in practice, the general demand is between 50 and 70% of the design flow.

8.0 UK LEGISLATION.

Recent changes in legislation have facilitated the possibility for changing odourisation practice.

8.1 Gas Act 1995.

The Gas Act 1995 no longer requires gas at pressures above 7 bar to be odourised. This is stated in Schedule 3, regulation 8 (para 2) of the Gas Safety (Management) Regulations viz.

'The gas shall have been treated with a suitable stenching agent to ensure that it has a distinctive and characteristic odour which shall remain distinctive and characteristic when gas is mixed with gas which has not been so treated, except that this paragraph shall not apply where the gas is at a pressure of above 7 barg.'

8.2 Health & Safety Executive (HSE).

The HSE seek to secure compliance with these regulations and the Transco position with respect to odourisation is described in a 'Safety Case' which must be accepted by the Executive.

A final draft of the Transco safety case was submitted to the HSE in November 1995 and comments are expected in January/February 1997.

The Transco arrangements for odourising natural gas are described in chapter 8 of the document. Where proposed modifications have a material effect on the safety case, the safety case, or relevant parts of it, should be resubmitted to the HSE for acceptance. Such changes should not be implemented until the new safety case (or parts) has been accepted by the HSE. A change to local odourisation can be considered to be a material change so preliminary discussions have been held with the HSE including a meeting in Nottingham on 17th January 1997.

At that meeting, Transco outlined the details of the proposals to the HSE. The response was positive, and to the effect that no major problems were foreseen.

The HSE offered guidance upon the timing and content of the submissions which would be required to modify the safety case, currently under review by the Executive.

Particular interest was expressed in contingency plans for ensuring continuation of the odourisation process in the event of delivery or equipment failure. They will also be interested in our proposals for the management of the new arrangements, including the identification and delegation of responsibilities. (some of this will be in appendix 4).

Transco pointed out that in some respects, the new arrangements would offer better safety margins eg: 120 days supply typically will be held rather than the existing 30 day contingency.

8.3 Environment Agency.

Odourisation is no longer a part A process under the 1990 Environmental Protection Act (EPA) and does not therefore require authorisation under the Integrated Pollution Control (IPC) regulations. (Odourisation at the terminals was initially included in IPC but has subsequently been