

<b>DISCIPLINE INFORMATION NOTE</b>			
<b>Other Gases</b>			
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To: Process Safety Inspectors HID and FOD.

## **DECANT FILLING OF CYLINDERS WITH HIGH PRESSURE OXYGEN BY MARGARET GREGSON**

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#### **BACKGROUND**

1. Decant filling or transfilling is the transfer of high pressure gaseous oxygen from one cylinder to another. Most oxygen decanting involves the transfer of oxygen from larger to smaller, more portable cylinders used to supply breathing apparatus or respiratory protective equipment. The oxygen is of breathing gas quality marketed as diving oxygen, aviation oxygen, breathing oxygen or medical oxygen.
2. Medical oxygen is classified as a medical product under the Medicines Act 1968. The Medicines and Healthcare products Regulatory Agency requires that any organisation carrying out the decant filling of medical oxygen cylinders for use by third parties holds a Manufacturer's License or has specific authorisation under the Medicines Act.
3. NHS Estates, an executive agency of the Department of Health, recommends that health care organisations do not carry out medical oxygen decanting. It recommends purchase of medical oxygen with the required pressure and cylinder size. This can be obtained from the major industrial gas companies with few exceptions.
4. The Medicines Act does not cover decant filling of medical oxygen by patients in private homes or the decant filling of oxygen for use as a breathing gas for non-medical purposes such as diving, aviation and respiratory protective equipment. Decanting of gaseous oxygen in the home is rare as decant equipment is not available from the NHS or the gas companies. However, oxygen decanting continues to be carried out by various groups such as aviation component suppliers, diving equipment suppliers and the Fire Service.
5. There were four reported oxygen decanting incidents in the period 1996-2002. One was at a fire station and three involved oxygen cylinders for aircraft.

## LEGISLATION

6. Oxygen decanting or transfilling is covered by the same legislation as for any gas cylinder filling:

Carriage of Dangerous Goods (Classification, Packaging and Labelling) and Use of Transportable Pressure Receptacles Regulations 1996 (CDGCPL2) as amended by the Transportable Pressure Vessel Regulations 2001(TPVR).

Schedule 8, paragraph 2 (2) deals with the design and manufacture of cylinders that can be filled and Schedule 8, paragraph 4 of deals with the filling.

**Note:** The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004 were expected to come into force on 10<sup>th</sup> May 2004.

**Note:** New legislation with specific requirements for the filling of gas receptacles is planned for 2005.

## GUIDANCE

7. There is little readily available advice on oxygen decanting. Only the American Compressed Gases Association (CGA) has published guidance:

Transfilling of high pressure gaseous oxygen to be used for respiration. Compressed Gas Association Inc. CGA P-2.5-2000 Fourth edition 2000

BOC did issue a leaflet entitled 'Decant filling of medical oxygen cylinders' in 1993 but this was withdrawn. No guidance on the subject is available from the British Compressed Gases Association (BCGA) or the European Industrial Gases Association (EIGA). BCGA is considering producing a Technical Information Sheet.

A summary of the safety measures identified from the CGA guidance is given in the Appendix.

## FURTHER READING

1. HSE8 (rev 2). Take care with oxygen
2. INDG308 (rev 1). The safe use of gas cylinders
3. BS EN 13096:2003. Transportable cylinders – Conditions for filling gases into receptacles – Single component gases
4. DIN TD5/046. Gas Cylinder Filling Plant

## **APPENDIX**

### **OXYGEN DECANTING – SUMMARY OF SAFETY PRECAUTIONS**

1. Oxygen decanting should be carried out under carefully controlled conditions, using appropriate equipment and by properly trained personnel.
2. Suitable personal protective equipment should be worn such as safety shoes, protective overalls, gloves, and eye and ear protection.
3. Decanting should be carried out in a clean and well-ventilated area, away from sources of ignition including smoking. The decanting equipment should be designed and constructed for use with oxygen. Only oxygen compatible materials should be used.
4. The decanting equipment and the cylinder to be filled should be suitable for the maximum cylinder pressure of the donor cylinder. The supply cylinder unit should have a calibrated pressure gauge to indicate the supply pressure.
5. When filling by pressurisation, the receiving cylinder unit should have a means to ensure that receiving cylinders are neither underfilled nor overfilled because of changes in the ambient temperature. This is normally achieved by the use of a calibrated pressure gauge and a calibrated thermometer in conjunction with appropriate temperature/pressure charts. (These temperature compensation measures are not needed if filling is by weight.)
6. There should be a means to vent any residual or excess oxygen in the receiving cylinder to a safe location, preferably outdoors in a safe, well ventilated area. Any such venting should be carried out at the fill position.
7. The labels on the supply cylinder should be checked to ensure it contains oxygen (of breathing quality, as appropriate). This is particularly important if there is any possibility of selecting a nitrogen cylinder, in error.

### **CHECKING THE CYLINDER TO BE FILLED**

8. Before filling the cylinder examine the markings on the cylinder to check:
  - that it has been examined by a relevant inspection body;
  - that it is within its statutory test date;
  - the safe operating limits.

Check it is correctly labelled and painted for breathing oxygen service.

9. Check the cylinder shows no signs of damage, external corrosion, defacing of markings or illicit repairs that may affect integrity. Check the valves, fittings and regulators (where fitted) to ensure they are correctly fitted, in good working order and suitable for the intended purpose.

10. Check the cylinder and fittings are clean and free from oil, grease and other contamination.
11. Check the residual weight and pressure. Investigate any differences between the marked tare weight and the measured weight (which cannot be explained by residual pressures).

## **FILLING PROCEDURES**

12. The person responsible for the decanting should be aware of the hazards of oxygen and have been properly trained in decanting procedures. The following precautions should be taken:
  - Before filling, any residual gas in the receiving cylinder should be vented. The cylinder should then be purged with gas from the donor cylinder and vented to atmosphere in a safe, well ventilated area.
  - Cylinder valves should always be opened and closed slowly. Rapid movement can result in momentarily high oxygen pressures and the possibility of fire.
  - The cylinder should not be filled too quickly to prevent excessive temperature rises.
  - Connections should be leak tested using an approved leak test solution. If any leaks occur during decanting, filling should be stopped and the connections vented to a safe place. The leak should be rectified before proceeding. Leaks should not be rectified whilst the system is pressurised.

## **AFTER FILLING**

13. After filling, the connections should be vented to a safe place before disconnecting.
14. The decant cylinder should be checked to ensure it is within its safe operating limits. If it has been overfilled, any excess gas must be removed in a safe manner and the cylinder checked to ensure it is fit for service.
15. After filling all cylinders, both supply and receiving, should be leak tested.
16. A cylinder decant record should be maintained detailing filling date, name of operator, donor and decant cylinder number, plus any additional information to permit an audit trail in the event of an incident.

This summary is based on:

Transfilling of high pressure gaseous oxygen to be used for respiration. Compressed Gas Association Inc. CGA P-2.5-2000. Fourth edition 2000