

# Minutes of 4<sup>th</sup> Meeting of the HSE Gas Cylinder Research Steering Committee

4 March 2003  
HSL Buxton

## 1.0 Attendance

Chairman	Roy Irani	(RI)
Secretary	Graeme Hughes	(GH)
	George Georgiou	(GG)
	Steve Elliott	(SE)
	Roy Mellick	(RM)
	Eddie Ojak	(EO)
	Glyn Evans	(GE)
	Jim Bentley	(JB)
	Michaline Howarth	(MH)
	Janet Joel	(JJ)
	Oliver Crichton	(OC)

Apologies received from Peter Bates (PB) and Andy Webb (AW) – both overseas.

## 2.0 Minutes of 3<sup>rd</sup> meeting

Incorrect spelling of GG name was the only correction.

## 3.0 Actions from minutes not covered elsewhere

3.1 Action 1-2 is still with HSE/HSL. RI informed meeting that the draft ISO11114-4 dealing with hydrogen compatibility was out for comment and that PVE3 would be meeting at Bsi in March to discuss UK response. The deadline for comments is 31 May 2003 and GH will as HSL to look at the document and raise any concerns with GH. **Action 1-2 continues.**

3.2 Action 1-3. GH reported that the consultative document should be out by Easter and that only the shortest legal period of consultation will be allowed to allow the new legislation to go before parliament before the summer recess. RI expressed concerns over another rushed consultation. **Action 1-3 continues.**

3.3 Action 2-1. AW reported by fax that this was not a cylinder issue but resulted in a deliberate act. **Action closed.**

3.4 Action 3-10. GH reported that Transport Canada had not yet circulated the Symposium papers. GH had sent a reminder. **Action 3-10 continues.**

## 4.0 Updates since last meeting

4.1 JJ reported her findings on the material analysis for the Vitkovice 30 litre mixed gas cylinder. RI suggested that the values for sulphur and phosphorous were high for modern day steels and GE said that Eastern steels used old manufacturing techniques that could lead to problems with nitrogen. The analysis had not looked at nitrogen content and JJ was asked to look at this. **Action 4-1 JJ**

RI reported that some fillers had stopped filling any Czech cylinders; GH stated that this problem was only known to be with Vitkovice manufactured cylinders. AW reported by fax that Air Products had inspected cylinders from this manufacturer but had found no problems to date.

GG suggested that the cylinders from this batch at HSL could be used for NDT research. This is minuted in 5.2.

4.2 JJ reported her work on a Brentex cylinder that had been reported as leaking at fill. A small defect had been found on the outside but no leakage path could be found. JJ reported that she had tested the suspect area to 2 bar using equipment developed at HSL but no leak was observed. JJ also reported that the inside of the cylinder was very corroded. RI said that corrosion products can block a leakage path. Investigation closed.

4.3 GH reported on the failed CO2 fixed fire extinguisher cylinder. This had failed by stress corrosion cracking and concern had been expressed over the origin or sufficient stresses in a CO2 cylinder. It was found that the cylinder had been stored by an oven and was subject to high ambient temperatures. It was also found that the test house – Central Inspection Services of Selby – had not been correctly drying cylinders after hydraulic test. The combination of a high temperature environment and hydraulic test water were the root causes of this failure. Investigation closed.

4.4 GH reported that the proposed press release on beverage gas cylinder failures was to have gone out in the run up to Christmas but was withdrawn when other news took priority. The press office was again contacted, following the latest failure (minute 4.8,) and has shown an interest in running the story.

4.5 JJ reported that she had contacted an HSL expert in computational fluid dynamics regarding the rapid filling of gas cylinders. The expert required more information on how the gases are pumped into the cylinders etc. and JJ was to contact Jackson and Kaye and Gas Container Services for the information required by the expert. **Action 4-2 JJ**

4.6 JJ gave a presentation on the failure of RPV non-return cassette from a batch of Ceodeux RPVs dated 03/01. She showed that in the two cases reported at Gas Container Service the failure mode was stress corrosion cracking from the top thread of the cassette inwards to the centre. She reported that she had requested the remaining parts of the other 4 failed valves of this batch from Ceodeux and these were awaited. JJ reported that the material of construction of the cassette was a 60/40 leaded brass. RI said that the lead content was a vital ingredient to prevent or promote SCC and asked that the lead content of this batch be compared to that in other batches from the same design of valve. **Action 4-3 JJ**

RM gave a presentation on the work Capsis had carried out for Messer on their 3 failed valves and on other valves of this batch and all other batches of the same design of RPV owned by Messer. RM report stress corrosion cracking from the inside outwards and dezincification on the inside surfaces of some valves. RI and OC discussed the probability that lead carbonate may be present on the surface of the failed parts after seeing a dark area on several of RMs slides. These deposits need to be further investigated.

**Action 4-4 JJ**

JB discuss the manufacturing processes and GE remembered a similar case in oxygen service that was traced back to lack of normalising after machining. It was suggested that JJ should look for evidence of heat treatment.

**Action 4-5 JJ**

GH reported that the owners of Batch 03/01 had been told not to fill any cylinders fitted with this batch of valves. GH also noted that Messer had stopped filling any cylinders fitted with the design of valve. GH stated that he had not enforced a full prohibition on filling cylinders with this design of RPV at this time pending the outcome of the HSL investigation. GH reported that just over 100 000 valves to this design were in use in the UK of which batch 03/01 represented about 10%. To remove all the valves at this time would cause the industry a major problem but that industry should prepare for this eventuality should either the investigation prove that the design is unsafe or if a valve from another batch should fail in service.

4.7 GH updated the group on the reported leaking of chlorine valves with a three-part stem. The instruction for using these valves had been supplied by the manufacturer and these were very clear that a low closing torque was required and that if that torque was exceeded then the valves could start to leak. GH said that this shows the importance of reading and following manufacturers instructions. The investigation has been closed.

4.8 GH reported on the failure of a beverage gas cylinder that had occurred at 08.00 in a club the week before. No persons were in the club at the time so only material damage was reported. The cylinder is with HSL but appears to be 8 years overdue examination by a competent person, it appears to have been filled with a 50/50 mixture and appears to have a test pressure of 310 bar. The supplier and filler have not yet been traced. Another cylinder in the club was made to 84/525/EEC for a fill pressure of 200 bar and a test pressure of 300 bar. This cylinder is marked for mixed gas service and investigations are underway into its suitability for a fill of 200 bar mixed gas.

## **5.0 NDT**

5.1 OC reported on the initial AE project and the difficulties in identifying growing cracks in cylinders that displayed many defects. He also discussed the difficulties of making artificial flaws that would grow during a test. The need to have such flaws on the inside of the cylinder was discussed and RI suggested that cutting a cylinder in half, adding the flaw and then rewelding was one option. Other options were to insert the flaw at cylinder manufacture before the cylinder was closed. JB reported that he was working with Chesterfield on AE of gas cylinders. He said that cracks must be very sharp and that even a flat bottom hole could not guarantee a sharp

enough profile. He offered to share the results of his work with the group and invited OC and JJ to Chesterfield to see the project. **Action 4-6 JJ OC**

JB also reported his success with predicting composite cylinder life by monitoring the first 10 fatigue cycles and his hope to extend this work to metal cylinders. GE said that Luxfer had tried this some years ago but they had found aluminium too noisy. JB said that advances in computing power had overcome many of these problems and that maybe it was time to try again.

5.2 GG had been bought into the group as an NDT consultant. He said that he came with a very open mind and would explore all NDT avenues to find economical and fast ways of inspecting gas cylinders. RI said that for prototype testing speed would not be an issue. He also recommended that GG read the proceedings of an NPL conference on the integrity of gas containers. GG would be carrying out literature reviews, technique evaluation and then testing the most promising techniques on sample cylinders – GH commented that HSL had plenty of samples for him to use. The neck cracking of the Czech cylinders was discussed and GG said that he thought it possible that such defects could be detected using tangential radiography and this was one area he would look at. GH commented that there was a TWI project on digital radiography that HSE hoped to support and GH was planning to take a gas cylinder into this project. GH further warned GG about the Regulatory restrictions placed on how cylinders can be examined and requested that GG read 6.2 of ADR and the TPED during his work. GH to forward the relevant sections. **Action 4-7 GH** JB asked GG to include the probability of detection, the minimum defect size that could be found and the largest defect that could be missed for each technique that he takes forward.

5.3 GH reported that one UK Company, Ineoschlor, were looking into the possibility of carrying out the periodic examination of pressure drums without the inclusion of an hydraulic test. GH also noted that the prEN would require an hydraulic test. RI noted that the prEN was up for discussion in Brussels 24/25 April and that PB may be attending for UK. RI suggested that Ineoschlor should attend that meeting and that GH should inform them. **Action 4-8 GH**

JB reported that the MOD no longer hydraulically test air receivers due to possible corrosion problems. The HT can only say that the vessel did not leak on that day and says nothing about on-going structural integrity.

The group thought that a project to look at alternative inspection techniques would be appropriate and GH stated that there was a draft HSE report on Non Invasive Inspection that would need to be used to steer any such work. GH will contact Ineoschlor to canvas their support and report back to next meeting. **Action 4-9 GH**

## 6.0 Project updates

6.1 OC reported that the cylinders were still pressurised. He showed a graph of pressure against time and there was clearly no slip in the pressure. The graph showed both mixed gas and CO<sub>2</sub> pressure to be significantly lower than those expected and OC was asked to investigate if this was a measuring problem or if the pressure was as low as indicated – in which case the project may be invalid. **Action 4-10 OC**

After some discussion it was agreed to terminate the test in one mixed gas and one CO<sub>2</sub> container and leave the other two containers on line until either they reach a

natural end or the next meeting whichever came sooner. It was agreed that the mixed gas with Tubularis cylinders and the CO2 with Czech cylinders should be depressurised, emptied and dried. **Action 4-11 OC/JJ**

6.2 The grinding project progress was presented by GH. He stated that the FEA model had been completed and had predicted when burst would be effected by grinding. Cylinders were prepared for testing but bursts were away from the grinding areas. HSL are to revise their FEA model in light of this experience. JB asked if the cylinders had been NDT inspected prior to bursting. GH said not. It was then discussed that the burst may be controlled by unseen defects in the cylinder wall. GH asked JJ to speak to the project leader on this point. **Action 4-12 JJ**

6.3 A fax was read from AW that said EIGA were very quiet on the 300 bar test program and that HSL should prepare more detailed costs. RI suggested that the European Cylinder Manufactures, of which GE is Secretary, should also take an interest in this project and requested JJ copy the proposal to GE **Action 4-13 JJ**

6.4 MH reported that her company had one burst disc failure since the last meeting. She said that the cylinder was not overfilled and was stood in a cold warehouse. The disc was just 1 year old, produced from Milmet and had probably been filled 3 times. MH was to have the failed disc examined dimensionally and metallurgically and report any findings back to the next meeting. **Action 4-14 MH**  
AW reported by fax that his company had burst 12 old bursting discs and no reduction in burst pressure was noted. RM said that this was not a statistically stable approach and offered to look at Messer burst disc failures and to carry out more bursts on old discs to build up the data base. **Action 4-15 RM**

6.5 GE opened the discussion on oval cylinders by stating that the failure at Jackson and aye had not been proven to be associated with ovality and at the time of the last meeting it was not clear if the ovality was service induced or from manufacture.  
RI expressed concern over the BCGA safety alert and quoted a 1986 paper that pointed to 4% ovality not reducing the fatigue strength of cylinders. GE also reminded the group of the NEL study into ovality that had been used to increase allowable ovality in BS5045 Part 3 from 1% to 2%.  
PB report by e-mail that his company had tested a 5.5% oval cylinder through 14119 cycles before leakage occurred and then the failure was away from the maximum diameter.  
GE pointed out that fluctuating wall thickness would effect fatigue life and RI said that the 1986 study had machined the walls inside and out to remove any such fluctuations and give the minimum wall thickness. JB and GH both stated that ovality will increase stress and it is the bending at repeat pressurisations that is the problem. JJ reported that 4 cylinders had gone to Chesterfield for fatigue and burst testing. These had ovality of 5.18%, 4.67%, 6.37% and 4.55%. JB said that they should go through the Chesterfield NDT prior to burst to check for any defect that may control burst performance. Defects should be ink marked **Action 4-16 JB/JJ**  
JJ further reported on the through wall crack in the original failed oval cylinder. RI said that these were quench cracks and there was agreement on this assessment. He questioned why these defects were not picked up at manufacture by UT or even HT.

GH reported that there were no UT reports from Nam Yang so HT must be by the jacket method only. GE questioned the role of the Approved Inspection Body. SE stated that the safety alert had been debated at BCGA TSC2 with no firm conclusion on its validity. GH stated that as the Safety Alert related only to Nam Yang cylinders he was content to leave it in place until the results of the current research were known.

## 7.0 Other updates

7.1 Training of competent persons was discussed in detail with JB stating that he was worried by where the next generation of competent persons would come from. RI said that the UKAS document RG3 was used as a basis for proving competence and that if this was followed he saw no problem. GH reminded the group that RG3 was overdue revision. This had been discussed a year ago at PVE3/7 but since then UKAS had not taken any action. GH said that he would remind UKAS and see if a date for a review meeting could be set.

**Action 4-17 GH**

JB stated that he currently had just 3 competent persons covering the UK and had worries over the fact that he needed to expect the same standard of inspection at each site. RI said that the UKAS scheme if properly controlled would give this. He also said that UKAS had good gas cylinder people who do a technically excellent job. GH suggested that maybe a central training scheme such as PCN could set up training and certification for those companies who did not have their own training schools. GG as chairman of BINDT training group said he would look into this. He also expressed concern over the age profile of Inspectors and the lack of any apprenticeship schemes to bring in new blood.

**Action 4-18 GG**

7.2 GH reported that he had received a reply from BCGA TSC2 chairman and that he had responded to the reply by asking for more detail. RI reported that the working group would meet again and reply to GH before the 15 March. **Action 4-19 BCGA**

7.3 GH reported that the following standards and specifications had been added to the approved lists for either CDGCPL2, TPVR, Both or parts as appropriate and users should check the entries on the HSE web site at [www.hse.gov.uk/signpost](http://www.hse.gov.uk/signpost) then go to 't' and then to 'transportable pressure equipment'. The latest editions are : BSEN12205, ISO9809-1, ISO7866, VAC007, BS5045 Part 2, BSEN13293, BSEN12245, BSEN12257.

Post meeting note. GH brings to your attention the requirements of TPVR 6 which specifically requires that to re-assess conformity of any cylinder by a Notified Body requires that either the standard is listed in Schedule 2 or that the standard of specification is approved by the Executive as meeting the requirements of ADR. BS5045 Part 1 has not yet been approved by the Executive for re-assessment so cylinders to this design cannot yet be 'pi' marked. GH is looking into the rigidity with which the ADR requirements must be met before proceeding with any approval.

7.4 GH reported on enforcement issues within the Beverage gas industry that HID CTG5 had given assistance. A list is attached to these minutes along with a log of reported incidents with receptacles and valves. These lists will be updated regularly and appended to minutes of these meetings.

7.5 GH reported that there had been an incident with an hydrogen sulphide cylinder where the valve had leaked resulting in two persons attending hospital. HSE are investigating this but it serves as a reminder of the importance of ensuring that CDGCPL2/TPVR requirements are met in full for all cylinders.

## **8.0 Any other business**

8.1 GH showed the picture of a drying rig that had been found in use in a recent test house inspection. The rig took air from the room, heated it to no controlled temperature and blew it into inverted cylinders. There was no control on time. The group stated that this was an appropriate drying method under the following conditions :

1. The cylinders do not reach a temperature that will effect their microstructure – 5000 series aluminium alloys being the most critical.

2. The quality of the air entering the cylinder is not compromised by contaminants in the air such as exhaust fume and oil mist.

3. The cylinder is examined internally after drying to confirm that all moisture has been removed.

4. The cylinder is sealed immediately after the internal examination has been completed by fitting a closed valve or brass plug to the required torque.

## **9.0 Date of next meeting**

The next meeting was scheduled for 19 June 2003 at HSL Buxton

<b>Action No.</b>	<b>Person</b>	<b>Action</b>	<b>Date</b>
1-2	GH	Ask HSL to check draft ISO 11114-4 for hydrogen compatibility.	05/03
1-3	All	Comment on consultative document	05/03
3-10	GH	Circulate symposium papers	06/03
4-1	JJ	Check nitrogen content of steel used for Czech 30 litre cylinders	04/03
4-2	JJ	Collect information on cylinder pressurisation rates.	04/03
4-3	JJ	Analyse lead content of Ceodeux RPV cassettes.	03/03
4-4	JJ	Investigate dark deposits on Ceodeux RPV parts	03/03
4-5	JJ	Look for evidence of heat treatment on Ceodueux RPV	03/03
4-6	JJ/OC	Visit Chesterfields to see AE and related equipment	04/03
4-7	GH	Forward ADR 6.2 and TPED to GG	03/03
4-8	GH	Inform Ineoschlor of Brussels meeting	03/03
4-9	GH	Discuss research on pressure drum examination with Ineoschlor	05/03
4-10	OC	Check calibration of pressure sensors	03/03
4-11	JJ/OC	Take two containers of cylinders out of test.	03/03
4-12	JJ	Discuss NDT of cylinders with Graham White	03/03
4-13	JJ	Update 300 bar proposal and send to AW and GE	03/03
4-14	MH	Investigate failed burst disc and report back to mtg.	06/03
4-15	RM	Investigate burst disc performance and continue AW work to give statistically sound sample	06/03
4-16	JB/JJ	Ask Chesterfield to NDT oval cylinders prior to burst	03/03
4-17	GH	As UKAS about revision of RG3	03/03
4-18	GG	Discuss training of gas cylinder competent persons at BINDT	06/03
4-19	BCGA	Reply to GH on cylinder management by 15/03/03	03/03

**LOG OF GAS CYLINDER RELATED INCIDENTS REPORTED TO HID CTG5 JUNE 2000 -**

<b><u>Incident No.</u></b>	<b><u>Date</u></b>	<b><u>Gas</u></b>	<b><u>Incident</u></b>	<b><u>Cause</u></b>	<b><u>Potential Injury</u></b>	<b><u>Action</u></b>	<b><u>Comments</u></b>
1	June 2000	CO <sub>2</sub> /N <sub>2</sub>	Leakage during filling	Stress corrosion cracking due to inadequate control during manufacture	Asphyxiation.	Recall of batch of approximately 8000 cylinders undertaken by importer. HSL report available.	Incident happened during filling and was seen by fill operator.
2	August 2000	CO <sub>2</sub> /N <sub>2</sub>	Leakage during filling	Stress corrosion cracking due to inadequate control during manufacture	Asphyxiation.	Recall of batch of approximately 8000 cylinders undertaken by importer. HSL report available.	Incident happened during filling and was seen by fill operator. Same batch as June 2000 entry.
3	September 2000	CO <sub>2</sub> /N <sub>2</sub>	Failure of hose during filling.	Flexible hose not designed for impact loading and suffered failure when dropped.	Asphyxiation. Possible injury from violently snaking hose.	Manufacturer informed of design short coming although hose was meant to be used in static situation. HSL report available.	In my opinion the hose was mistreated by filling staff, allowing it to swing into the factory wall once removed from full gas cylinder.

4	September 2000	CO <sub>2</sub> /N <sub>2</sub>	Failure of cylinder valve screwed connection during filling.	Cylinder valves manufactured from a picture, no testing of design. Imported from China.	Actual injury to fill plant operator, severe bruising to front abdomen. Damage to plant.	Importer asked to recall all similar valves and to ensure that in future appropriate design standards are used for valve design, prototype testing and manufacture.	Valves are marked 'ST' and have no design standard stamped onto body. Dimensionally unstable. HSL report available.
5	October 2000	CO <sub>2</sub> /N <sub>2</sub>	Reported by FOD area 18 'Explosion of gas cylinder in Walmar Village Hall'	Stress corrosion cracking	Hole through brick wall and ceiling. Potential fatalities but happened middle of night.	Cylinder with HSL. Not to approved design.	Cylinder not to approved spec. CrMo V.80 Huge number of SCC cracks visible on inner surface.
6	January 2001	CO <sub>2</sub> /N <sub>2</sub>	Sudden and unforeseen release of gas at a pressure of 190 bar during filling.	Gross corrosion due to beverage backwash into cylinder.	Severe disruption of filling plant. Potentially fatal but fill operator not at post.	Informed HID Basingstoke of incident, suggested BCGA GN4 Para 8 notice on filling plant. Cyl with HSL	Square hole in side of cylinder wall approx 75mm each side. Flap of material still attached but some missing.

7	January 2001	CO <sub>2</sub>	Sudden and unforeseen release of gas at a pressure of approx. 410 bar during transport.	Burst due to overfilling and heating of contents by car radiator. Burst disc had been tampered with previously and did not work.	Potentially fatal. Driver had just left car when cylinder exploded and bounced around his cab.	No trail to person tampering with Bursting disc. Filling company procedures tightened up to reduce chances of overfilling.	Info to be included in DIN. Cylinder behaved as expected.
8	May 2001	Hydrogen Bromide	Leakage of gas through hole in valve.	Leakage due to corrosion of fitting.	Potentially fatal by inhalation.	Work continues	DIN on cylinder management under review.
9	June 2001	Hydrogen Fluoride	Rupture of cylinder in courtyard after a long period of storage.	Burst due to build up of hydrogen gas on inside of cylinder due to reaction between HF and steel.	Potential multiple fatality. 6pm site empty. Offices windows broken and office space sprayed with acid.	Not to approved spec (DOT 3A not DOT3A HSE) ACL not followed	DIN on cylinder management under review.
10	July 2001	CO <sub>2</sub> /N <sub>2</sub>	Rupture of cylinder in storage depot	Burst due to SCC on East German cylinder	Potential fatalities – staff had gone home 5 minutes before explosion	Not to approved design spec	Same batch of cylinders as item 5

11	Oct 2001	CO <sub>2</sub> /N <sub>2</sub>	Rupture of cylinder during hydraulic test	Burst due to SCC of Chesterfield cylinder at about 240 bar	Potential for fatalities if cylinder had not been taken for test. Cracks not seen at time of visual exam	To approved spec and made within spec. Liquid forms to basis of the problem.	Chesterfield issued report, which recommended further work.
12	Feb 2002	CO <sub>2</sub> /N <sub>2</sub>	Rupture of cylinder in pub cellar	Burst due to SCC. Korean cylinder 10 month overdue examination.	Potential for multiple fatalities. Explosion at 9pm on a Saturday night in busy South London pub	Cylinder with HSL. Report issued	Same filling company as incident 6. Company visited and problems found with filling procedures.
13	March 2002	CO <sub>2</sub> /N <sub>2</sub>	Valve ejected from Al cylinder	SCC of valve stem	Potential for fatality. Pub cellar at night.	Investigation by company.	Report in file.
14	April 2002	Chlorine	Failure of three part valves (many)	Valve appears to crush on closing – hand wheel replaced by square for spanner tightening	Potential for fatalities by toxic gas release. Many reports of small releases on removal of valve cap.	HSL carrying out tests. Report awaited.	Preliminary report suggests valves crush easily but manufacturer instructions are clear and limit tightening torque.

15	May 2002	CO <sub>2</sub>	Cylinder leaked during fill at Brentex immediately after return from Selby Test House	Suspect manufacturing defect not spotted at test house. Cylinder 5 years old	Potential for asphyxiation if cylinder leaked in cellar.	Cylinder with HSL – report could not find leak.	Possible corrosion aspect to this. Fitting of RPV would prevent or delay failure ?
16	June 2002	O <sub>2</sub>	Valve fitting explosion	Dirt in newly fitted connection	Explosion and fire after filling cylinder. No injuries but potential for fatalities – 2 in building	Investigation by company – overseen by HID	Copy of report seen. Failings by company on cleanliness and continuing to fill after initial ‘noise’.
17	July 2002	O <sub>2</sub>	Cylinder explosion in residential house	No feed back to date	Explosion in lounge caused fatality to old lady and damage to street outside house.	Police investigation.	No further info.
18	July 2002	O <sub>2</sub>	Valve failure on aircraft cylinder at Liverpool Airport	No feed back to date	Ignition in valve, valve parts ejected. Injury to filler.	With Steve Wright RSG Manchester	No further feedback.

19	July 2002	Special gases	Valve part ejected during filling	Poor manufacture of valve – double threaded in opposite hands leaving connection very weak.	Potential fatality but no-one in firing line	Report from owner	Recall underway. No other companies involved
20	August 2002	CO <sub>2</sub> /N <sub>2</sub>	Rupture of cylinder during hydraulic test	Ovality ? No signs of SCC. Cylinder burst at 340 bar. Stated as 4.7% ovality	Potential for fatalities if cylinder had not been taken for test. Crack not seen at time of visual exam	Cylinder with HSL, quench cracking found	Issue warning to check all Korean cylinders for ovality at time of test and scrap any exceeding 2%
21	August 2002	CO <sub>2</sub>	Rupture of fire extinguisher	Moisture in cylinder from Test in 1999	Potential for fatalities. No reported injuries.	Report from Graham Tattersall HSL	Cylinder stood by oven giving high stress levels needed to cause SCC.
22	September 2002	Diving	Failure of valve 'o' ring	Cylinder top incorrectly manufactured	Potential for serious injury or fatality if occurring during dive.	Cylinder with HID diving group	Recall of batch for rework or scrap.
23	November 2002	H <sub>2</sub> S	Leakage from valve	DOT3AA cylinder not approved for UK	2 hospitalised	Cylinder with HSL	Await report

24	Oct 2003	Mixed Gas	Failure of RPV cassette Ceodeux batch 03/01	SCC	Potential for serious injury	HSL Investigation	Await report
25	Oct 2003	Mixed Gas	Failure of RPV cassette Ceodeux batch 03/01	SCC	Potential for serious injury	HSL Investigation	Await report
26	Nov 2003	Mixed Gas	Failure of RPV cassette Ceodeux batch 03/01	SCC	Potential for serious injury	HSL Investigation	Await report
27	Dec 2003	Mixed Gas	Failure of RPV cassette Ceodeux batch 03/01	SCC	Potential for serious injury	HSL Investigation	Await report
28	Jan 2003	Mixed Gas	Failure of RPV cassette Ceodeux batch 03/01	SCC	Potential for serious injury	HSL Investigation	Await report
29	Feb 2003	Mixed Gas	Failure of RPV cassette Ceodeux batch 03/01	SCC	Potential for serious injury	HSL Investigation	Await report
30	Feb 2003	Mixed gas	Rupture in club	SCC	Potential for fatalities. No reported injuries.	HSL Investigation	Await report.

**Log of Enforcement Issues for Beverage Gas**

	<b>Area</b>	<b>Enf</b>	<b>Issues</b>	<b>Comment</b>
1	Wigan	Letter	Filling overdue cylinders. Overfilling cylinders. No pre-fill checks. No labels	Series of visits.
2	London	Prosecution	Tower Hamlets v Kallwin Ltd. Supply of cylinders up to 18 years overdue examination	Supply only.
3	Rochdale	Letter	Import of East German cylinders and rerating for mixed gas.	Recall 3200 cylinders
4	Rochdale	Letter	Incorrect inspection and drying at time of examination.	Improvements made.
5	Wigan	Prohibition	J & K Gases. Filling overdue cylinders.	Improvements made.
6	Middleton	Letter	Filling overdue cylinders, filling unapproved cylinders, not carrying out prefill checks, no transport labels	Little understanding of Regs
7	Gower	Letter	Filling overdue cylinders and filling unapproved cylinders.	Improvements made
8	Middleton	Prohibition	Brentex Ltd. Filling overdue cylinders.	No evidence of improvement.
9	Middleton	Prohibition	Brentex Ltd. Filling unapproved cylinders.	Improvements made
10	Selby	Letter	Poor drying practices after hydraulic test.	Improvements made
11	Garston	Letter	Poor control over inspection activities, no brand.	Improvements made
12	Bristol	Letter	Poor control over inspection activities, no brand.	Improvements made.
13	Wimbledon	Letter	Filling overdue cylinders and no prefill moisture checks	Improvements made.
14	Middleton	Prosecution	R v Brentex Ltd. Failure to comply with Prohibition Notice – filling overdue cylinders.	Not re-inspected.
15	Middleton	Prohibition	Brentex Ltd. Poor inspection practices and poor branding.	Inspections stopped
16	Grantham	Letter	Filling overdue and cylinders where markings could not be seen.	Improvements made
17	Northampton	Letter	Filling overdue cylinders and no transport labels.	Improvements made
18	Manchester	Letter	Poor inspection practices – no light to see inside cylinder	Improvements made.
19	Nelson	Letter	Filling unapproved and overdue cylinders, no transport labels.	Improvements made.
20	Liverpool	Letter	Assessment of East German cylinders and stating that they were fit for use.	Regs explained.
21	Kent	Letters	Import of beverage gas cylinder valves from China to no standard	Valves recalled.