

Minutes of 3rd Meeting of the HSE Gas Cylinder Research Steering Committee

**22 November 2002
HSL Buxton**

1.0 Attendance

Chairman	Roy Irani	(RI)
Secretary	Graeme Hughes	(GH)
	Steve Elliott	(SE)
	Peter Bates	(PB)
	Jim Bentley	(JB)
	Andrew Jackson	(AJ)
	Michelin Howarth	(MH)
	Janet Joel	(JJ)

Apologies were received from Andy Webb, Roy Mellick and Oliver Crichton

2.0 Minutes of 2nd meeting

The minutes of the 2nd meeting were approved with the following adjustments:

Correct spelling of 'Elliott'

Section 5.1 3rd paragraph should note that BSENISO 13341 for the correct application of thread tape is available, listed in EN1968 etc. but seldom used. This should be further publicised by BCGA and HSE to ensure a harmonised approach.

Section 10 correct to read IMechE

3.0 Actions from minutes not covered elsewhere

Action 1-2 remains outstanding until the ISO DIS is published. At that point HSE will ask HSL to conduct an independent review and the results will be presented to the steering committee.

Action 1-3 remains, awaiting the consultation document from Rose Court, which is due early in the New Year. Need to push for lowering of date for accreditation and put in an interim step of quality management for all test houses by July 2004.

Action 2-1. Andy Webb not available to comment. Action on going.

Action 2-2. AE proposal awaited from HSL. Action on going.

Action 2-14. No information from Andy Webb. Action on going.

Action 2-15 now with EIGA main council. Due feedback 16/17 December.

4.0 Updates on incidents since last meeting

- 4.1 GH reported on the main reasons for the issue of a Prohibition Notice on a test house, Brentex of Middleton. The Prohibition was for the testing of cylinders and required that such activities were carried out competently. The company were not following any known standards for periodic examination of gas cylinders, the brand would cause confusion in the industry and a cylinder from Nam Yang date 09/95 had just been stamped up as suitable without due regard to its hardness. Brentex have been asked to work to RG3 of UKAS before they complete another gas cylinder examination.
- 4.2 JJ reported on the neck leakage from a Czech 30 litre cylinder to 84/525. The neck region showed 80 plus small cracks from inside plus indications on the outside. No leakage passage was found. RI suggested that any cylinder reported as leaking should be pressure tested with helium in a water bath before sectioning. JJ will take this into account in future. JB said that from the micrographs the steel looked 'dirty'. JJ will check this. There was discussion on the way the company forms the neck and this appears to be a novel process of heat and spinning. It was suggested that more cylinders from this manufacturer are checked to prove if this is a batch or a common problem. A decision on this will be made after the quality of the steel has been assessed. **Action 3-1 JJ**
- It was also noted that the inside surface of the cylinder was covered in mill scale. RI stated that this prevents corrosion but when loosened can block the cylinder valve. JJ said that some of the test cylinders were from this manufacturer so there was a possibility that the corrosion tests in these cylinders would not work. AJ said that a Northampton company, K G Smith, were importing from this manufacturer so GH will consider looking at their stock once the steel analysis is known and will also inform BCGA of any actions that may be necessary from this investigation. **Action 3-2 GH**
- 4.3 JJ reported on the leaking Brentex CO2 cylinder made in 1988 by IWKA. Again no leakage path had been identified but there were small indications in the wall. RI suggested a liquid nitrogen technique to detect a through wall defect and GH had previously suggested a vacuum/helium test. JJ to continue with this work and will report back at the next meeting. **Action 3-3 JJ**
- 4.4 The ovality of Nam Yang cylinders was discussed. AJ had made a 2-½% ovality go – no go ring that was demonstrated. Both AJ and JJ presented results of measurements with 4.7% the highest figure recorded. RI said that the most oval should go through 12000 cycles to test pressure and then see the effect on burst pressure. The failed cylinder appears to have a pre existing defect away from area of maximum ovality. JJ is continuing to investigate this. GH stated that any cylinder from Nam Yang presented to a test house must be checked for ovality and taken from service if the ovality exceeds 2%.

- Withdrawn cylinders should be put aside awaiting the fatigue results. BCGA was asked to circulate this requirement to their members and Non BCGA members would be picked up by HSE. **Action 3-4 GH/SE**
- 4.5 GH briefly discussed the conference papers that had been given on the beverage gas issue this autumn. These were to FESI and BINDT. In addition GH had written a chapter for an IMechE book on the prevention of failure. RI asked GH to submit an abstract for the EIGA conference in January 2004, this was done post meeting. He also requested a similar abstract from JB on cylinder revalidation issues. The BCGA conference will be at Leeds in March 2003. It is unlikely that GH will be available due to the joint ADR/RID meeting in Berne on the same week.
- 4.6 A press release by HSE on the beverage gas issue has been planned for mid December in the Southwick pub. GH will contact the HSE press office to see if they would allow BOC to attend the release. This has been done and a reply is awaited. GH also reported on a paper for the UN committee of experts meeting in Geneva December 2 – 6 which alerts other member companies to the problems UK has been experiencing. RI also discussed the issue of life of composite cylinders – the USA are looking to limit this to 15 years – GH has issued a paper stating that with proper assessment UK are happy to go 30 years and EIGA have asked for unlimited life. RI asked for a copy of the free HSE leaflet on ‘Safety of Gas Cylinders’. **Action 3-5 GH**

5.0 NDT

- 5.1 JB discussed the revalidation processes that the MOD uses for their gas cylinder population. It can be hugely expensive to remove cylinders from a ship so on line inspection is the preferred option. The requirement for HT has also been shown to be a nuisance rather than a benefit. It should be noted that the MOD cylinders are significantly thicker than the standard industrial gas cylinder with the consequence that stresses are low and related problems are very rare. In fact JB stated that stresses were so low he had difficulty growing cracks so he would welcome the chance to test some of his techniques on industrial cylinders. JB went on to discuss the advantages of composite wrapped cylinders but also the down side and the validation work that he has overseen which should predict life from the first few pressure cycles. It was also noted that the MOD keep a log of every cycle or every cylinder, which must be a requirement of the MOD type of inspection regime. Industrial gas cylinders could do this using existing technology but to date it was not the norm to collect such specific data on each cylinder. JB is also working on PODs and human factors in gas cylinder inspection. Such work will be of interest to all on the committee.
- 5.2 GH stated that he has asked HSL to contract some work on NDT at time of fill at periodic examination to a consultant, George Gorgario. He will be asked to look at the corrosion test cylinders during his work and will be asked to attend steering committee meeting to discuss

progress and results. JJ is asked to add him to the circulation list once the contract has been agreed

Action 3-6 JJ

JB discussed the influence of fill rate on the possible defects. AJ and PB both stated that they fill a 10-litre cylinder with mixed gas in less than a minute. JB stated that in that time the cylinder would not be in equilibrium with the gas, which could lead to high thermal stresses within the cylinder. This has not previously been highlighted as an issue and it is noted by GH that the failed cylinders had all come from filling plants where the CO₂ fill is quick but the nitrogen fill is very slow in banks of around 6 cylinders at a time. However, it would be useful for HSL to give this rapid filling some thought and JJ was asked to find a suitable scientist at HSL to look at this issue. **Action 3-7 JJ**

6.0 Project updates

- 6.1 The corrosion project is 12 weeks into containment. The pressure is holding up well and to date no failures. GH had told JJ to discontinue the work after 6 months but this was later amended to be after the next steering committee meeting. JJ was asked to obtain the manufacturers certification for each cylinder used – this will be available from the cylinder suppliers.

Action 3-8 JJ

JB stated that MOD had carried out work in this area using demin water with air fill from which he has results of comparative corrosion rates with different steels. This work is of interest to the group and should add to the experience found with the differing corrodants.

- 6.2 GH reported on the grinding project. The modelling is complete, the cylinders have been purchased and the grinding and strain gauging is underway.

- 6.3 Bursting disc work had not progressed as AW not available. JB reported that discs do work harden. MH reported that her company does suffer bursts after fill. GH asked her to keep records of these burst, how long disc had been in service, time after filling of burst, supplier of disc if known and any other relevant information

Action 3-9 MH

7.0 Other updates

- 7.1 GH gave a brief overview of the Ottawa Symposium on Pressure Relief Devices and promised to circulate the papers once they were made available. There was no clear resolve to the symposium with two opposing views on to fit or not to fit PRDs. A further symposium is planned in two years to monitor progress.

Action 3-10 GH

- 7.2 PB gave a quick update on the BCGA working group on the management of gas cylinder populations. RI said that this had been discussed at TC23 and at EIGA where the draft DIN issued by GH was seen to be 'Draconian'. GH stated that one 'special case' of hydrogen fluoride has gone before the UN and agreement for 2-1/2 years

inspection period has been reached. GH will further seek the committee of experts views on the periods for other substances during the next bi-ennium starting in July 2003. In the mean time a response is required from BCGA and PB undertook to press the chairman of TC2 to get a reply to HSE. **Action 3-11 PB**

- 7.3 Two ISO standards were requested for addition to the approval list. These were ISO9809-1 and ISO 7866. In both the 'F' Factor is allowed to reach 0.85, which is a significant increase over the 0.77 allowed by ADR. Both standards have been approved in ADR 2003 but with a note to limit the F factor to 0.77. GH asked PB and Simon Nicholson of Luxfer to look at the influence of the F Factors for both standards and report the findings back to me. Luxfer have done this and have shown that burst always limits thickness with a maximum F of 0.76 being achievable. Once GH has details of the steel position it should be possible to approve both standards to CDGCPL2/TPVR rather than wait for the Regulation change in late summer that would automatically bring in both with the F Factor warning. **Action 3-12 PB**

8.0 AOB

- 8.1 JB started a discussion on training competent persons. SAFed are looking at this issue and at present there is no formal training. AJ and PB both stated that they had their own in house schemes that served them well. MH stated that this gave her and similar organisations great difficulty in breaking into the market where you need to be competent from day one. GH observed that it appears that you need to buy in ready trained expertise. JB said that he may devise a training course. RI said that JB would be welcome to see the BOC training as there was no clash of interests between the companies but he could not assist other commercial companies. GH suggests that all members before the next meeting think about this issue where it can be given a fuller airing. **Action 3-13 All**
- 8.2 PB discussed the failure of three RPVs that all appear to have failed by SCC. The valves are Ceodeux C52000061 Batch 03/01. The failure is the ejection of the non-return valve cover nut during filling. No injuries have yet been reported. GH further discussed this with Dave Hopper of Messer post meeting and, following action on JJ to look at mode of failure, will contact the importer under section 6 of HSWA to require the batch to be withdrawn. **Action 3-14 JJ**
- 8.3 GH showed the committee a failed CO2 fire extinguisher that had failed by SCC. This caused some concern, as the mode of failure was not common for an extinguisher. GH discussed this further post meeting and it was clear from the crack morphology that the stresses were low in comparison to Beverage gas cylinders with a depth of 80% wall thickness before final failure. Once the test house/filling station is known HSL will undertake more work to find out why this cylinder failed catastrophically where other wet CO2 cylinders have only leaked.

- 8.4 GH also mentioned work that was on-going to look at a series of chlorine releases involving a valve with a three-part stem. The parts are crushing in use and allowing leakage. This work also looks at competence of persons carrying out periodic examinations of pressure drums.

9.0 Date of next meeting

A provision date and venue of the next meeting was set to correspond with the end of the 6-month test period.

March 4th 2003 at 11.00. HSL Buxton

Summary of actions

Action No.	Person	Action	Date
1-2	GH	Hydrogen compatibility	05/03
1-3	GH	Comment on consultative document	04/03
2-1	AW	Monitor and report back on Israel failures	03/03
2-2	OC	Continuation of AE work	12/02
2-14	AW	Test used bursting discs and note time in service	03/03
2-15	AW	Report on feed back from EIGA on 300 bar proposal	12/02
3-1	JJ	Check steel quality of Czech cylinders	12/02
3-2	GH	Inform BCGA of any action following Czech cylinder investigation	12/02
3-3	JJ	Report back on leaking Brentex cylinder	03/03
3-4	GH/SE	Disseminate information on Nam Yang ovality checks	12/02
3-5	GH	Send copy of free leaflet to RI	11/02
3-6	JJ	Add George Gorgorio to contact list and issue all past papers	On contract
3-7	JJ	Find scientist in HSL to look at rapid filling issue and develop GP30	12/02
3-8	JJ	Obtain manufacturer certification for all test cylinders	03/03
3-9	MH	Collect data on burst disc failures within company	03/03
3-10	GH	Circulate symposium papers	12/02
3-11	PB	Press chairman of TC2 to write to GH on cylinder management issue	12/02
3-12	PB	Supply analysis of F Factors for steel cylinders	12/02
3-13	All	Consider the training needs for test house competent persons	03/03
3-14	JJ	Look at the mode of failure of the RPV nut	12/02