

# Minutes of 9<sup>th</sup> Meeting of the HSE Gas Cylinder Research Steering Committee

26<sup>th</sup> November 2004  
HSL Buxton

## 1.0 Attendance

Chairman	Roy Irani	(RI)
Secretary	Graeme Hughes	(GH)
	Steve Elliott	(SE)
	Roy Mellick	(RM)
	Eddie Ojak	(EO)
	Glyn Evans	(GE)
	Jim Bentley	(JB)
	Peter Bates	(PB)
	Jan Joel	(JJ)
	George Georgiou	(GG)
	Simon Davies	(SD)
	David Holt	(DH)
	Andy Webb	(AW)
	Oliver Crichton	(OC)
	Michael Dean	(MD)
	Micheline Howarth	(MH)

Apologies received from

Rod Timms (DfT) (RT)

## 2.0 Minutes of 8th meeting

Page 2 – GG – last paragraph on probe sensitivity ‘ GG explained the variability of probe sensitivity at 60 degrees, when using rectangular notches as reference targets.

RI reports that action 8.4 is no longer valid. This is deleted.

RI – 5.2 second paragraph the ISO6406.2 has been agreed – so delete ‘not’.

RI – 5.2 third paragraph should relate to aluminium only and should relate to ISO6406-1.

RI – 5.2 third paragraph last line after ‘aluminium’ add alloy as it is not possible that UT...’

Page 3 last line of 5 ' to the public'.

4<sup>th</sup> paragraph 0.003% not 0.03%.

### **3.0 Actions from minutes not covered elsewhere**

None, 8.4 is removed and nothing further to report on 8.12.

### **4.0 Updates since last meeting**

#### **4.1 RPVs.**

It is understood that one user has settled out of court. GH issued a factual statement at request of both solicitors dealing with fly filling.

PB asked about the Improvement Notices that HSE were going to issue on Ceodeux. GH had discussed this inside HSE and would chase up with the relevant policy section.

**Action 9-1 GH**

RI stated that industry recognised the importance of this working group in high lighting problems within the industrial gas sector. The open nature of the meeting and the way all issues could be dealt with were a benefit to all.

### **5.0 NDT**

#### **5.1 Acoustic emission.**

RI relayed to JB that the comments on the AE ISO standard were very useful and were helping to make a good standard that should soon be available.

JB reported that he was still in the process of building the AE rig for composite cylinders but that progress was slow due to funding issues. He is hopeful that the composite technology will be used in new build pressure systems. JB also stated that the technology he has developed would be of great benefit to the high cost gas sector, such as semi conductor gases, and he is willing to talk to any operators outside of this meeting.

DH stated that LPGA did have concerns on how to inspect composite cylinders and thought that AE could be one way forward. Time of fill and periodic examination both need to be brought into line with the available technology and it is suggested that DH liase with JB on what is available.

**Action 9-2 JB/DH**

The issue of owner filling of composite gas cylinders with LPG at petrol filling stations was briefly discussed. This is being tackled by LPGA, DfT, HSE and DTI at this time and petrol station operators are being made aware of the safety implications.

SD pointed out that composite cylinders are being used in the paintball industry and so this same problem will arise here and as the cost of composite cylinders continues to fall more and more sectors will take up this technology.

GH stated that HSE had no funding at this time to continue with the work proposed at IMES but that this proposed project would remain on file until such time as funding restrictions changed.

## **5.2 NDT Research.**

RI thanked GG for his report that everyone had been given a chance to read, he said that Appendix A had not downloaded correct, these were the CoMech Ltd. reports, and so some people had not been able to read these. The draft report was discussed at the last meeting.

JB agrees with the conclusions and most of the recommendations but stated that the report dealt with the current situation rather than how to deal with ongoing integrity issues. He said that the maximum allowable defect size is needed but is not known for these types of cylinders. RI said that this was a compromise approach between what can be found and what the manufacturer can live with.

DH said that there are many variables to critical crack length and so a conservative approach is adopted. JB says that you must be careful with this approach as things of importance can be missed. RI said that the current approach has not led to failures in service so is there a need for change. ISO TC58 SC4 WG1 (report No. 22694) is working on this problem and has sent out a discussion document – clearly the allowable defect sizes will be reduced by this work. JB said this is a positive move and should lead to increased safety. The gas cylinder WG will need to comment on this draft once it is made fully available early next year. DH pointed out that the ‘one defect size fits all’ approach is flawed and industry needs to move to a fitness for service approach. JB reminded the group that inspection may cost more than the cylinder in the future so we may soon get to a position where it is cheaper to scrap than examine. RI went on to discuss the ISO work in more detail, the use of FE and calculation to arrive at a reject criteria curve with the axis % of wall thickness against length of defect. JB said this was a good starting approach but will need to do more as cylinders start to age etc. The user needs to be aware of his responsibility for cylinder safety throughout the cylinders life. SD pointed out that this was a risk assessment on each cylinder application.

JB said that chain pitting was not covered in detail – RI said that the Italians had bought this issue to ISO and will be included in the ISO report for comment.

JB again pointed to ‘severe corrosion’ this was not defined. Other report comments will be appended to these minutes. A bespoke UT system must be the way forward but cost may make this unviable. RI reminded the group that BOC experience is that

UT rejects hugely more cylinders than hydraulic test and that the UT failures are generally all justified. The HT failures are mostly leaks.

JB said that current cylinder UT with 10mm probe on 8mm raster misses 50% of the cylinder wall. RI said that his system covers 100% of the wall, this was guaranteed by the UT manufacturer. JB went on to say that a 45-degree defect is most likely to be missed. JB says that the standards are incorrect and in need of revision, GG supported this view and said that his report covers this. JB has just completed some work to get 100% wall coverage with UT and had to reduce probe size to 4mm and greatly decrease the raster-scanning pattern. GG said that the spread of frequencies and probe sizes would lead to mistakes. RI said that now only a 45-degree probe can be used. GG said that more guidelines are needed to produce procedures that will give full UT coverage. RI said that the new standard would come out now but that the UK should seek an early revision. GG said that the manufacturing UT standard has been used for in service inspection and this is not the correct approach – HSE had just reported on the use of EN1714 for in service inspection of pressure plant and found 6 serious short falls that need to be addressed by all users. GH proposed a small WG to get comments forward to BSi. The group will involve GG, RI, JB and GH and RI proposed February. GH pointed out that he had to have a foot operation in that period but that a meeting could be held at his house. **Action 9-3 GH**

### **5.3 Ring testing**

AW gave a video presentation on cylinder pre fill checks. An 11-cylinder bundle was being filled and failed at about 200bar, about 10 years ago. There had been 3 people nearby at the time, no serious injuries. This led to the hammer test being used throughout Air Products. AW said that this test does work, it does find heavy corrosion but it may miss lighted/smaller defects. Air products still do this test on every cylinder.

The video showed a test of ring testing a mixture of faulty and good cylinders. The ring tone will vary with many factors but all good cylinders should give a clear ring. It went on to show the level of corrosion on each rejected cylinder. All of the cylinders had passed hydraulic test and would have gone back into service had the ring test not been carried out – clearly active corrosion could have led to failure.

DH asked if this would find cracks – AW said no and neither would it find chain pitting etc.

RI said that RPVs are now used by the industry to restrict internal corrosion.

GG pointed out that similar acoustic methods are routinely used in the aerospace industry. AW said that this was tried at one time but it was found that the hammer was the preferred route for Air Products.

RI stated that the test would not pick up 5 litres of water in the bottom of a cylinder.

GH asked if the sound had been digitised. MD said that his R&D were looking further at this and would report back later. **Action 9-4 MD**

#### **5.4 MoD report**

JB said that his sanitised report is not yet available but will be forwarded on to JJ once it is in the correct language. Action remains. **Action 8-8 JB**

### **6.0 Project updates**

#### **6.1 Corrosion project.**

JB reported on the 12 cylinders he had taken from the project to do independent NDT. He said that he had to produce a 4mm probe and a shaped shoe to give complete contact and full coverage. He showed superb thickness images of each cylinder. In some cases there was significant wall loss. The major damage was shown to coincide with cleaning fluid, with the unpressurised cylinder being the worst effected – a minimum thickness of 1.92mm was recorded.

JJ needs to confirm the cleaning fluid used in these tests and analyse the contents. GH questioned if other cleaning fluids would put cylinders at risk or if only one type of cleaning fluid is the problem. **Action 9-5 JJ**

RI said that we would need to inform BLRA of these findings and what needs to be done by the landlords. AW cautioned that RPVs maybe being damaged by the cleaning fluid. RI pointed out that the pre fill checks on the RPV is a better way forward. RM said that the valve manufacturers must take this into account and design against damage by cleaning fluid.

JB said that he will now put these cylinders through acoustic emission testing to see if it shows up cracks – this can be done using mon-pac type technology and will differentiate between cracks and corrosion. He will use cylinder 18 as a control cylinder and carry out a burst and also burst one of 20, 21 or 22 as a second burst. Other cylinders will be AE tested up to working pressure. **Action 9-6 JB**

JB issued copies of his interim report to the meeting.

#### **6.2**

JJ said that PB supplied data for the cylinders supplied to the project by GCS. She said that, due to the HSL move from Sheffield to Buxton, this data had been had not been located. RI asked that the data be appended to the minutes of this meeting once they have been found. **Action 9-7 JJ**

JJ had found scale on the inside of some cylinders but this scale was broken in places with pitting beneath. The scale is thought to slow down initial corrosion but then to accelerate corrosion once it had started.

### **6.3 Sambre/Loire cylinder**

MD reported that his metallurgist has a very heavy workload at present and has not yet completed the work. Action remains. **Action 8-11 MD/JJ**

## **7.0 Other updates**

### **7.1 Ovality of Nam Yang cylinders**

PB stated that work has continued in this area and the work is being put together and will be made available to the working group.

GH reported that he was carrying out further investigations on the ovality of the cylinders and also the role of the Approved Inspection Body at the time of manufacture. RI said that he saw the Approved Inspection Bodies were often too close to the manufacturer and this needs to be changed.

GH stated that the design approval has just looked at passing performance tests and good design features are being missed. RI agreed with this and said that things look set to get worse as ISO move more towards only performance testing. SD said that he is often faced by this and it is difficult to work above the standard requirements.

RI said that with tube made cylinders he had seen failures at 18 cycles and others of the same design going up to 12000 cycles. Control is very difficult when a Notified Body has approved the design. The standards need to be more specific on how to carry out the prototype tests and how to select truly representative cylinders.

GE related a recent incident on some cylinders where the neck had not been correctly formed but this had been missed by manufacturer and Notified Body.

SD called for a Notified Body forum. GH said that this was proposed for the commission and that GH had proposed a smaller forum for the UK.

### **7.2 TPED Guidelines/Standards/NB issues**

GH outlined the UK papers to take to the next TPED experts group.

GH outlined the technical codes being produced at this time.

GH stated that EN1440 does not require blocked valve testing and HSE will be writing to BSi to correct this deficiency.

### **7.3 Enforcement**

GH stated that he had visited a filling plant/test house in Birmingham and had advised the area office to issue an improvement notice on both activities.

### **7.4 Shipping DoT cylinders**

RT had reported to GH that he was working on this. RI asked that this is dealt with as a matter of urgency. JB said that other member states have recently said that there is a problem and that DfT will be working on a multilateral special agreement.

**Action 9-8 RT**

### **7.5 Course and Seminars**

RI reported on an EIGA seminar on oxygen compatibility. Papers are available.

DH stated that the IMechE seminar had taken place on 25 May.

GH stated that HSE had carried out training for one district council, which had been very well received. The course was available for other Local Authorities.

SD reported that he had given a presentation to the CGA at a Speciality Gas Seminar 2<sup>nd</sup> –3<sup>rd</sup> November in the US about European Legislation.

### **7.6 HSE Website update**

GH reported that the website now includes the minutes of this meeting and the pressure drum WG meeting. RI requested that the group checks minutes before issuing to the web and GH said that he would allow a 2-week period after first issue before forwarding to the web.

### **7.7 Future of Cylinder Working Group**

GH outlined the current position with HSE/DfT as Competent Authority. It is expected that GH will stop doing this work as from 01/07/05 but it is not yet clear who will be the technical expert for gas cylinders. GH will be redeployed in COMAH safety work.

JB said that he would not wish to see this group disbanded and it should continue without GH if necessary. RI supported this view.

### **7.8 Incidents**

AW reported that a CO<sub>2</sub> cylinder leaked on fill. It appears that the RPV is gummed up and therefore allowed liquid to pass into the cylinder. Cylinder suffered from general

gross corrosion and failed at 180bar on a burst test. MD reported that he is looking further at the valve and will report back to next meeting. **Action 9-9 MD**

GH reported that an RPV manufactured by GCE to batch 0303 had failed at fill and that he was awaiting a report on this. GE said that the batch should have been 0203. PB and RM said that the letter from GCE stated that 0303 should not be filled. The manufacturer will clarify this.

RI reported on the acetylene cylinder incident in Ireland – the operator was transferring acetylene into an oxygen cylinder when explosion occurred. RI stated that it has been shown that there was no fault with the cylinders involved.

RI reported on a German incident with hoop wound composite cylinders where a cut in the winding had led to failure. The cut was big and should have been seen at the time of fill inspection. AW said that he agreed with RI and that this is a defect that should have been spotted.

## **8 Any other business**

Action remains with Richard Wilson from last meeting.

GG asked for an update on the list of attendees.

**Action 9-10 JJ**

## **9 Date of next meeting**

26<sup>th</sup> April 2005 at HSL Buxton. 10.30 start.