

Minutes of 7th Meeting of the HSE Gas Cylinder Research Steering Committee

**13 January 2004
HSL Sheffield**

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)
	Gordon Newscombe	(GN) Part
	Bill Geary	(BG) Part

Apologies received from

Andy Webb	(AW)
Micheline Howarth	(MH)
Oliver Crichton	(OC)

The chair welcomed DH from Calor Gas.

2.0 Minutes of 6th meeting

Numbering of section 7 and 8 was incorrect on page 6.

7.5 should say 'HSE standards work'.

3.0 Actions from minutes not covered elsewhere

6.5 ISO11114-4 – HSL to attend meeting as expert. This was not found to be possible. RI updated the group on progress with the draft standard. USA did not like the two European tests so they carried out comparative tests but this was not done correctly. Working group could not accept the results but chairman has decided to go to vote. This may cause confusion and may lead to an unused standard. Chair of TC58

needs to work with WG to find a way forward before any formal vote.

Action Closed.

4.0 Updates since last meeting

4.1 Rapid fill rates.

RM has carried out some preliminary tests on rapid fill rates and showed a presentation of temperature gradients. 6 thermocouples were fitted to each cylinder during fill. 30/70 mix was used and showed about a 15 degree centigrade temperature differential between the neck area and the cylinder base. Filling took about 40 seconds. Next a 50/50 mix was used and finally a 60/40 mix with little difference in temperature profile. A 1974 drop test report on cold cylinders was made available to the group. This showed no evidence of embrittlement. RI said that RMs work proved that there was no issue with rapid fill rates. Presentation is attached to these minutes.

Action closed.

4.2 RPVs.

JJ reported on progress since the problem was first identified and then went on to explain what has been found since the last meeting. Reported SCC found on 5 threads roots from one plug. JJ went on to look at 393+ plugs that had been supplied by RM. These had corrosion product evident. One plug fell apart on disassembly – SCC found on 7 threads – some near full plug width. JJ reported that 1.2% of plugs had a problem. JJ reported on a 17mm plug that was jammed in by corrosion product. This allowed a path around the non-return shuttle back into the cylinder. Hydraulic test proved that the RPV was inoperative. This allowed ingress of corrosive medium to both sides of the hexagon. JJ reported that the 14mm threads were not protected by locktight whereas the 17mm threads generally were – this could point to reasons for more SCC on the 14mm design. It could be that the 03/01 batch of 17mm design may have had a different or insufficient locktight but this cannot be proved. GE was not convinced that the full picture had been explored and he was not convinced that the atmospheric ammonia was sufficient. RI also said that he did not see this as the route cause. GH explained that we already knew that we had high stresses and this now showed that we could get ammonia to the high stressed area. This stress was made higher by the stuck RPV pin that gave a higher spring stress than the design allowed. The pin would be pushed in at time of fill and, if corrosion product were present, would not return to neutral position after fill. Ceodeux need to look at design to see how to prevent the plunger sticking in normal use. DH said that in his experience Ceodeux did not design springs but allowed them to develop by experience. SD said that spring heat treatment might have been an issue. RI said that JJ should analyse any deposits to see if the cause of the plunger corrosion could be found. After

Action 7-1 JJ

RI suggested that powder-coating technology could be used to prevent the corrosive products reaching the valve components. GH suggested that RM keep an eye on the

stainless steel modified cassettes to ensure that no corrosion is occurring.

Action 7-2 RM

RI suggested that EN849 should include a test for SCC. The cassette must also remain captive at the time of any anticipated failure.

Action 7-3 RI

5.0 NDT

5.1 Acoustic emission.

JB had nothing new to report at this time but work will push on after the EIGA Symposium next week. GH to visit Aberdeen to see trials.

Action 7-4 JB/GH

GH reported that the main AE project is progressing slowly but that the gap analysis has been completed. This has led to a testing matrix.

GH suggested that at the next meeting we should be in a position to discuss a proposal to fit up AE rigs in test houses and filling plants.

RI suggested that vehicle fuel tanks are looking closely at AE as a sole test method. DH said that he had looked at AE for storage tanks using passive fire protection but had discounted it.

5.2 NDT Research.

GG has not yet visited JB or Chesterfields so cannot complete his work yet. Report will focus on NDT at time of fill and at periodic examination it will also touch on manufacture. The report will look at existing standards and how industry uses these. It will then go on to make recommendations on improvements. GH asked DH if he would be interested in giving information into the project. DH suggested that LPG would not be interested in NDT at this time. GG to complete the visits and issue a draft report before next meeting. GG said that some of his NDT tests have found neck defects and that there is scope for further testing.

Action 7-5 GG

RI said that he would send GG the latest draft of the revised ISO6046 that gives the DOT exemption method for UT.

Action 7-6 RI

6.0 Project updates

6.1 Corrosion project.

JJ reported on progress since the last meeting. All cylinders are now out of storage. Liquid samples have been taken from each. All 140mm diameter cylinders have gone through BOC NDT – 12 failed. Liquid metallic content was analysed of a range of cylinders. This showed most metallic elements for cola and tonic syrup. The pH was found to range from 1.62 for cola to 13.95 for cleaning fluid. Gas samples were taken

to look for hydrogen, all were less than 0.01% v/v except tonic water unpressurised cylinder 22 of which showed 40% v/v.

Each cylinder was weighed after drying. No significant weight loss but weight gains thought to be oxidation.

JB is waiting for the AE kit to be freed up and then he will continue with the testing.

Action 7-7 JB

GH said that the results of this work can be used to revised BCGA advise on beverage gases and the free leaflet to pub landlords that was developed by BCGA and BBPA a few years ago.

Action 7-8 SE

RI asked JJ to find the minimum wall thickness of the new cylinders so that this could be compared with the final thickness posttest.

Action 7-9 JJ

6.2 300 bar cylinders.

RI attended the EIGA meeting where Worthington Cylinders presented a paper. It was agreed that AW would circulate the paper around the group. RI said that the results contradicted the industry expectations that show that there is very little difference with corrosion rates at higher pressures. JB said that in his experience corrosion rates do increase with increased pressure.

Action 7-10 AW

JJ needs to assess the presentation and comment on validity of the work.

Action 7-11 JJ

7.0 Other updates

7.1 Hydrogen.

GN of HSE HID CD5 joined the meeting along with BG of HSL. GN explained his background and RI told him the WGs remit with the possibility of 850 bar cylinders being used. ISO11114-4 is still being developed and RI reiterated the need for a UK expert to attend the next meeting. Industry needs this standard to allow it to move forward into the new technologies needed. DH asked about the type of cylinders to be used. RI said that they were hoop wrapped aluminium at present but the aluminium was showing creep problems. Future could be either plastic lined or stainless steel lined and composite wound.

GN gave a short presentation 'Hydrogen, know the hazards, control the risks'. An HSE guidance document on the hydrogen economy will be issued in February.

Further guidance on the storage of hydrogen should be published in Q4 2004.

The future shows much less control of hydrogen than that presently seen so the challenge is how can hydrogen be used safely in less controlled situations.

GN suggests that it may be 25 years before hydrogen is the only answer by which time the issue of hydrides versus compressed gas would have been solved.

Bill Geary said that HSL had a core research project to look at the whole hydrogen economy – storage, transmission and use. They also have money to look at gas

cylinder material issues. RI asked if HSL could look at the ISO11114-4 type B test where only 3 rigs exists in UK at the present time – one of which could soon be out of commission.

7.2 Test house competent person training.

JB said that MOD would look to develop their own training schemes. The scheme will be developed by MOD experts and then gain certification by a Notified Body. For Industrial gases GH said that he had met with TWI and GE and that due to cost implications it was unlikely that any small test houses could afford to become HSE approved in July 2006. Therefore no further work is proposed.

DH said that UKAS WG EITAC was looking at creating a new RG0 that would look at methodologies for assessing the full competence ranges. This would need to be appropriate for ranges of products from LPG cylinders up to complex chemical plants and would allow an appropriate level of assessment. GH sits on the working group.

7.3 Enforcement since last meeting.

See 7.4 below.

7.4 Chlorine valves.

GH explained that some chlorine valves in service were made to a 1961 standard post 1992 and that these had not been type tested to BS4341 or EN849. Type testing was currently underway and the results will dictate the next stage of enforcement taken by HSE.

RI suggested that chlorine could have one-use valves. GH agreed that this was possible and that he would look at any proposed technical code issued to HSE in accordance with the TPVR and in accordance with 6.2.3 of ADR.

7.5 Pressure drums – inspection at time of fill.

GH said that the HSE website now has listings of time of fill standards to which has been added the time of fill inspection for pressure drums.

A WG has been formed which will look at periodic examination and go on to look at ageing mechanisms.

RI stated that it was not reasonable to look at the base of cylinders at the time of fill. He went on to say that it was more dangerous to turn a cylinder over than the dangers posed by crevice corrosion. EIGA are proposing a new form of wording that may be acceptable to HSE. GH may carry out some more inspections of LPG cylinder bases to see if crevice corrosion can be found without external footring damage/corrosion. He said that he was currently awaiting data from Flogas.

7.6 TPED Guidelines/Standards/NB issues

GH highlighted the last TPED guidelines meeting in Brussels. 8 new guidelines have been issued. GB has put forward 3 draft guidelines to the next meeting in February. These include PI insurance and categories for Notified Bodies.

The only standard approved during this period was HAB01 for hot air balloons.

7.7 LPG/welded cylinder issues.

LPG issues re footrings was discussed above.

DH mentioned user refillable LPG cylinders. GH said that static with composite cylinders has been proven as a real issue and he went on to say that these cylinders couldn't safely be used in GB without detailed engineering solutions.

7.8 Hydrogen sulphide valves.

GH stated that one valve had leaked significant quantities of H₂S at a client after its 5-year periodicity had expired. A second valve had started to leak before the expiry of the 5-year period. GH reiterated the need to control the populations of class 8/6.1 gases and table 3 of P200. RI said that BCGA were still looking at this issue and hope to offer a way forward in the very near future.

8 Any other business

- 8.1 JB asked if GH could visit MOD to discuss transport of DOT cylinders across Europe.
- 8.2 RI asked that GH attend the next BCGA meeting. PB said that this WG was impacting on the BCGA work and RI asked that these minutes be circulated around BCGA.

9 Date of next meeting

The next meeting was scheduled for 20 April 2004 10: 30am, at HSL Buxton