

Minutes of 5th Meeting of the HSE Gas Cylinder Research Steering Committee

19 June 2003
HSL Sheffield

1.0 Attendance

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| 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) |
| | Peter Bates | (PB) |
| | Andy Webb | (AW) |
| | Janet Joel | (JJ) |
| | Oliver Crichton | (OC) |
| | Simon Davies | (SD) |

Apologies received from Michaline Howarth(MH)

2.0 Minutes of 3rd meeting

Incorrect spelling of 'ask' in 3.1.

'BOC' replaces 'some fillers' in 4.1

5.3 should show that the MOD approach is risk based.

7.1 replace 'Training Committee' with 'Membership, Qualification and Education Committee (MQE)'

3.0 Actions from minutes not covered elsewhere

3.1 Action 3-10. GH reported that Transport Canada had just circulated the Symposium papers via CD. The index and ordering information is attached to these minutes. **Action closed.**

4.0 Updates since last meeting

4.1 JJ reported her findings on the nitrogen content of the material for the Vitkovice 30 litre mixed gas cylinder. RI suggested that the values of 0.0062% were acceptable out should not have caused problems with the steel.

- 4.2 RI reported that Vitovice had contacted him and that they had expressed concerns over the roll of this committee and the analysis carried out by HSL. GH agreed to write to Vitkovice to ask for their concerns in writing. **Action 5-1 GH**
- 4.3 Jan can you please add something here on the rapid fill **Action 5-2 JJ**
- 4.4 JJ gave a presentation on the on going investigation into the Ceodeux valve failures and showed that markings on the hex nuts could not be put down to operator abuse. She also discussed cleaning processes but the group decided that this was not a worthwhile line of enquiry as the cleaning fluid was not batch specific whereas the failures appeared to be.
- 4.5 RM gave a presentation on the work Capsis had carried out for Messer on two recent failures from batch 02/02. This showed very high lead peaks on the fracture surface. RI commented that it was known that lead could form into layers in the material matrix and when this lead weakened surface aligned with a high stress then failure was almost inevitable. AW confirmed some earlier failures with Ceodeux that showed a lack of control over brass manufacturer and said that Air Products were very careful to specify exactly how their brass was to be made to avoid inaccuracies in homogeny. RI discussed the probability that lead carbonate may be present on the surface of the failed parts after seeing a dark area on previous slides and suggested that the golden areas may be lead enriched. GH asked JJ to carry out surface analysis of three failed cassettes to see if high lead levels were present. GH also reported that GH and JJ were to visit the BOC valve expert, David Birch, next week to gain from his experience. GH stressed the importance of completing this work as soon as possible and said that the final report would be made available to all but that HSE/HSL were not to be called as experts in any civil actions that might follow the release of the report. **Action 5-3 JJ**
- 4.6 RM reported that the newer batches of RPV had a modification from Ceodeux to replace the brass cassette with a stainless steel cassette. GH had expressed concern that failure may occur elsewhere in the modified valve and Ceodeux were now undertaking prototype testing with Appragaz. RI stated that any halogen-based cleaners must not be used on stainless steel – it is assumed that Ceodeux understand this.
- 4.7 RI reported that ISO11114-4 on hydrogen compatibility had been discussed at Bsi and that the late comments from HSL had been included in the UK response to ISO. The WG7 are due to meet in November to discuss this draft further. HSL may wish to consider sending Roy Parrott to that meeting. **Action 5-4 JJ**

5.0 NDT

5.1 GH reported that the ISO AE for gas cylinder standard had been discussed in Munich and that all of the UK points had been taken up. GH therefore felt that there was no need for further work on testing the ISO at this time. JB said that he had some

extensive research on AE for gas cylinders that would significantly change the application and analysis of AE results. The work was nearing completion and is to be reported to EIGA at the January meeting. JB stated that GH should see this work sooner rather than later

Action 5-5 JB

5.2 GH also reported that HSE were carrying out a large AE project that looked at AE for pressure systems. The approach was to have a decision tree followed by a gap analysis, which would lead to work to fill gaps. Then testing the final decision tree would lead to Industry Guidance. This may be useful for the Gas Cylinder community. GH also asked if a further project could be the fitting of AE equipment at a test house and at a filling centre and there was support for this idea. JB said that any such proposal should wait until his research was finished as it could influence the type of equipment specified. GH suggested that this was discussed with JB and IMES in combination with action 5-5.

5.2 GG gave a presentation of his NDT work to date. The presentation is attached to these minutes. The committee made it clear that the scope of GGs work should be limited to seamless cylinders at present but GH notes post meeting that there may be a need for more work on the inspection of pressure drums at a later date. RI agreed to send GG the latest draft of ISO6406 as it relates to UT.

Action 5-6 RI

There was discussion on the advantages of drilled side holes and slots over flat-bottomed holes and GG offered a short paper on the subject for RI to use at the next ISO WG meeting in Geneva on 7 July.

Action 5-7 GG

JB offered to let GG use some MOD data on testing of cylinders.

Action 5-8 JB

There was some discussion on the approach to defect tolerance, sizing, moves towards higher stress levels and the need for more risk based approaches to design construction and periodic examination. It was clear that JB already took a risk based approach based on the environment and operating conditions of critical plants and high lighted the need for the operator to know the critical defect sizes for each cylinder. GG showed a video of an endoscopes examination of two cylinder necks. Images were clear but it was agreed that these could be improved by the use of colour and by different lighting conditions.

GG agreed to visit BOC, GCS and Chesterfield cylinders and GH suggested that he may also wish to visit a non-UAS accredited test house.

Action 5-9 GG

5.3 GH reported that Jackson and Kaye had two drums on site and would be carrying out a detailed analysis of their condition. Both drums dated from the mid 1960s and appeared in poor condition externally although they were still in traffic. GH had concerns that they were made to pressure vessel codes that did not take fatigue into account and that the materials might not have good impact properties at -20C. GH suggested that, dependent upon the legal position, GE could report his findings at the next meeting.

Action 5-10 GE

6.0 Project updates

6.1 OC reported that half the cylinders were still pressurised and that he had found an error in his pressure monitoring calibration. The general mixed gas pressure was 200 bar with a peak at about 220 bar and the carbon dioxide was at 50 bar with a peak at 55 bar. The maximum temperature found inside the containers so far was 27C. It

was agreed to leave these cylinders until their anniversary and then to terminate the test.

Action 5-11 OC

JJ reported that the cylinders taken off test had been emptied, washed and dried and stored ready for further work. She also reported that Tonic Water appeared to contain the most corrosion products. RI stated that to ensure good preservation an N2 blanket and plug should be fitted to each cylinder. He also suggested that each cylinder undergo a thickness survey to give an indication of remaining wall and that this information is circulated to the group by e-mail.

Action 5-12 JJ

JB offered to put the cylinders through AE testing.

Action 5-13 JB/JJ

6.2 GH reported that the initial grinding project had been completed but that he had asked HSL for a proposal to carry out more work. The proposal had not yet been completed but it was expected to include cyclic loading of a ground area. GH reminded the group of the wording in the HSE free leaflet where it is stated that HSE sees no justification for grinding markings off a cylinder and that obsolete markings should be 'XXX' out. GH will continue to press HSL

Action 5-14 GH

6.3 AW stated that EIGA were to discuss the 300 bar project the following week. JJ gave AW a revised proposal with full costing. The costs included a risk assessment, which GH said HSE would pay. The proposal clearly required equipment, gas, NDT etc free of charge but did include all of the work at HSL Buxton and Sheffield. AW to report back to JJ results of EIGA meeting.

Action 5-15 AW

6.4 RM reported on 33 burst disc tests, which did not show any fatigue for nickel discs. However there were concerns that some discs failed in excess of their burst pressures and it was felt that there could be work hardening. SD said that copper discs may show fatigue but this has not been tested. GH said that he was pleased that there was now a valve maintenance standard which should push towards disc renewal at periodic examination. It was decided to close this work now until any group member could show evidence that either work hardening or fatigue had lead directly to a dangerous occurrence.

6.5 JJ reported on the fatigue tests at Chesterfield where oval cylinders 4.2 to 5.6% oval were put through cyclic loading. One cylinder failed at 11927 cycles and the defect was shown to be a fatigue crack from the inside bottom radius 42 mm long and through wall. Two cylinders were burst after 12k cycles, one burst at 670 bar and the other at 595 bar. RI suggested that this proves that ovality is not a problem with gas cylinders although GH notes that this is not a statistically stable sample. AW said that control of manufacturing was difficult in the Far East and SD suggested that the NB should be on site during all production periods. RI further said that Nam Yang had consistently proved that they had no control over their heat treatment procedures. RI said that BOC were now carrying out checks on all new batches of cylinders to control manufacture and any tests that were not in spec resulted in the full batch being returned to the manufacturer. SD asked how HSE were going to protect the UK from these sub standard cylinders.

Post meeting GH discussed PB application for a derogation from CDGCPL2 for Nam Yang out of spec cylinders with Rose Court and there was nothing in law that allowed such a derogation to be granted. Therefore the ban on any Nam Yang cylinder more than 2% oval must remain.

7.0 Other updates

7.1 Training was again discussed. JB reported that RG3 was a good document for the assessor but was of no use as a training document. GG had raised the issue at MQE where the committee was looking at apprenticeship schemes but it was thought that the NDT companies were not the experts on gas cylinders and so may not be in the best position to train competent persons. RI asked if UKAS could set up a training scheme and GH said that he would bring this up at a meeting with UKAS. JB said that he was looking to Devonport for the training of his competent persons but that this would not help smaller players trying to break into the market such as MH. There would appear to be an opportunity here for a competent training scheme and as HSE will require approved competent persons by July 2005 GH would explore this further and report back at the next meeting.

Action 5-16 GH

7.2 PB reported that BCGA would be replying to GH concerns on cylinder management and GH reminded the group that the Consultative Document addressed this issue and so replies should be sent to Rose Court.

7.3 GH reported that the following standards and specifications had been added to the approved lists TPVR, Both or parts as appropriate and users should check the entries on the HSE web site at www.hse.gov.uk/signpost then go to 't' and then to 'transportable pressure equipment'. The latest editions are :
CD01 for fire extinguisher cartridges and extension to EN1975 to below 0.5 litres. GH reminded the group that the CDGCPL2 approval expire on 01/07/03. The main concerns from industry centred on the composite standards and non-refillables. GH noted that he had agreed with RI to maintain HSE-AL-HW1 until the end of October but post meeting it appears that Rose Court will not maintain the Approved Inspection Body beyond midnight on 30 June 2003.

7.4 GH reported on enforcement issues that centred on poor filling practices within the LPG industry.

7.5 GH reported that he had found two instances of mixed gas cylinder to 84/525 that were marked for mixed gas but had a fill of 200 bar and test of 300 bar. TUV Sud Deutschland certificated both. One batch was from Vitkovice and the other from Beijing. Vitkovice admitted their mistake once they were told that mixed gas was at least 30% CO₂. The Vitkovice cylinders were derated to 175-bar fill and the Beijing cylinders were put into N₂ service.

7.6 GH reported that pressure drums in service in Refrigerant gases in GB were not complying with the Regulations. AW said that the problems were well known since 1991 and that it had been agreed that the only way to prove if a drum had been in service in the UK prior to 1991 was to have documentary evidence. GH reiterated that he was concerned at the state of the drums seen at Jackson and Kaye earlier in the week and discussed the need for a standard for inspection at time of fill. RI said that this was a good idea although other countries may need convincing and invited GH to submit a draft to Bsi.

Action 5-17 GH

7.6 GH reminded the group that the consultative document did not address the deferral agreed in Brussels for Pressure Drums and Bundles of cylinders and further informed the group that HSE planned to allow compliance with ADR for drums from the date of the new Regs.

8 Any other business

- 8.1 GH noted that the H2S cylinder valve investigation had been completed and that the condition of the valve was of great concern. The cylinder was an ICC3AA and should not have been in the UK at the time of failure. The report again highlights the need to properly maintain cylinder valves at the time of periodic examination.
- 8.2 EO enquired about the filling ratios that would be applied to LPG cylinders under the TPED. GH explained that HSE could not adopt BS5355 but would be looking for Industry specific code of practice for National filling ratios only and the HSE would approve these. GH suggested that he would look favourably at filling ratios based on BS5355 but did not rule out the possibility that Industry may need to rethink some of these ratios.
- 8.3 GH discussed a letter received from a composite cylinder test house that wanted to know why the periodicities had been increased from 3 to 5 years without a full 15 years of experience. RI stated that the ISO periodicity was set at 5 or 10 years. GH mentioned that the UN had not adopted this but had left the periodicity to the Competent Authority. JB suggested that an external examination should note any composite damage. GE said that in Fire service these cylinders could be badly treated. GH suggested that inspection at time of fill is the key and would respond to the writer asking for any specific incidents that should lead to a reducing of the periodicity. **Action 5-18 GH**

9 Date of next meeting

The next meeting was scheduled for 10: 30am, 18 September 2003 at HSL Buxton