Cyfoeth Naturiol Cymru Natural Resources Wales

Compliance Assessment Report

Report ID: CAR_NRW0035655

This form will report compliance with your permit as determined by an NRW officer					
Site	Newport Steam Reforming Plant	Permit Ref	VP3736EF		
Operator/Permit holder	The BOC Group Limited				
Regime	Installations				
Date of assessment	03/04/2019	Time in	10:00	Out	13:00
Assessment type	Audit				
Parts of the permit assessed	Maintenance				
Lead officer's name	Kemp, Andi				
Accompanied by					
Recipient's name/position	Robert Warren/ Regional SHEQ Manager	Date issued	06/09/2019		

Section 1 – Compliance Assessment Summary

This is based on the requirements of the permit under the Environmental Permitting Regulations or the licence under the Water Resources Act 1991 as amended by the Water Act 2003. A detailed explanation is captured in "Compliance Assessment Report Detail" (Section 2) and any actions you may need to take are given in the "Action(s)" (section 4). This summary details where we believe any non-compliance with the permit has occurred, the relevant condition and how the non-compliance has been categorised using our Compliance Classification Scheme (CCS). CCS Scores can be consolidated or suspended where appropriate, to reflect the impact of some non-compliances more accurately. For more details of our CCS scheme, contact your local office.

Permit conditions and compliance summary	CCS Category	Condition(s) breached
A1 - Specified by permit	A	
B5 - Infrastructure - Plant and equipment	A	
C1 - General Management - Staff competency/training	A	
C2 - General Management - Management system and operating procedures	A	
G3 - Monitoring and Records, Maintenance and Reporting - Maintenance records	A	
H1 - Resource Efficiency - Efficient use of raw materials	A	
H2 - Resource Efficiency - Energy efficiency	A	

KEY: See Section 5 for breach categories, suspended scores will be indicated as such.
A = Assessed or assessed in part (no evidence of non-compliance), **X** = Action only,
O = Ongoing non-compliance, not scored.

Number of breaches recorded	**0**	**Total compliance score** (see section 5 for scoring scheme)	0

If the Number of breaches recorded is greater than zero, please see Section 3 for our proposed enforcement response

Section 2 – Compliance Assessment Report Detail

This section contains a report of our findings and will usually include information on:

- The part(s) of the permit that were assessed (eg. Maintenance, training, combustion plant, etc)
- Where the type of assessment was 'Data Review' details of the report/results triggering the assessment
- Any non-compliances identified
- Any non-compliances with directly applicable legislation
- Details of any multiple non-compliances
- Information on the compliance score accrued inc.
- Details of advice given
- Any other areas of concern
- Any actions requested
- Any examples of good practice
- A reference to photos taken

Compliance Assessment Report: B.O.C. (Eastman Hydrogen Satellite) – VP3736EF, 30th August 2019

Purpose of Compliance Assessment

In July 2018 an inspection was conducted at the B.O.C. Margam plant around maintenance systems, training and competence. The Margam plant oversees (in addition to the main B.O.C. control centre in Brinsworth, northern England) the regional satellite plants – of which the Newport hydrogen plant is one. See CAR1 issued on 27th March 2019. Following on from that inspection a physical inspection was scheduled to assess actual on plant maintenance at the Newport site – the main subject of this CAR1.

Additionally, actions raised in the March CAR1, the operator responses to which, are also assessed in this CAR1.

Lastly, the operator made some comments about some terminology and descriptions in the March 2019 CAR1 – the CAR1 was issued without these changes, so the points raised are briefly covered here.

Previous Actions

The CAR1 issued on 27th March 2019 contained three actions. The operator has responded to each action – that submission will be filed with this CAR1 form. The action responses are summarised below each action.

Action 1 27th Mar. 2019: *Operator to provide additional information on the vent gas header result of 599000ppm (59.9%) hydrogen from 9th Aug. 2018; what would cause this high result and if this relates to a malfunction of the process.* **Due: 31st May 2019.**

Various processes can flow into the vent gas header and the composition varies. When this was sampled (at the time data was gathered for annual reporting) all available storage was taken up, therefore hydrogen content could be expected to be relatively high as gases from PSA and compressor blow down would normally be either fed as supplementary fuel to the reformer, or released from the vent header, so this doesn't constitute a loss of control. **Action closed.**

Action 2 27th Mar. 2019: *Operator to provide a copy of the ISO 14001 registration certificate for Margam.* **Due: 31st May 2019.**

There has been a change in policy for the BOC group with regard to EMS. The Newport satellite site was managed within an overarching EMS certified to ISO 14001 for Margam (and the satellites). The regulator has always accepted this due to the commonality between sites and an overarching EMS in this situation is acceptable. The change now is that not all of the "overarching" sites will be individually certified against the 14001 EMS standard, but there will be UK wide EMS – again the regulator accepts this.

Therefore can the operator send a copy of the latest UK wide 14001 registration certificate.

Action 2 27th Mar. 2019 still open.

Action 3 27th Mar. 2019: *Operator to provide evidence from standards or regulations that explains the 48 month interval for pressure relief valves (hydrogen process plant).* **Due: 31st May 2019.**

The operator has submitted the British Compressed Gas Association, Code of Practice 39, In service requirements of pressure equipment. Appendix 3, Table 3 Protective Devices, provide the best practice maintenance inspection interval – where it is stipulated that pressure relief devices in hydrogen, carbon monoxide or steam service are either 5 or 4 years. BOC are applying a four year maintenance schedule. **Action closed.**

Amendments for March 2019 CAR1

Amended text beginning 4th line, second paragraph after Action 2, should read:

Regional SHEQ Advisors report direct to either the UK and Ireland Safety, Health & Environment or Quality Managers. RW reports to the head of Health & Environment.

The regulations covering pressure systems are:

Pressure Systems Safety Regulations.

Maintenance Inspection Newport Satellite Plant 3rd April 2019

The main permit conditions and directly applicable aspects of the Environmental Permitting Regulations (EPR) underpinning this inspection are:

- 1.1.1 – general management, written management system, including maintenance
- 1.2.1 – energy efficiency
- 1.3.1 – efficient use of raw materials
- 2.3.1 – operating techniques – incorporating parts of the permit application documentation into the permit
- General Best Available Technology principles in design and operation: application of recognised BAT for this sector, environmental protection and efficient use of resources, optimising performance, reducing waste and energy use / losses, controlling emissions

The inspection was discussed beforehand between AK and Rob Warren and a scope of assessment email sent by AK on 26th March 2019 and included: how is maintenance planned and recorded; what standards and legislation are followed; technical competence; KPIs; maintenance intervals; shut down and start up; ancillary tasks such as lubricating and other fluids, seals, valves etc.; overdue jobs; risk based planning etc.

For this inspection Rob Warren (Regional SHEQ Advisor BOC) was present along with Chris Smith (BOC On Site Engineering Support from Brinsworth), Chris Jenkins (Satellite Manager), Andrew Thomas (Shift Manager Margam, but on Satellite fortnight – general duties and issuing Permits To Work) and Dave Green (Hoerbiger – compressor manufacturer and maintenance contractor).

The piece of maintenance activity assessed today was around a routine job on the product hydrogen compressor – this is a significant and vital part of the plant, both in plant operation, safety, energy and production efficiency. As the operator is subject to other regulations related to pressure systems, design codes and process safety, the NRW assessment will focus on whether a BAT demonstration has been made and that the operator remains in control of the plant, minimising emissions, waste and preventing pollution.

After the inspection AK requested several pieces of evidence from the operator (email sent by AK on 3rd April 2019). RW supplied the evidence in an email with attachments on 25th April 2019. The documents attached comprise:

- Risk assessment and hazard identification forms – hydrogen compressor
- Physical and electrical isolation
- Overhaul isolation list
- SIS temperature monitoring and control of compressor outlet gas temperature – proof test and record sheet
- Maintenance system screen shot of compressor and associated assets
- Permit to Work record – no.: 162024

RW supplied some narrative covering:

- BOC staff competency (BOC Margam and Satellites), On Site Support and an outline of how BOC ensures Hoerbiger staff are competent
- Describing the final job sign off safe and complete process

AK took copies of the following documents on the day of the inspection:

- Hydrogen plant Normal Shutdown
- Shutdown checklist
- Normal start up
- Hydrogen plant emergency shutdown

The whole plant has to be safely taken to shut down mode before this type of maintenance can be carried

out, so it is the shut down and start up procedures that are assessed first. These are shutting down and starting up under normal operational conditions. RW supplied the Hydrogen Plant Normal Shutdown, Start-Up After Shut-Down or Maintenance (Normal Start-Up) and Shutdown Checklist. An Emergency Shutdown procedure was also provided.

The normal shut down procedure for the hydrogen plant is dated June 2015 – the document is controlled and author and owner are shown; a review is to be conducted within 5 years. NRW's interest in this document is as part of the overall maintenance and management system, just the fact that these documents are controlled, easily retrievable and up to date should give the regulator some confidence. The particular steps or aspects that are relevant under EPR and BAT include: reducing feed rate; controlling the temperature of the reformer outlet; ultimately turning off raw material feed; preventing condensation; step by step flow and temperature reductions; purging with nitrogen; turning off natural gas compressor; coolant and boiler water pumps off; fans off; isolate hydrogen customer line. A complementary checklist must be filled in by the technician.

Once this maintenance activity has been completed, the plant needs to be started up again – after routine planned overhauls / maintenance, this is considered a normal start up. This procedure is considerably longer, there being many more factors and parameters to be monitored and confirmed before the next stage is commenced. The main things NRW can pick out are that the temperature of the plant as it progresses through start up is critical; the order of feeds entering the plant is also critical; utilities must be at their usual set points (nitrogen pressure, cooling water etc.); flow and pressure controllers must be at their set points; isolation valves in normal positions; burner system trips, set points and override; purge vent system; boiler feed water; introduction of nitrogen; reformer flue system; natural gas fuel; reformer light up; warming the reformer and building steam pressure; natural gas into the reformer; ensuring waste gas recovery system is operating. This is an operation that takes time and staff must be competent – within the document are directions to the Learning and Assessment Guide and self-study and a test on the Traccess system. The learner and assessor must sign the document. NRW has seen other policies and procedures (July 2018 Margam inspection), where the importance of maintenance to safety, reducing emissions and efficient use of energy and raw materials, against the cost of not carrying out risk based maintenance interventions, is a clear priority for BOC – the efficiency and profitability of their plant goes hand in hand with energy and raw materials efficiency.

The emergency shut down is to be deployed if the inbuilt trip system operates as a response to some crucial parameter deviating from the set points. The trip will be activated by the SCADA system, but the procedure covers on site engineer manually shutting down the system – when / if needed. The preservation of safety and the plant equipment is paramount, so the procedure is necessarily brief and includes stopping the hydrogen compressor, shutting off burning systems; turning off feed flows and turning off fans and various control valves in the correct positions.

It can be clearly seen that the operator has controlled procedures for these crucial aspects of site processes. From this, NRW can reach the conclusion that the operator has control of the plant and that control of emissions and resource / energy use are considered and embedded into the national policies and site work instructions.

BOC have produced a risk assessment and method statement to complement the actual shut down and specific technical procedures for the compressor overhaul. The risk matrix is explained and areas covered

include chemicals, biological, noise, environmental, pressure, fire & explosion. For example, the environmental hazard assessment proceeds thus: potential environmental impacts have been identified, e.g. jointing materials, oils etc.; occasional occurrence with low risk; leading to low overall risk; control measures stipulated e.g. following BOC hazardous waste disposal procedure, waste sealed and sent to Margam for storage in designated tanks or skips. This risk assessment line appears to reach the correct risk classification and this can be verified by NRW in terms of the infrastructure on site and the waste storage containers seen on inspections – i.e. impermeable surfaces, known drainage routes. NRW can also assess hazardous waste consignment notes as a future regulatory topic. The method statement accompanying the general risk assessment includes these items pertinent to EPR: isolation of machinery; fitting new seals / gaskets; leak testing; emergency procedure; competence of staff; waste disposal. These procedures, in addition to protecting people and the asset, should also lead to well managed maintenance activities, safe waste handling, preventing leaks, prolonging the life of the asset and leading to efficiency in production. These documents are approved by the Regional SHEQ Advisor.

NRW offers no comment on the isolation certificates issued for this job, other than to acknowledge that such practices are sensible and necessary and should prevent incidents. The isolation certificates, amongst other items, require reference to the relevant P&IDs and relevant permit to work, records the safe position of isolated valves and is signed by the permit issuer and authorised maintenance personnel. BOC also supplied an overall Newport hydrogen compressor isolation list – this contains additional information on which P&IDs are relevant and comments relating to specific isolations, their location, process fluids encountered and the actual nature of the isolation itself, i.e. tagging and locking specific numbered valves.

Going hand in hand with the isolation certificates is the actual permit to work issued for this compressor maintenance job: No. 162024. This makes a link to the risk assessments mentioned above, confirms the nature of the work, e.g. pressure systems, electrical, flammable substances, PPE, issuing times / dates and permit to work monitoring activities through the maintenance period.

Crucial to the safe shut down and start-up of the hydrogen plant and efficient running of the plant, is the monitoring of the compressor outlet temperature. This is regarded as a Safety Instrumented System and thus to claim the associated predicted failure on demand, or ensure such a critical PFD is maintained, BOC / The Linde Group perform a proof test / calibration procedure on the temperature SIS, i.e. temperature switch, safety PLC logic solver and compressor trip contactor. The procedure *NEWPH2-P-TSHH 9103: 3rd Stage Discharge Temperature on H2 Compressor, C-102,* stipulates a 12 month proof test interval and is recorded on a separate document.

To illustrate how maintenance planning and actual work is carried out and recorded, RW provided some screen shots of the BOC maintenance SAP system. On one screen shot the various numbered components of the hydrogen compressor are listed and a sub heading for the associated instrumentation lists the instrumentation components, e.g. asset 30150832 C-102 H2 Compressor > asset 30216429 Oil knock out drum. Under instrumentation, various items are found: asset 30214556 C-102 Instrumentation > asset 30152034 Level Alarm C-102 Oil Tank. Additional screen shots show the interval and nature of the maintenance work for the compressor, e.g. 8000 hrs – this is linked to a Strategy plan 000000224594. On this system the outcome of the maintenance activity, condition, observations, comments, photographs, changes, final sign off etc. are all entered. If necessary P&IDs are amended. Within the procedures ancillary things like the proximity of flammable or hazardous lines or hinderances to maintenance access are assessed and put on the relevant instructions.

In terms of what was seen and who was questioned on the day, the information gleaned (refer to named personnel earlier in the assessment) confirmed:

- Lock out tag out system in operation
- Relevant documentation and permits issued and being followed
- Tag attached to a PSV 9103 confirming inspected 13th Aug. 2018
- Double skin oil tank and glycol IBC
- Chris Smith (Brinsworth) BOC onsite support – overseeing work
- Hoerbiger compressor engineer carrying out the main work
- Andrew Thomas (Margam) on site to issue PTW

One reason for subjecting the compressor to this maintenance intervention is to ensure piston ring seals do not fail – if they do, gases can pass through the cylinder, resulting in a potential fire / explosion issue. The compressor has PSVs in appropriate locations with appropriate pressure set points – controlling pressure is vital for this component. A failed seal on a piston can be picked up by a reduction in pressure, elevated temperatures from piston rubbing in the cylinder and hydrogen detection in the crank case.

In terms of management RW confirmed the following audits:

- The permits to work issued are audited
- This site is classed as a lower risk Category 3 plant by BOC
- It is subjected to a major hazard review programme
- There are operations and engineering audit every 9 years – conducted by a multidisciplinary team, where SAP records and plant components are checked
- KPIs such as natural gas usage verses volume of hydrogen produced; oxygen levels controlled around 2 – 2.5% in reformer flue gas, which corresponds to 10% excess combustion air and

optimum combustion conditions

Additional discussions with RW concentrated on BOC staff competency and contractor competence and the job is finally signed off as safe and complete. RW submitted a written response, which will be filed with the other evidence in NRW records. To summarise though in terms of competence, the main points declared by RW are:

- Time serviced personnel who have been through apprenticeships
- Traccess training and development records
- QA audits conducted on Hoerbiger
- Feedback from BOC staff on Hoerbiger work
- Repeat visits are minimal therefore indicating right first time
- Management reviews with Hoerbiger

In terms of work sign off, the main points are:

- Overarching procedure for work handback is IMS-26-05-RUK: UK permit to work standard
- Remote operators are notified that plant is back on line
- Permit to work cancelled and returned to issuer – the work area to be safe and clean
- PTW issuer and acceptor must inspect the area after work completed
- Isolations removed and lock out tag out devices returned
- Plant must be tested before plant put back into production

Conclusion

In terms of an EPR BAT demonstration on maintenance, competence, records and reviews, BOC have provided sufficient evidence to show that they have control of the plant, consider maintenance planning, efficiency of operation, control of resources and pollution. In addition, the competence of staff is set around a defined framework, where competence is maintained and recorded. Audits and reviews take place covering key processes and procedures.

The operator is encouraged to continue these diligent management practices.

Cyfoeth Naturiol Cymru Natural Resources Wales	**EPR Compliance Assessment Report**	**Report ID: CAR_NRW0035655**

This form will report compliance with your permit as determined by an NRW officer

Site	Newport Steam Reforming Plant	Permit Ref	VP3736EF
Operator/Permit holder	The BOC Group Limited	Date	03/04/2019

Section 3 – Enforcement Response

You must take immediate action to rectify any non-compliance and prevent repetition.
Non-compliance with your permit conditions constitutes an offence and can result in criminal prosecutions and/or suspension or revocation of a permit. Please read the detailed assessment in Section 2 and the steps you need to take in Section 4 below.

Other than the provision of advice and guidance, at present we do not intend to take further enforcement action in respect of the non-compliance identified above. This does not preclude us from taking enforcement action if further relevant information comes to light or advice isn't followed.

Section 4 – Action(s)

This section summarises the actions identified during the assessment along with the timescales for when they will need to be completed.

Criteria Ref.	**CCS Category**	**Action required/advised**	**Due Date**
See Section 1 above			

Section 5 – Compliance notes for the Operator

To ensure you correct actual or potential non-compliance we may

- Advise on corrective actions verbally or in writing
- Require you to take specific actions verbally or in writing
- Issue a notice
- Require you to review your procedures or management system
- Change some of the conditions of your permit
- Decide to undertake a full review of your permit

Any breach of a permit condition is an offence and we may take legal action against you

- We will normally provide advice and guidance to assist you to come back into compliance either after an offence is committed or where we consider that an offence is likely to be committed. This is without prejudice to any other enforcement response that we consider may be required.
- Enforcement action can include the issue of a formal caution, prosecution, the service of a notice and/or suspension or revocation of the permit.

See our Enforcement and Civil Sanctions guidance for further information

This report does not relieve the site operator of the responsibility to

- Ensure you comply with the conditions of the permit at all times and prevent pollution of the environment
- Ensure you comply with other legislative provisions which may apply

Non-compliance scores and categories

CCS category	Description	Score
C1	A non-compliance that could have a major environmental effect	60
C2	A non-compliance which could have a significant environmental effect	31
C3	A non-compliance which could have a minor environmental effect	4
C4	A non-compliance which has no potential environmental effect	0.1

Operational Risk Appraisal (Opra) - Compliance assessment findings may affect your Opra score and/or your charges. This score influences the resource we use to assess permit compliance.

Section 6 – General information

Data protection notice

The information on this form will be processed by the Natural Resources Wales (NRW) to fulfil its regulatory and monitoring functions and to maintain the relevant public register(s). The NRW may also use and/or disclose it in connection with:

- Offering/providing you with its literature/services relating to environmental matters
- Consulting with the public, public bodies and other organisations (eg. Health and Safety Executive, local authorities) on environmental issues
- Carrying out statistical analysis, research and development on environmental issues
- Providing public register information to enquirers
- Investigating possible breaches of environmental law
- Assessing customer service satisfaction and improving its service
- Freedom of Information Act/Environmental Regulations request

The NRW may pass it on to its agents/representatives to do these things on its behalf. You should ensure that any persons named on this form are informed of the contents of this data protection notice.

Disclosure of information

The NRW will provide a copy of this report to the public register(s). However, if you consider that any information contained in this report should not be released to the public register(s) on the grounds of commercial confidentiality, you must write to your local area office within fifteen working days of receipt of this form indicating which information it concerns and why it should not be released, giving your reasons in full.

Customer charter

What can I do if I disagree with this compliance assessment report?

If you are unable to resolve the issue with your site officer, you should firstly discuss the matter with officer's line managers using the informal appeals procedure. If you wish to raise your dispute further through our official Complaints and Commendations procedure, phone our general enquiry number 0300 065 3000 (Mon to Fri 08.00 – 18.00) and ask for the Customer Contact team or send an email to enquiries@naturalresourceswales.gov.uk. If you are still dissatisfied you can make a complaint to the Public Services Ombudsman for Wales. For advice on how to complain to the Ombudsman phone their helpline on 0845 607 0987.

Welsh Language
If you would like this form in Welsh please contact your Regulatory Officer.