Cyfoeth Naturiol Cymru
Natural Resources Wales

Compliance Assessment Report

Report ID:
CAR_NRW0031410

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	03/10/2016	Time in	09:00	Out	17:00
Assessment type	Report/Data Review				
Parts of the permit assessed	monitoring, annual submissions, emergency and EMS				
Lead officer's name	Kemp, Andi				
Accompanied by					
Recipient's name/position	Robert Warren/ SHEQ Manager	Date issued	24/03/2017		

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
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

Purpose of Compliance Assessment

This assessment form covers a number of regulatory activities:

- Pre-operational conditions in the permit relating to EMS and commissioning
- Review of OPRA profile
- Routine annual monitoring submissions
- Actual monitoring report covering Jan 2016 monitoring
- Annual performance reporting
- EMS
- Emergency arrangements
- Maintenance of critical environmental equipment
- Site / organisational KPIs
- Events post commissioning
- Inspections and on site meetings – 11th Sep 2015 & 3rd Oct 2016

The site sits within the main Eastman (Solutia UK) chemical installation footprint, but the BOC hydrogen plant permit extends to giving BOC (Linde Group) the responsibility for the land under their installation. BOC and Eastman liaise with regard to matters around shared utilities, emergency planning and site condition.

This site came about from Eastman's expansion of their Therminols business and the requirement of a more immediate and available source of hydrogen, in preference to an unmanageable number of hydrogen tankers.

BOC produce hydrogen on site, mainly for Eastman (by direct pipeline), but with some off site bullet transfers, by steam reforming of methane – the full process details, plans and drawings are part of the application and indeed part of the permit by virtue of Operating Techniques condition: 2.3.1 and Table S1.2. Natural gas from the network main is the main feedstock, with steam generated within the plant and hydrogen as the product and gaseous effluent emissions. The unit was a former BOC reforming unit and associated equipment that was decommissioned elsewhere and re-commissioned here at Newport. As

such the permit contains pre-operational measures conditions, POM1 & 2.

Hydrogen production using the steam methane reforming process is considered BAT – see Section 2 Ammonia Production, in the Large Volume Inorganic Chemicals BAT Reference document. It is also mentioned in Section 2.14 of the Refinery BRef, but this also refers the reader for a more thorough description, to the LVIC BRef.

The main steps of the steam methane reforming process used in the Newport BOC plant are:

- Natural gas and hydrogen recycle to the feed preheater and heat from reformer flue gases preheat the feedstock
- Natural gas and PSA off gas to reformer furnace firing
- Desulphurisation of natural gas feedstock using catalysts in a two stage process: hydrogen reacts with sulphur compounds to produce hydrogen sulphide and in the second step the hydrogen sulphide reacts with zinc oxide to form zinc sulphide
- Gas feedstock into reformer with steam from the process
- Reformer flue gases generate steam and used in reactants preheater
- In the reformer, the natural gas feedstock is reacted with steam to form synthesis gas: carbon monoxide and hydrogen
- Shift conversion reaction to convert CO from methane reforming into more hydrogen and carbon dioxide in the shift reactor
- Raw hydrogen through pressure swing adsorption to produce >99% pure hydrogen
- Off gases from PSA to reformer furnace

Pre-operational Measures

POM1 – requires submission of the EMS before operations commence on the site. The submission received is section 6.3 of BOC document: Newport Steam Reforming Plant, Documentation in support of an Environmental Permit Application, Jan 2014, prepared by Dr N Ford, ESG Ltd.

The environmental permit requires operators to produce, implement and maintain a written management system, which addresses amongst other aspects, the risks of pollution, operations, maintenance, accidents, incidents, non-conformances, closure and complaints – with sufficient competent personnel and resources – permit conditions: 1.1.1, 1.1.2 & 1.1.3.

BOC state that they maintain environmental management systems in accordance with ISO 14001 at several of their sites.

Action 1 BOC March 2017: Operator to confirm which operations are actually certified to ISO14001 if any. **Due:** 30th April 2017.

The regulator can accept a national EMS where the site operations are essentially the same as long as there is evidence of implementation at the specific site concerned. The operator confirms that the EMS will identify and address key environmental impacts, continual improvement will be aimed for by setting objectives relating to environmental performance, internal monitoring and auditing will take place and responsibilities will be allocated. The EMS is part of an overall Integrated Management Systems and Standards program and is supported by relevant policies, standards and work instructions, covering such areas as process design, commissioning, operation and optimisation, waste management, maintenance, emergency procedures, monitoring and management control. These various procedures are also included in the OPRA profile.

The operations are designed to run with remote surveillance and control from the Margam plant and BOCs central control room in Yorkshire, with weekly attendance and routine and reactive maintenance practices at site. Extra attendance during and post commissioning was provided until the operator was satisfied that the plant had reached stable operational parameters and staff were competent in plant operations.

Certain specific procedures and evidence of EMS implementation and records keeping will be looked at periodically as part of routine compliance assessment. At this point the regulator is satisfied that environmental management has been implemented to a good standard at this site. KPIs will be looked at further on in this assessment

POM2 – requires the operator to provide a commissioning plan prior to operations commencing, which should confirm expected emissions. The operators submissions comprise: The Linde Group Hydrogen Plant Start-Up plan (Nov 2014) and an email off Sean Wright (BOC Lead Project Engineer) showing emissions and other performance factors during the 4 day start up period. The emissions results cover the reformer furnace stack and the vent gas header stack at start up and at 35% load.

The reformer stack emissions are combustion emissions of NOx and CO, the vent gas header releases H_2, CO and CH_4 from the desorption of the PSA bed, most of which are used as fuel in the reformer furnace, with periodic vent header releases.

The ELVs for the reformer stack are:

NOx – 140 mg/m3 – with start-up monitoring @ 61.5 mg/m3 and 35% load @ 61.5 mg/m3

CO – 25 mg/m3 – with start-up monitoring @ 3.15 mg/m3 and 35% load @ 2.8 mg/m3

BAT limits are: NOx (with pre-heat) up to 200 mg/m3; CO (from LVIC BRef) should be <10 mg/m3

There are no limits for the vent gas header.

Further on in this assessment will be a review of two rounds of annual emissions monitoring.

The start-up procedure is detailed and obviously covers safety items and basics such as checking all connections and utilities before commencing start-up proper. Then steps such as purging the system, loading the catalyst beds, introducing nitrogen, warming up the reformer, producing steam and pressure and introducing natural gas to the system.

The procedure covers normal start-up from routine maintenance shutdown as well as initial start-up as part of commissioning. Relevant procedures are referenced and various set points and other numerical parameters are stipulated for the operative to follow, observe and act upon if the system shows adverse or unusual conditions during the start-up procedure.

OPRA Profile

The profile was checked in March 2016 against the profile submitted with the application and it was checked again and put onto the NRW version in January 2017. The only change that affected the base score was the inclusion of NOx air emissions, moving the base score from 95 to 98. The operator has entered the required evidence in the Operator Performance tab and the regulator has cross checked these documents with the application and POM submissions. There is one change that was advised about in March 2016 but the operator has not carried out and that is scoring 5 in Human Occupation in the Location tab, as the site is <50 m from human occupation – meaning Eastman employees, visitors and contractors. This increases the Location attribute score from 13 to 15, but overall it stays within Band D – so this change can be put on by the next OPRA review.

Routine annual monitoring submissions

The operator is required to take annual spot samples of the reformer stack and the vent gas header stack. NRW has received two annual rounds, which should be one for 2015 and one for 2016. The actual monitoring was carried out in January 2016 and a second round in December 2016 – going forward the monitoring should be every 12 months, which NRW confirms is one round each year commencing January 1st, no closer than 6 months apart. This prevents monitoring carried out in December of one year and the following year carried out between January – June the following year.

The results are compliant:

Jan 2016 NOx – reformer = 46.66 mg/m3 (ELV 140 mg/m3)

Dec 2016 NOx – reformer = 74.7 mg/m3

Jan 2016 CO – reformer = 4.86 mg/m3 (ELV 25 mg/m3)

Dec 2016 CO – reformer = 4 mg/m3

The vent gas header stack spot results expressed in were:

Jan 2016 – H_2 – 17.99% (V/V); CO – 0.22%; CH_4 – 1.71%

Dec 2016 – H_2 – 10%; CO - <10(ppmv); CH_4 - <1%

Question 1 BOC March 2017: Is there a reason NOx emissions would be 46 and 74 mg/m3 over the two rounds, but CO levels stayed more or less the same at 4 mg/m3?

Actual Monitoring Report Covering Jan 2016

The operator has supplied the monitoring report from the monitoring contractors who carried out the monitoring of the reformer stack and the vent gas header in Jan 2016. Firstly the results submitted by the operator on the annual air emissions forms correspond to the actual results provided by the contractor.

The monitoring contractor, at the time of monitoring and according to the report, held the appropriate MCerts levels and technical endorsements for stack emissions monitoring. The trainee involved in the monitoring was directly supervised by a Level 2 MCerts colleague. The MCerts competency levels and technical endorsements are items checked by the regulator typically during an OMA audit – at this time NRW accepts at face value that the monitoring was carried out by qualified staff.

The correct parameters were sampled for, using the method stipulated in the permit and in accordance with guidance note M2 index of methods. Stack gas parameters were measured, but the regulator is uncertain about whether there was a correction for moisture and the correct oxygen level. The reference conditions for mass emissions for combustion of gaseous fuels are: 273K, 101.3 kPa, 3% O_2 and a dry gas basis. It may be the instrument used (Horiba PG250) measures on a dry basis. The monitoring location also needs to be compliant with the criteria from guidance note M1.

Action 2 BOC March 2017: Can the operator confirm that the relevant corrections were made to the appropriate reference conditions and that the location of the sampling ports are compliant with M1 in so far as distance from disturbances, bends and exit of the stack. **Due:** 30th April 2017.

Other more detailed assessment of monitoring would take place during an OMA or other desk based assessment of monitoring arrangements and results.

Annual Performance Submissions

Condition 4.2.2 requires the operator to report by the 31st Jan every year the following items:

- a review of the monitoring results
- annual production tonnage of hydrogen
- performance parameters: water use, energy use

The part year 2015 reported 130.6 t hydrogen and for 2016 145 t – at the time of the emissions monitoring the plant was on average operating around 35% load. Energy use is dictated mainly by plant load and the baseline consumption for this type of plant – this SMR plant is BAT. Water use is minimal as would be expected for this type of plant – used mainly for steam raising for cooling and process steam for reforming.

The operator has commented on the monitoring results, even though the parameters are limited in number and frequency, the operator asserts that the results are demonstrative of the plant running typically.

EMS, KPIs & Maintenance

The main indicators the operator has stipulated are in the main related to plant performance economics, but some of these have synergies with environmental performance. KPIs etc. are defined in a specific procedure and are reviewed regularly and monitored daily, monthly or at other intervals. Key items to point out are:

- thermal efficiency of the plant
- oxygen in the flue gas kept to around a 2% level to ensure efficient combustion
- vent losses
- production verses capacity
- plant reliability
- results of monitoring and audits

There is also a procedure relating to developing process safety indicators, which are on a traffic light system with early warning made to senior management. These are reviewed monthly and include:

- trailer bay high pressure trip
- reformer tube temperature
- syngas cooler high temperature alarm
- inspections of natural gas compressor
- calibration of trailer fill pressure

As pointed out by the operator, even within these PSPIs, environmental performance is relevant, for example the reformer tube temperature is critical for production and also maximising production efficiency.

Waste is minimal at this location, but steps have been implemented to minimise production and to handle appropriately hazardous waste, such as waste oil.

Recommendation 1 BOC March 2017: Other criteria that the regulator would assess and expect the operator to cover, would be:

- how many critical maintenance tasks have not been completed on time (lagging indicator)
- how many staff have been trained in environmental awareness (leading indicator)
- have emergency situations and accidents been defined and response / drills been tested (leading)

BOC intend to register the Margam plant to the ISO 14001 standard by 2020 – and NRW accepts that this EMS would cover the Newport satellite plant – see comments about implementation above.

The plant has adequate control both from Margam and Yorkshire and planned preventative maintenance is built into a computerised SAP system. There is sufficient competency and understanding of the process, as you would expect, available to the operator to plan maintenance around critical equipment to maintain efficiency, safety and environmental performance. The operator carries out preventative inspections and is able to react to early warnings and abnormal operations.

Significant maintenance intervention is carried out (plant overhaul) every three years and this along with other more routine aspects are dictated by legislation relating to pressure regulations and explosive atmospheres.

Part of ongoing regulatory work would be to examine the maintenance records around critical environmental kit, for example combustion conditions control logic, containment of hazardous substances, level alarms, joints, valves.

Emergency Preparedness

The Linde Group have produced a BOC Newport Eastman Hydrogen Plant Site Emergency Plan – v1 Feb 2015. The permit requires by virtue of condition 1.1.1, that accident scenarios are managed.

The main points about this plan are that it must be reviewed annually according to internal policy and that it links to the Eastman emergency arrangements. The main potential accident scenarios are fire, explosion, high pressure natural gas release, other gas releases. The plan includes locations of relevant equipment such as extinguishers, alarms and personnel monitors. The contacts from BOC that would need to be called are listed and the roles of site controller and main incident controller are defined and the location of the emergency control centre is stipulated. The procedure also requires the incident to be logged and recorded.

Any accidents, incidents and permit breaches need to be reported to the regulator – see permit section 4.3. Accidents and incidents relate to occasions that are or have the potential to cause significant harm to the environment.

Inspections & Post Commissioning Incident

The site has been formally inspected twice since permit issue: Sep 2015 and October 2016, where site management gave presentations and a tour of the plant and overview of the process. The plant is often also visually looked at when the NRW officer is inspecting Eastman.

No issues have been identified during these inspections and associated areas such as infrastructure, drainage, storage of chemicals, security, plant design etc. appeared all in order. One minor issue which ideally needs correcting is the plan in the operators application and appearing as the site plan in Schedule 7 of the permit, and the locations of the three air emission points:

Referring to the position and colour indicators in the plan, the actual points are:

- vent gas header = black
- deaerator steam vent = blue
- reformer flue stack = green

Future inspections will be made and may include assessment of the monitoring when the contractor is on site; an assessment of the computerised maintenance system; operational control parameters from the on site control system; any hazardous waste records.

The operator did explain that post commissioning one of the reformer tubes had cracked and this required down time. It is believed, that whilst all precautions were taken during rebuild, the reassembly of the unit at Newport led to some minor damage.

Summary

Operator to address the two actions, one question and one recommendation from the assessment.

Action 1 BOC March 2017: Operator to confirm which operations are actually certified to ISO14001 if any. **Due:** 30th April 2017.

Action 2 BOC March 2017: Can the operator confirm that the relevant corrections were made to the appropriate reference conditions and that the location of the sampling ports are compliant with M1 in so far as distance from disturbances, bends and exit of the stack. **Due:** 30th April 2017.

END

Cyfoeth Naturiol Cymru Natural Resources Wales	**EPR Compliance Assessment Report**	**Report ID: CAR_NRW0031410**

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	03/10/2016

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.