

Compliance Assessment Report

Report ID:
CAR_NRW0031694

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

Site	Port Talbot Steel Works EPR/BL7108IM	Permit Ref	BL7108IM		
Operator/Permit holder	Tata Steel UK Limited				
Regime	Installations				
Date of assessment	18/05/2017	Time in	13:00	Out	16:00
Assessment type	Audit				
Parts of the permit assessed	1 Management; 2 Operations; 3 Emissions and Monitoring; 4 Information				
Lead officer's name	Cowie, Douglas				
Accompanied by	Broom, Mark				
Recipient's name/position	Claire Grainger/ Lead Environmental Engineer	Date issued	28/06/2017		

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
B1 - Infrastructure - Engineering for prevention and control of emissions	A	
B5 - Infrastructure - Plant and equipment	A	
C2 - General Management - Management system and operating procedures	A	
D2 - Incident Management - Accidents, emergency and incident planning	A	
E1 - Emissions - Air	A	
G1 - Monitoring and Records, Maintenance and Reporting - Monitoring of emissions and environment	A	
G2 - Monitoring and Records, Maintenance and Reporting - Records of activity, site diary/journal/events	A	
G4 - Monitoring and Records, Maintenance and Reporting - Reporting and notification to Natural Resources Wales	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
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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

Site description

Tata Steel UK Ltd (Tata) operates an integrated iron and steel works at Port Talbot, Neath Port Talbot. The site is permitted as an installation under the Environmental Permitting Regulations (EPR). The steelworks has several identifiable permitted processes which are carried out sequentially across the installation to convert raw iron ores and coal to semi-finished (slab) and finished steel products (such as hot rolled, pickled and oiled, cold rolled and annealed). The permit also covers coke making and the reception, stockpiling and blending of raw iron making materials. Three other companies, Cambrian Stone, Harsco Metals and ICL, undertake separately-permitted slag handling, iron plating and cold mill effluent treatment activities at the steelworks on Tata's behalf.

Purpose of visit/assessment

This intervention focused on bleeder valve releases from Tata's blast furnaces at Port Talbot steelworks. We concluded a review of increased bleeder valve openings that occurred in May and June 2016 and examined the findings from Tata's process safety inquiry into these related events. The root cause(s) of additional bleeder valve releases which occurred in March and May 2017 were also discussed.

Other matters in relation to sinter plant main stack emissions, fugitive emissions from coke oven battery doors and tops and a recent fire at Tata's coke ovens by-products plant were also discussed during this intervention.

The relevant permit conditions are listed under Sections 1.1, 2.3, 3.1, 3.2, 3.5, 4.1, 4.2, 4.3 and 4.4 of Tata's permit.

Person(s) present

Tata Steel

Claire Grainger (all)
Jason Heatman (other matters)
Andrew McGregor (furnaces)
Richard Brown (furnaces)
Andrew Townsend (furnaces)
Michael Launder (furnaces)
Gabrielle Torkington (furnaces)

NRW

Mark Broom
Doug Cowie

Blast furnace process and background

The blast furnace makes iron by reacting iron oxides (ores) with air under reducing conditions at high temperatures. The reaction is a gas-solid one that produces liquid products (and by-

products) and gas wastes. The reactions are carried out counter-currently and it takes between 6 and 7 hours for the raw materials that are added to the top of the furnace to be converted into the molten iron and slag that comes out of the bottom. By contrast it only takes seconds for the hot air blown into the middle of the furnace to exit through the top of the furnace.

For good stable blast furnace operations, gas flow should be up the centre of the furnace with minimal gas tracking up the furnace walls. If gas pressure rapidly builds up in the furnace, there are four pressure relief or 'bleeder' valves that are set to operate at different sequential pressures to protect the integrity of the furnace. When the valves open, the escaping gas can produce a loud noise and a plume of black smoke and dust. Tata's permit recognises that bleeder valves are important safety devices and they protect a blast furnace from a more serious event.

When furnace raw materials are blended, fluxes such as limestone or dolomite are added which help remove impurities from the iron. These fluxes form the slag that is eventually drawn from the bottom of the furnace when molten iron is tapped. Different fluxes have different effects on slag properties and various raw materials also have impurities that can affect slag properties. Silica, aluminates and magnesia can make the slags thicker, more viscous and higher melting, whereas materials high in calcium produce thinner, less viscous slag which melts at lower temperatures.

Within the furnace there is a zone where molten iron and *primary slag* are formed. As this primary slag moves down the furnace towards the tap hole, ash and residual inorganics from injected coal mix with it and change its properties. The resulting *final slag* is then tapped out of the furnace. Tata controls the input of raw materials to ensure that the final slag meets the criteria needed to maintain furnace output and slag processing requirements.

Blast furnace bleeder valve releases: May & June 2016

On 21 June 2016 NRW carried out a compliance intervention following multiple bleeder valve releases from No.4 Blast Furnace (BF4) in May and June 2016 and No.5 Blast Furnace (BF5) in June 2016. Tata formally notified NRW about these bleeder releases in **S5N/16/39A** and **S5N/16/40A**.

It should be noted that the majority of these bleeder openings only involved the semi-clean bleeder valve, which does not normally generate visual emissions. More severe openings usually involve all four bleeder valves opening at once. It is these events which invariably generate visual emissions (black smoke and dust) and attract public interest.

NRW's initial findings are recorded in **CAR_NRW0025274**. We concluded that further information was necessary in order to fully close out this intervention and assess permit compliance. Tata has since completed a major process safety inquiry to establish the cause(s) and better understand the conditions which led to this particular spate of bleeder valve releases from BF4. This inquiry has been conducted with support from colleagues at Tata's IJmuiden steelworks in Holland. The primary focus is on BF4, but the later openings from BF5 were attributed to a similar set of stability issues and therefore the inquiry's findings are relevant to both furnaces. It is thought that the stability problems took longer to manifest themselves in BF5 as the furnace has thicker walls than BF4 and heat losses tend to be lower.

The inquiry's conclusions and recommendations can be summarised as follows:

1. Thermal control. A low thermal condition existed within BF4 leading up to the first spate of bleeder releases on 24 and 25 May 2016. Tata has identified that stockhouse/stockline problems contributed to this which led to more water being used to maintain raw material flow. This had the effect of cooling the furnace below its optimum working temperature, decreasing thermal isotherms and triggering the formation of slag deposits on the furnace walls, reducing the working volume of BF4.

Tata's thermal control procedure has already been optimised for stable furnace scenarios, but this event identified that improvement is needed for unstable furnace conditions and high/low heat

gain events. This will allow Tata to intervene more robustly e.g. by adding more coke or injection coal (furnace fuel). Tata's action plans, thermal control procedures and coal injection rates are being optimised to address unstable furnace conditions in a more effective way. Shared learning from similar scenarios encountered at IJmuiden is being used to inform this work which will benefit both steelworks.

2. Primary slag basicity (alkalinity). During 2016 BF4 was being operated to minimise final slag volumes by monitoring the final slag composition. However this does not give a true indication of primary slag composition, which lies deep within the furnace and cannot be directly monitored.

Prior to the bleeder releases a furnace burden with higher than normal basicity was used. This situation arose due to blockages at the stockhouse bunkers, forcing modifications to the ore blend which changed the overall basicity of the burden. The resulting primary slag had a higher basicity and melting temperature, allowing it to solidify within the furnace before casting. This phenomenon was exacerbated by the low thermal condition of BF4 discussed above. Solidified deposits of primary slag have the effect of forming a 'gas barrier', reducing permeability and smooth gas passage through the burden. This in turn can cause furnace burden slips and bleeder openings.

Tata are creating a procedure for primary slag basicity control to provide operators with clearer guidelines for batching of furnace raw materials and blends. On occasion, pockets of localised high basicity slag have been encountered which impedes smooth gas passage through the burden. Software is also being developed to allow more flexibility when charging (currently only 3 types of materials per skip). The aim is to maintain an even burden with consistent levels of acidity and basicity throughout, minimising pockets of solidified basic primary slag.

IJmuiden had also encountered furnace stability problems which were previously unexplained but can now be attributed to primary slag basicity issues.

3. Raw materials. The particular ore blend used prior to the bleeder openings had a high fines content. This made screening difficult (especially when wet) and increased the propensity for material to build up on the furnace walls. The ore also had lower silica and higher alumina levels than expected, which added to the basicity problems discussed above.

The overall high basicity of the burden exaggerated swelling of the fluxed iron ore pellets used in the blend. Although this is not normally an issue in isolation, Ironmaking's preference is to use pellets with lower swelling properties. In this case the high swelling pellets contributed to reduced permeability of the burden.

Tata Steel's corporate policy at the time was to maintain lower stocks of raw materials at its UK sites to minimise costs in the context of ongoing uncertainty in global steel markets. The inspecting officers had noted lower raw material stocks at Port Talbot in 2016. Tata Port Talbot needed to make more spot purchases of raw materials which had less well-known properties.

Since this event Tata has changed its raw material inventory controls and ensured that each furnace has a dedicated bunker for acid and silica-rich raw materials used in the blend. This provides a contingency/blend adjustment option in the event of bunker loss at the stockhouses.

Raw material stock control has been changed to minimise shortages ('stock-outs') of critical materials and to use ores with better understood properties wherever possible. This has been reflected in the increased volumes of materials present in the stockyards in 2017.

Tata is using its 'SPY' planning tool to allow burden and slag chemistry forecasting. SPY provides a 1-month forward look for Tata operators, allowing them to intervene earlier and remain in control of factors such as primary slag chemistry. A number of new metrics have been incorporated into SPY including predicted primary slag composition and nucleation of sinter. The aim is to ensure that the primary slag is not too basic or thick and the sinter is not too weak, fine or friable.

The coke blend used in BF4 contained coals of high alkali content as other, more acidic coals were not available at the time. Tata has routinely operated BF4 on a campaign of coke types. This had led to stability problems on BF4 so the coke diet has been changed to 40:60 or 60:40 Port Talbot coke to third party coke to help maintain a more consistent coke feed to the furnace, which should help improve furnace stability. Campaigning coke types can offer more certainty in terms of the blend make-up, it can result in larger changes within the furnace e.g. alkali/base load. Tata intend to return to a blend of cokes in BF4 once tracking of the coke reclaim system improves. In the meantime BF4's coke diet has been altered to mitigate the effects of using one type of coke only.

4. Burden distribution. For BF4, burden distributions have historically been set up to reduce gas flow towards the walls of the furnace and encourage gas passage through the centre of the burden. However when burden permeability is reduced – as it was in May and June 2016 – Tata did not have set burden distribution patterns to cater for this scenario. This is being rectified and a new set of distribution patterns for BF4 are being developed.

Alterations to the coke rate have normally been made by changing the ore layer thickness within the furnace, which can result in large burden changes and reduced permeability. Tata are looking to alter the thickness of the coke layer as well as the ore layer.

Large variations in stockline level control measurements can have a large impact on burden distribution. Tata are creating the option to use an average figure derived from multiple measurements to better inform their raw material batching activities.

5. Bleeder operation. 27 bleeder openings were recorded from BF4 on 24 and 25 May 2016, with a further 17 openings from the same furnace on 4 and 5 June 2016. A number of openings from BF5 occurred in 21 June 2016 including one at 12.50hrs which was witnessed by NRW officers. All bleeder valves functioned correctly and activated as designed to relieve furnace top pressure.

NRW awaits further information from Tata in the Schedule 5 Part B notifications for S5N/16/39 and S5N/16/40.

Tata's inquiry has shown there are multiple factors that affected furnace stability in 2016: thermal control, burden distribution, primary slag basicity and raw material chemistry. The inquiry has identified ten recommendations to minimise the possibility of future similar problems occurring. It has also shed light on some previously unexplained furnace stability issues at Port Talbot and IJmuiden. NRW has found no evidence of any failure to follow permitted procedures or any unjustified deviation from permitted procedures and techniques in relation to these events in 2016.

Blast furnace bleeder valve releases: March 2017

During March 2017 there were two bleeder valve releases from BF4 and BF5 (one from each furnace). This attracted a number of complaints about black smoke, dust fallout and noise. Whilst these bleeder valve releases were not as acute or severe as the spate of openings in 2016, the root causes have also been reviewed as part of this intervention.

Tata's initial investigation has shown that a non-homogenous blend of raw materials spot purchased from an ore trader was used to make sinter for approximately 10 days during March 2017. This resulted in poor/incomplete sintering and a high proportion of fines entering the furnace burden blend. Poorly sintered material is generally weaker, more friable and more likely to break up during movement and screening activities, generating more fines. As previously discussed, increased fines can result in permeability problems and deposits of solidified material within the furnace.

The particular blend of raw materials that caused these problems appears to have been marketed by the trader as a homogenised blend, but on delivery was found to be poorly mixed. Tata normally obtains its raw materials directly from an ore supplier.

The non-homogenised material ultimately forced Tata to abandon a partially prepared sinter bed and start a fresh one. Sinter production and blast furnace management proved difficult during this period and primary slag basicity problems were again encountered. Higher coke rates were introduced to increase furnace drive and clear any pockets of viscous slag. Learning points from the previous spate of bleeder openings, particularly in respect of primary slag basicity, were used to lead Tata's interventions and minimise the number of bleeder openings.

This event highlights the importance of sound raw material planning and the usefulness of the SPY tool. In a sinter context, SPY is now able to produce forecasts based on the ratio between available 'nuclei' materials and adhering materials, which will help Tata's engineers optimise sinter blends going forward. Risk procedures are being reviewed across multiple works areas including the Harbour area. Tata has communicated the issue further up its supply chain.

NRW requires further information from Tata Steel to allow us to fully assess permit compliance in respect of these raw material and sintering issues. Whilst we are satisfied in respect of Tata's response to the furnace stability issues, questions remain about Tata's ability to intervene earlier in the production process when the non-homogenised ore blend was first discovered. It appears there were a number of opportunities for Tata to review/take action before the material was charged to the blast furnaces. However current information suggests these opportunities were missed or were not followed up quickly enough.

A follow-up visit to Tata's Sinter plant and Raw Materials Handling areas will need to be undertaken. Our final compliance assessment will be recorded in a separate CAR form.

Blast furnace bleeder valve releases: May 2017

Tata formally notified NRW of a bleeder valve opening on 4 May 2017 from BF5 (**S5N/17/44A**). The root cause has been reviewed as part of this intervention.

BF5 had returned to production following an enforced shutdown in response to essential rail repair work. The rail system is vital to the movement of hot metal torpedo cars between the furnace and the Basic Oxygen Steelmaking (BOS) plant. The repairs were completed successfully without Tata having to plate any surplus molten iron.

While bringing BF5 online, the oxygen enrichment supply to the hot blast was lost due to a power failure. This necessitated an urgent/crash shutdown of the furnace in accordance with established procedures. During this shutdown some stability issues were encountered which resulted in the bleeder valves opening.

The loss of oxygen supply has been investigated and traced to the failure of a sealed component forming part of an O2 tank skid belonging to a third party gas supplier. Following the failure, the supply was switched to a spare O2 skid allowing BF5 to be brought back online. The mechanism of failure is unknown at this time but Tata is making enquiries with its supplier. Tata is not aware of any prior warning signs or faults that suggested the component was likely to fail.

NRW awaits further information from Tata in the Schedule 5 Part B notification.

Other matters

Sinter plant main stack emissions (A1)

Following the recent planned maintenance stop, the anticipated improvement in sinter plant main stack particulate emissions has not materialised. Tata has notified NRW about several exceedances of the 40mg/m³ daily mean limit for particulates at emission point A1.

Tata confirmed that a period of plant optimisation is necessary following the significant improvements made to the sinter plant emissions abatement systems. This will involve upgrading the sinter plant control system software. There is another planned maintenance stop in July 2017 during which the final sections of wind main ducting are to be replaced.

NRW will conduct a separate compliance intervention to investigate this issue further and better understand the reason(s) for these exceedances. A visit to the sinter plant has been arranged for 14 June 2017. In the meantime Tata is requested to provide further detail in its Schedule 5 Part A as when notifying any future exceedances.

Coke Ovens fugitive emissions (A54)

Tata has notified NRW about a number of exceedances of the monthly Best Available Techniques – Associated Emissions Performance Levels (BAT-AEPLs) for fugitive emissions from coke oven battery doors and tops (emission point A54).

NRW has arranged a compliance intervention for 22 June 2017 to look at this issue in more detail and review progress with Tata's ongoing coke oven battery life extension programme. Emissions from coke oven charging operations will also be reviewed as there is an additional BAT-AEPL that applies to charging operations.

Coke Ovens By-Products (COBP) Plant fire 10/05/17

On 10 May 2017 Tata notified NRW about a fire at the Coke Ovens By-Products (COBP) plant. It appears this fire started following some work carried out under a hot work permit (required for all operations involving open flames or producing heat and/or sparks).

The fire was extinguished quickly using firefighting foam with the assistance of Mid and West Wales Fire and Rescue Service (MWWFRS). Tata was able to contain all firefighting runoff within the steelworks effluent system and this will be gradually processed by the on-site effluent treatment plant.

Tata's initial investigation has found there was flammable vapour present in the area where the hot work was being undertaken. This vapour caught fire while the work was being carried out. Tata did not expect the vapour to be present and a process safety investigation is ongoing. All hot work in the area has been suspended.

NRW's visit to the Coke Ovens on 22 June 2017 would seem an opportune time to jointly review this event with Tata and the Health and Safety Executive (HSE), to minimise any unnecessary duplication of time and effort by the COMAH Competent Authority (CA).

Conclusions and further actions required

Tata has completed a major process safety inquiry to establish the cause(s) and better understand the conditions which led to the spate of bleeder valve releases from BF4 and BF5 in May and June 2016. The later openings from BF5 were attributed to a similar set of stability issues affecting BF4 and therefore the inquiry's findings are relevant to both furnaces.

Tata's inquiry concluded that furnace thermal control, burden distribution, primary slag basicity and raw material chemistry were all factors in the stability problems that affected its furnaces. The inquiry has identified ten recommendations based on the learning acquired by Tata Port Talbot and IJmuiden operators during the inquiry, which has also explained some previous furnace stability issues with unknown causes. This should minimise the possibility of future similar problems occurring. NRW has found no evidence of any failure to follow permitted procedures or any unjustified deviation from permitted procedures and techniques in relation to these events in 2016.

The bleeder openings from BF4 and BF5 during March 2017 occurred as a result of difficulties with an ore blend purchased from a trader rather than direct from an ore supplier. The blend was not homogenised (mixed) properly, which caused sintering problems and increased the proportion of fines within the blend. This in turn resulted in furnace instability. NRW needs to conduct a compliance intervention at the Sinter plant and Raw Materials Handling areas to investigate this issue further and determine if there were opportunities for Tata to intervene before the problematic material was charged to the furnaces.

The root cause of the BF5 bleeder opening on 4 May 2017 was an oxygen supply failure. The

method of failure is currently unknown but Tata are conducting an investigation with a third party oxygen supplier. NRW awaits further information from Tata in the Schedule 5 Part B notification.

NRW will return to the steelworks to review issues pertaining to:

- Sinter plant main stack emissions (particulates)
- BAT-AEPLs for fugitive emissions from coke oven battery doors, tops and charging
- COBP plant fire on 10/05/17 (COMAH CA joint investigation)

[ENDS]

EPR Compliance Assessment Report

**Report ID:
CAR_NRW0031694**

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

Site	Port Talbot Steel Works EPR/BL7108IM	Permit Ref	BL7108IM
Operator/Permit holder	Tata Steel UK Limited	Date	18/05/2017

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.

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.