

Compliance Assessment Report CAR_NRW0041511

Permit being assessed: BR9685IX.

For: Barry Silicone Plant, held by Dow Silicones UK Limited

At: Cardiff Road, Barry, Vale of Glamorgan, CF63 2YL.

Type of assessment carried out: Site Inspection, Reason: Other.

On 12/01/2023 - 09/03/2023.

Parts of permit assessed: Effluent Treatment Plant

NRW Lead Officer: Geraint Harris.

Report sent to: Jude Sartor, Environmental Specialist on 09/03/2023.

1. Summary of our findings (full details in section 4)

Part of permitted activity assessed (criteria)	Assessment result	Permit condition
E3 - Emissions - Surface water	C3 Minor	Permit Condition 3.1.2
C2 - General Management - Management system and operating procedures	C3 Minor	Permit Condition 1.1.1

Result types are explained in more detail in the 'Important Information' section below.

Total number of non-compliances recorded	Total non-compliance score
2	8

How we use the non-compliance score to calculate your annual fee is explained in the 'Important Information' section below.

2. What action is required?

Criteria	Action needed	Complete by
E3	NRW would expect operators of treatment plants to have a methodology in place encompassing trigger levels for each of the relevant parameters with associated procedures in place for when these trigger levels are exceeded. Is such a system in place?	28/04/2023
C2	Since there is an ongoing trend with fouling of the dosing system, Dow must now undertake a review to see if any modifications can be made to the system which eliminates or reduces the risk of fouling of the Magmex delivery system	28/04/2023

Action criteria codes are listed in the 'Important information' section below.

3. What will happen next?

Any non-compliance we have identified and recorded on this form is an offence. It can result in criminal prosecution and/or suspension or revocation of your permit.

At this time, we do not intend to take any further action.

This statement does not stop us from taking additional enforcement action if further relevant information comes to light or offences continue.

4. Details of our assessment

Dow Silicones

EPR/BR9685IX

On the 12th of January 2023 a Schedule 5 Notice was sent by Dow informing NRW of an exceedance of the copper, W1, discharge limits. Dow have a 95th percentile limit for copper (0.1mg/l) and this was exceeded for the quarter 1 (2023) reporting period. For the quarter preceding Q1, Q4 (2022), the 95th percentile for copper was 0.09786mg/l therefore within the limit. Dow primarily control their copper effluent levels within their primary wastewater treatment (PWWT) process. During this process, metals, including copper, are reacted with lime to generate metal hydroxides. The pH of the wastewater is then raised to pH 9.5 where these hydroxides are precipitated out of solution. With the assistance of coagulants and flocculants these insoluble substances are then removed from the wastewater stream using clarifiers. The next stage of the wastewater treatment is the biological wastewater treatment process known as secondary wastewater treatment (SWWT). This involves the use of microbes to remove organic based material from the wastewater stream. Biological treatment plants maintain optimal performance through several different ways, one such way is to balance the portion of waste activated sludge (WAS) with the portion of returned activated sludge (RAS). This, among other things, helps to maintain the age of the bugs within the plant. For Dow this has the added benefit of removing additional precipitated copper from the effluent, especially when the effluent is kept within the alkaline range. During the plant upset in December 2022, the mixed liquor suspended solids (MLSS), which makes up a large portion of the solids within the SWWT and removes/reduces the biochemical oxygen demand, was reduced significantly. Consequently, Dow had to stop wasting their activated sludge to try to build up this MLSS concentration. Dow have noticed that every time they wasted some of their sludge their MLSS value dipped. They also noticed that if they don't waste a portion of the sludge the copper in the treated effluent also increases.

A plant upset in 2021 highlighted the importance of maintaining the pH within the 200 Bioreactor in SWWT at pH 7.5. Below pH 7 copper and zinc solids are fully soluble and cannot be removed by the SWWT settlement tanks. The subsequent Schedule 5 Part B notice, received on the 25th of May 2021, stated the following:

"Elevated Cu results in March have resulted from a low pH in the bioreactor (~pH6) compared to normal pH of ~7.5. This has been due to blockages and equipment failures associated with the Magnesium Hydroxide dosing system. Manual dosing of sodium hydroxide is currently being undertaken to return pH levels to normal, which should bring dissolved copper levels in W1 back to normal".

During this recent incident, Dow ran out of Magmex (Mg(OH)₂) on the 8th of January 2023 and were unable to resupply for a period of 5 days. During this time, they shot dosed NaOH to try and aid some pH control, but the pH in the Bioreactor dropped down from the normal level of pH 7.5-8.0 to just above pH7.0. Dow believe this to be a contributing factor in the increase in copper in the final effluent.

A previous assessment (2021) of bioavailability in the receiving water (Cadoxton) using the Water Framework Directive Metals Bioavailability Tool (M-BAT) has shown that the bioavailable copper concentration did not exceed the environmental quality standard for copper (CAR_NRW0038379). This was verified using M-BAT and the monitoring data provided, along with sensitivity to measured independent parameters such as pH, DOC and calcium concentrations. Since the copper exceedances during this recent plant upset are of a similar concentration it is unlikely that there has been an exceedance with the EQS for copper for this incident.

Therefore, the current copper emission limit exceedance is considered to be a minor category 3 breach of permit condition 3.1.2.

Where a noncompliance has been identified we must investigate the root cause. There are a number of factors which contributed to this most recent copper ELV exceedance. The plant upset in December, in which the MLSS concentration decreased rapidly, resulted in a significant decrease in the usual wasting of activated sludge. This meant that the usual amount of precipitated copper hydroxide removed within the waste sludge also decreased. Dow have had several issues with the Magmex dosing system over the years including issues with freezing of the lines during the cold period in December. Dow continued to dose manually as best they could until they were able to get the automatic dosing operational again. Unfortunately, Dow exhausted their supplies of Magmex on the 8th of January 2023 and were unable to get any in quickly (combination of holidays and supplier delays). During this 5-day period without Magmex, Dow used an alternative approach of using NaOH to elevate the pH. This approach failed to raise the pH out of the soluble zone for copper hydroxides. This resulted in copper redissolution which ultimately led to the exceedance in copper levels within the final effluent discharge. In a previous root cause analysis, back in 2021, for copper ELV exceedances, Dow wrote that the “Magmex system was not operational due to tank and linework fouling (Caustic dosing ineffective)”. Since Magmex was previously identified as important and caustic ineffective, NRW would have expected Dow to have built more resilience into the treatment plant especially in known troublesome areas such as the supply of Magmex. Magmex is available in bulk and in IBC’s and so it might have been prudent for Dow to keep a stock of IBC’s onsite for any future plant upset especially since caustic was deemed ineffective.

Permit condition 1.1.1 requires operators to manage and operate their activities in accordance with a written management system that identifies and minimises risks of pollution. This should include procedures that cover periods of plant upset including monitoring and maintaining critical treatment solutions such as Magmex. Ultimately Dow have failed to manage and operate their activities in accordance with a written management system that identifies and minimises risks of pollution. A graphic display shared with NRW on the 8th of February 2023 showed the copper levels spike around the time the Magmex supplies were exhausted and then start to drop back into compliance after the site was resupplied. Had Dow effectively managed the quantities of Magmex onsite they may have prevented or at least reduced the chance of exceedance of copper to river. **Therefore, the current copper emission limit exceedance is considered to be a minor category 3 breach of permit condition 1.1.1.**

Action1: Since there is an ongoing trend with fouling of the dosing system, Dow must now undertake a review to see if any modifications can be made to the system which eliminates or reduces the risk of fouling of the Magmex delivery system. **Due 28th April 2023.**

Action 2: NRW would expect operators of treatment plants to have a methodology in place encompassing trigger levels for each of the relevant parameters with associated procedures in place for when these trigger levels are exceeded. Is such a system in place? **Due 28th April 2023.**

As a result of the recent plant upset Dow have investigated ways to improve their effluent treatment. One such improvement is the installation of a rotary flush filtration unit. This unit was installed to replace the existing disc filters on the final effluent line. Since its installation, Dow have seen their suspended solids concentrations in their final effluent drop considerably. It also looks as if this new filtration unit may also have improved the copper concentration within the final effluent.

A graphic display in which the copper concentration is displayed along with the pH was provided by Dow. The graph shows the copper concentration at its lowest level since the 1st of January. It also clearly shows the correlation between pH and copper, with the copper concentration increasing as the pH decreases. A graphic

display showing the MLSS of the bioreactor was also shared by Dow and showed the MLSS figure gradually rise from sub 1000mg/l on the 19/12/22 to around 4000mg/l on the 8/02/23. Dow have since reconfigured some old PI links to incorporate their online SS analysers on Bioreactor. This gives Dow an estimated MLSS value on the bioreactor which can be observed globally on Dow's network. This has already proved beneficial with Dow's technical specialists from various parts of the globe reviewing the data and identifying anomalies.

Energy Recovery Unit (ERU)

The particulate matter emissions for the ERU were measured in Q4 and found to be within the permitted emission limit values. Dow have since set up their own inhouse particulate matter testing. An email with several queries relating to the ERU was sent to Dow on the 8th of February. These queries and subsequent responses will be summarised in a future CAR Form.

END.

If you have any queries about this report, or to discuss completion of any actions, please contact the NRW Officer named above.

Important information

Legal status of this report

Your permit is issued to you under the Environmental Permitting Regulations. You have a responsibility to comply with the conditions of your permit and prevent pollution/harm of the environment. You must also ensure that you comply with any other relevant legislation that may apply to your site's operations.

This report explains the findings of our assessment and any action you are required to take. We categorise non-compliance using our guidance for assessing non-compliance at regulated sites.

When we find potential non-compliance/s we will normally give you advice on how to maintain compliance.

To correct non-compliance, we may:

- require you to take specific actions
- issue a notice
- review the conditions of your permit.

Any advice and guidance we give will be without prejudice to any other enforcement response that we consider may be required.

Assessment results and non-compliance categories (used in section 1):

Assessment result	Description
Assessed (A)	Assessed or assessed in part, no evidence of non-compliance found
Action only (X)	Action only relating to the activity assessment
Ongoing (O)	Ongoing non-compliance, not scored

Non-compliance category	Description	Score
C1 Major	Potential to have a major, serious, persistent and/or extensive impact or effect on the environment, people and/or property	60
C2 Significant	Potential to have a significant impact or effect on the environment, people and/or property	31
C3 Minor	Potential to have a minor or minimal impact or effect on the environment, people and/or property	4
C4 No environmental impact	Non-compliance at a regulated site that cannot foreseeably have any impact on the environment, people and/or property	0.1

How we use assessment scores

The number and severity of non-compliances recorded in a year will affect your annual subsistence fee the following year. A non-compliance factor is added to your site's Operator

Performance Risk Appraisal (OPRA) score when we calculate your fee to reflect the additional resource we use to assess permit compliance.

What are suspended scores?

In line with our guidance, we may suspend scores for up to six months to allow time for remedial action to be taken. Suspended scores will be re-instated if the action is not completed.

Full list of Industry and Waste action criteria (used in section 1 and 2):

A: Permitted activities

- A1 Specified by permit

B: Infrastructure

- B1 Infrastructure – Engineering for prevention and control of emissions
- B2 Infrastructure – Closure and decommissioning
- B3 Infrastructure – Site drainage engineering (clean and foul)
- B4 Infrastructure – Containment of stored materials
- B5 Infrastructure – Plant and equipment

C: General management

- C1 General management – Staff competency/training
- C2 General management – Management system and operating procedures
- C3 General management – Materials acceptance
- C4 General management – Storage, handling, labelling and segregation

D: Incident management

- D1 Incident management – Site security
- D2 Incident management – Accidents, emergency and incident planning

E: Emissions

- E1 Emissions – Air
- E2 Emissions – Land and groundwater
- E3 Emissions – Surface water
- E4 Emissions – Sewer
- E5 Emissions – Waste

F: Amenity

- F1 Amenity – Odour
- F2 Amenity – Noise
- F3 Amenity – Dust/fibres/particulates and litter
- F4 Amenity – Pests/birds and scavengers
- F5 Amenity – Deposits on road

G: Monitoring and records, maintenance and reporting

- G1 Monitoring and records, maintenance and reporting – Monitoring of emissions and environment
- G2 Monitoring and records, maintenance and reporting – Records of activity, site diary/journal/events
- G3 Monitoring and records, maintenance and reporting – Maintenance records
- G4 Monitoring and records, maintenance and reporting – Reporting and notification to Natural Resources Wales

H: Resources efficiency

- H1 Resource efficiency – Efficient use of raw materials
- H2 Resource efficiency – Energy efficiency

Enforcement response

Any permit condition non-compliance is an offence and we may take legal action against you. Action we take can include prosecution, serving a notice on you and/or suspension or revocation of your permit. See our Enforcement and Sanctions Guidance for further information.

Data protection notice

You should make sure that anyone named in this report knows that the information it contains will be processed by Natural Resources Wales to fulfil its regulatory and monitoring functions and to maintain the relevant public register(s).

We may also use and/or disclose the report in connection with:

- offering or providing you with our literature or services relating to environmental matters
- consulting with the public, public bodies and other organisations (e.g. 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 our service
- Freedom of Information Act or Environmental Information Regulations requests.

We may also pass it on to our agents or representatives to do these things on our behalf.

Disclosure of information – this report will be available to view on-line

If you think this report contains commercially confidential information that should not be placed on our public register, you must contact your local Natural Resources Wales office within **fifteen working days** of receiving this report, using the contact details in the accompanying email or letter. You must give a full explanation of why it should not be added to our public register, including specifying which information is commercially confidential. We will assess your request and respond to you within 20 working days to let you know if we agree to your request.

What do I do if I disagree with the report or have a complaint?

If you disagree with this compliance assessment report, you should contact the lead officer without delay to discuss your concerns.

If you are unable to resolve the issue with the lead officer or their line manager you should contact our Customer Contact team on 0300 065 3000 (Monday to Friday 08:00 – 18:00), or email enquiries@naturalresourceswales.gov.uk for details of how to raise your dispute further through our Complaints and Commendations procedure.

If you are dissatisfied with our response, you can contact the Public Services Ombudsman for Wales by phone on 0300 7900203 or by email at ask@ombudsman.wales

Welsh Language Standards

We are committed to establishing Natural Resources Wales as a naturally bilingual organisation. We will provide compliance reports in your preferred language.