

Annex J

Investigation Report

Investigation Report of CEMS Exceedances

Date	1 – 31 August 2019
Time	Continuous monitoring throughout July 2019
Monitoring Location	Continuous Environmental Monitoring System (CEMS)
Parameter	Various emission parameters of the Centralised Air Pollution Unit (CAPCS), Cogeneration Units (CHP) and Ammonia Stripping Plan (ASP)
Exceedance Description	<ol style="list-style-type: none"> 1. Continuous monitoring was carried out for CAPCS, CHP and ASP throughout the reporting period using the CEMS. According to the EM&A Manual, exceedance is considered if the emission concentration of the concerned pollutants is higher than the emission limits stated in Tables 2.2, 2.3 and 2.5 of the EM&A Manual (Version E) for CAPCS, CHP and ASP respectively. The concentration of the concerned air pollutants were monitored on-line by the CEMS. Exceedances of various emission parameters were recorded on the CEMS including: <ul style="list-style-type: none"> • Odour (including NH₃ & H₂S) in the CAPCS; • Dust (or TSP), NO_x, SO₂, HCl and HF in the CHP; and • Carbon Monoxide, NO_x, SO₂, VOCs (including methane) and NH₃ in the ASP. 2. According to the Contractor, the plant was receiving around 100 tonnes of SSOW daily and was operated normally. 3. The chemical dosing system of the CAPCS was undergoing optimisation. The new setting of the chemical dosing system could not effectively remove the odourous gas (mainly NH₃) and caused exceedances of odour limits in the CAPCS. 4. CHP setting was undergoing fine-tuning for performance optimisation which leads to the ineffective removal of NO_x and VOC (including methane) at a certain period of time. 5. The Contractor explained that the exceedances recorded in the ASP was because the thermal combustion unit of the ASP still require tuning to optimise the combustion efficiency.
Action Taken / Action to be Taken	<ul style="list-style-type: none"> • The setting of the chemical dosing system has been revised to its original during this reporting period; the chemical dosing system can effectively remove odourous gases at the CAPCS. • It was arranged with the supplier of CHPs to check the performance of CHPs onsite during the reporting period. The supplier will conduct a detailed investigation of the remaining exceedance recorded on

	<p>the CHPs. After the investigation, the Contractor will perform the maintenance work according to suggestions raised by the supplier. The maintenance work is expected to complete in the next reporting period.</p> <ul style="list-style-type: none"> • It was arranged with the supplier of the ASP to modify the system onsite. . The supplier suggested that main components required for the modification work, i.e. an air cooler, will be delivered to Hong Kong by early October 2019. Meanwhile, the supplier will perform some minor modification work, such as the replacement of control valves in the next reporting period. The Contractor is developing a detailed schedule with the supplier to ensure preparatory works are completed for the major modification work to take place. The operation team of the Contractor will also liaise and agree with the supplier for any shutdown period required to replace and install the equipment.
<p>Remedial Works and Follow-up Actions</p>	<p>The Contractor is recommended to closely monitor the processes, including the combustion of biogas in the ASP to avoid the reoccurrence of similar problems. MT will carry out follow-up audit regarding the progress next month.</p>

Prepared by: Bonia Leung, MT Representative

Date 10 September 2019

Investigation Report of Treated Effluent Leakage

Date	25 August 2019
Time	12:35 am
Monitoring Location	Biogas system
Parameter	Biogas pressure
Exceedance Description	Biogas release as a result of unstable power supply by CLP on 25 August 2019.
Action Taken / Action to be Taken	The Contractor closed the biogas holder inlet valve to safeguard the biogas system as per emergency response procedures. The biogas pressure began to build up in the biogas system (before the biogas holder) resulting in the biogas being released through one of the pressure relief valves as per designed scenario to safeguard the biogas tanks.
Remedial Works and Follow-up Actions	The Contractor resumed the power supply from CLP and the biogas booster set. A thorough check was conducted to confirm the situation was under control with stable performance at around 5am.

Prepared by: Bonia Leung, MT Representative

Date: 11 January 2020

Extract of the Incident Notification Form on Release of Biogas to the Environment Prepared by the Contractor

Description of the Process

The purpose of Organic Resources Recovery Centre Phase 1 (ORRC1 or the facility) is to convert source-separated organic waste into compost and biogas through proven biological treatment technologies. The biogas generated, after post-treatment including sulphur and water removal, would be in the on-site Combined Heat and Power (CHP) generators to generate hot water and electricity to be used on site and exported to the China Light and Power (CLP) power grid network.

The major equipment involving biogas includes:

- Anaerobic Digesters (AD)
- Suspension Buffer Tank (SBT)
- Desulphurisation Column
- Gasholder (GH)
- Dehumidifier
- Biogas booster system

The biogas consumers include:

- Emergency Flare
- Combined Heat and Power (CHP) Unit
- Ammonia Stripping Plant (ASP)

Description of the Incident

Time (Roughly)	Event
00:35	The electrical connections Q1 and Q2 opened because of the unstable power supply by CLP (Confirmed by CLP that there was a problem with their overhead lines). CHP2 & 3 were supply by CLP (Confirmed by CLP that there was a problem with their overhead lines). CHP2 & 3 were
00:40	CHP3 tripped off.
00:52	CHP2 tripped off and the plant blackout
01:58	Biogas holder inlet valve was arranged to close to safeguard the biogas system as per the emergency response procedures. This arrangement discontinued the pressure and level build up inside the biogas holder.
02:01	Q1 & Q2 closed, CLP power resumed.
02:01	Biogas holder level reached over 90%, booster set was unable to start due to lack of compress air supply.
02:01	Emergency flare was unable to start due to booster set was unable to start and therefore also no biogas supply to the flare
02:08	Anaerobic Digester (AD) Tank 1 Pressure relief Valve (PRV) triggered, biogas released from AD1 PRV intermittently. The biogas pressure was built up in the biogas system (before biogas holder) resulting in the biogas being released through one of the pressure relief valves as per designed scenario to safeguard the biogas tanks.

04:22	Biogas booster set resumed and thus biogas supply resumed
04:24	CHP2 resumed to consume biogas
04:52	Flare system tested and restarted to rapidly reduce the pressure and biogas holder level
05:00	Plant resumed normal operation

Immediate Corrective Actions

The Contractor immediately arranged onsite personnel to prepare for emergency (Biogas release). The Contractor immediately arranged maintenance team to carry urgent maintenance. The Contractor arranged to conduct a thorough check to confirm the situation was under control with stable performance at around 5:00am.

Root Cause Analysis

1. CHP's were able to enter "Island Mode". CHP 2 for approximately 15 minutes and CHP 3 for approximately 4 minutes after Q1 and Q2 opened. Primary cause for CHPs tripped is that the power demand exceeded the load generation step of the CHPs therefore as explained in "Electrical Operation philosophy" CHPs shutdown.
2. There were 2 sources of compressed air supply to the booster set (plant air and a standby portable air compressor). The plant air supply was resumed after CLP power resumed. However, a valve (0014-AV-001) was closed resulted in no plant air supply to a Sub-loop which provided plant air supply to the booster set and flare. The valve's operation philosophy is to maintain the pressure in the Biogas Area Compressed Air Sub-loop if the main loop loses pressure. Therefore, the valve was operating properly at the time of the incident and should have been placed into manual to open once the pressure in the main system reaches approximately 7 bar to return normal plant air to the Biogas Compressed Air Sub-loop.
3. The booster set resumed normal operation once the plant air was manually isolated from booster set to allow the air to activate the pneumatic valves on the booster set. A check valve (non-return valve) was found malfunction and caused the standby portable air compressor continues running and finally overheated. For normal weekly testing, the plant air isolated from the booster set therefore the effectiveness of the check valve between the plant air and the booster was unable to check. The check valve was not included in the normal testing protocol. The testing protocol and a detailed review of the biogas safety system will be conducted to mitigate the risk of future biogas incidents.
4. The flare could not start primarily due to the booster set being inoperative. Without adequate pressure and flow provided by the booster set, no fuel (biogas) reached the flare to allow for consumption of biogas. Flare was in automatic mode during blackout and power was supplied through the UPS system. The testing protocol and a detailed review of the biogas safety system will be conducted to mitigate the risk of future biogas incidents.

Description of Corrective Actions⁽¹⁾

1. To immediately arrange maintenance team to carry urgent maintenance

(1) The corrective actions have been closed on 30 September 2019

2. To replace the malfunction check valve
3. To train up staff for emergency response during the planned Loss of Main test
4. To conduct review of the biogas safety system to mitigate the risk of future biogas incidents.

Description of Preventive Actions ⁽²⁾

1. To review the system and the testing protocol revised to allow testing of the check valve to the plant air system.
2. To add extra compressed air source (3rd Source) in case of emergency and prepare the emergency operation procedure of the diesel compressor
3. To provide refreshment training for staff about the updated response
4. To update the plant resume and checking procedures during blackout
5. To manage the plant loading while CHPs in island mode a detailed operation procedure will need to be developed. OSCAR has invited the CHP supplier (MWM) engineer to review the capability of the CHPs to understand how island mode conditions and expecting engineer visit in November 2019 afterword we can provide more a detailed road map for the island mode situation for the CHPs.

(2) Items 1 to 4 have been closed on 4 October 2019. Items 5 is an on-going action.