Annex J

Investigation Report

Annex J1

Investigation Report – September 2019

Investigation Report of CEMS Exceedances

Date	1 – 30 September 2019
Time	Continuous monitoring throughout July 2019
Monitoring Location	Continuous Environmental Monitoring System (CEMS)
Parameter	Various emission parameters of the Cogeneration Units (CHP) and Ammonia Stripping Plan (ASP)
Exceedance Description	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: • SO_2 in the CHP; and • NO_x, SO_2, VOCs (including methane) and NH_3 in the ASP. 2. According to the Contractor, the plant was receiving around 100 tonnes of SSOW daily and was operated normally. 3. Tripping of the desulphurisation column resulting in the incomplete desulphurisation of biogas that leads to the exceedances of SO_2 limits for CHP stacks and ASP stack. 4. 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	• Routine maintenance of the desulphurisation column, e.g. cleaning of sensors, has been carried out. Continuous monitoring of the desulphurisation column will remain in place to reduce the duration of tripping which causes exceedances in SO2 in CHP stacks and ASP stack. 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.
Remedial Works and Follow-up Actions	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.

Prepared by: Bonia Leung, MT Representative
Date 10 October 2019

Annex J2

Investigation Report - October 2019

Investigation Report of CEMS Exceedances

Date	1 - 31 October 2019
Time	Continuous monitoring throughout October 2019
Monitoring Location	Continuous Environmental Monitoring System (CEMS)
Parameter	Various emission parameters of the Ammonia Stripping Plan (ASP)
Exceedance Description	1. Continuous monitoring was carried out 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: • NO_x, VOCs (including methane) and NH_3 in the ASP. 2. According to the Contractor, the plant was receiving around 100 tonnes of SSOW daily and was operated normally. 3. Further optimisation of the chemical dosing system of the 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	• The supplier suggested that main components required for the modification work, i.e. an air cooler, was delivered during this reporting period. Meanwhile, the supplier will perform some minor modification work, such as the replacement of control valves in the next reporting period. The schedule developed by the Contractor and the supplier suggests that the major modification work is to be performed in the next report period. 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.
Remedial Works and Follow-up Actions	The Contractor is recommended to closely monitor the processes, including the modification work and follow-up emission monitoring of the ASP to avoid exceedance. MT will carry out follow-up audit regarding the progress next month.

Prepared by: Bonia Leung, MT Representative
Date 7 November 2019

Annex J3

Investigation Report - November 2019

Investigation Report of CEMS Exceedances

Date	1 - 30 November 2019
Time	Continuous monitoring throughout November 2019
Monitoring Location	Continuous Environmental Monitoring System (CEMS)
Parameter	Various emission parameters of the Cogeneration Unit (CHP) Ammonia Stripping Plan (ASP)
Exceedance Description	1. Continuous monitoring was carried out at the 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 F) 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: • NO_x and SO_2 in the CHP • NO_x and NH_3 in the ASP. 2. According to the Contractor, the plant was receiving around 100 tonnes of SSOW daily and was operated normally. 3. Further optimisation of the chemical dosing system of the 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	• 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 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. • Parts of the modification works on the ASP has been completed, with more components waiting to be delivered to Hong Kong. The Contractor has scheduled the remaining modification work for the next few reporting periods with schedule shutdown of the ASP to facilitate the installation of equipment for performance optimisation.
Remedial Works and Follow-up Actions	The Contractor is recommended to closely monitor the processes, including the modification work and follow-up emission monitoring of the ASP to avoid exceedance. MT will carry out follow-up audit regarding the progress next month.

Prepared by:	Bonia Leung, MT Representative
Date	11 December 2019

Investigation Report of Intermediate Digestate Tank Leakage

Date	5 November 2019
Time	7:45 am
Monitoring Location	Intermediate Digestate Tank (IDT)
Parameter	IDT level
Exceedance Description	Suspension liquid overflow at the intermediate digestate tank (IDT) was observed at the digestate tank on 5 November 2019. The digestate spilled into the storm water discharge channel, and subsequently into the nullah.
Action Taken / Action to be Taken	The Contractor arranged clean-up of the spillage in the nullah immediately and stopped the suspension liquid of the IDT from overflowing. The Contractor found that the programme that controls the IDT was not functioning properly resulting in the overflow of digestate at the IDT. In addition, the 3-way valve near the IDT was open which did not stop the spillage from entering the storm drain system.
Remedial Works and Follow-up Actions	The Contractor monitors the IDT level closely using CCTV, enhanced the routine patrol on the IDT and closed the 3-way valve to prevent possible leakage to the nullah.

Prepared by: Bonia Leung, MT Representative
Date 11 December 2019

Extract of the Incident Notification Form on Suspension Overflow at IDT Prepared by the Contractor

Description of the Process

Intermediate Digestate Tank (IDT) is a 30m^3 buffer tank to transfer digestate to the duty centrifuge use. The IDT is provided with liquid level measurements to detect the hydrostatic pressure at the bottom. The second level sensor detects the fill level by radar at the roof area. The digester recirculating / transfer pumps are inhibited by high level in the IDT.

IDT automatic operation is controlled through SCADA. When dewatering operation finishes (the required volume of digestate is processed) the digestate feed pump stops and the duty centrifuge stops after going through a ramp down sequence according to its programmed procedures. Afterwards, a back-flushing cycle of digestate feed pipe can be carried out automatically or manually to clear digestate off the pipeline to avoid release and accumulation of biogas gas within pipelines.

Description of the Incident

On 5/11/2019 morning at around 7:50am, black water was found discharging to the nullah from the storm water discharge channel. The team immediate carried out investigation to identify if there had any leakage from the plant. It was found that suspension was overflowed from the overflow tank of IDT to the surface channel inside AD tanks farm. Operation Team immediate contacted the Central Control Room to stop all feedings to the IDT. The suspension was stopped overflowed from the IDT overflow tank immediately.

Immediate Corrective Actions

The team immediate arranged to clean up the spillage inside the tank farm, nearby surface channel and around the IDT. A vacuum tanker truck was also immediate arranged to clean up the suspension at the nullah (*Figure 1*). All the cleanup work was completed at around 11:00am. (*Figure 2* and *3*)

Figure.1 Vacuum tanker was arranged to cleanup the nullah

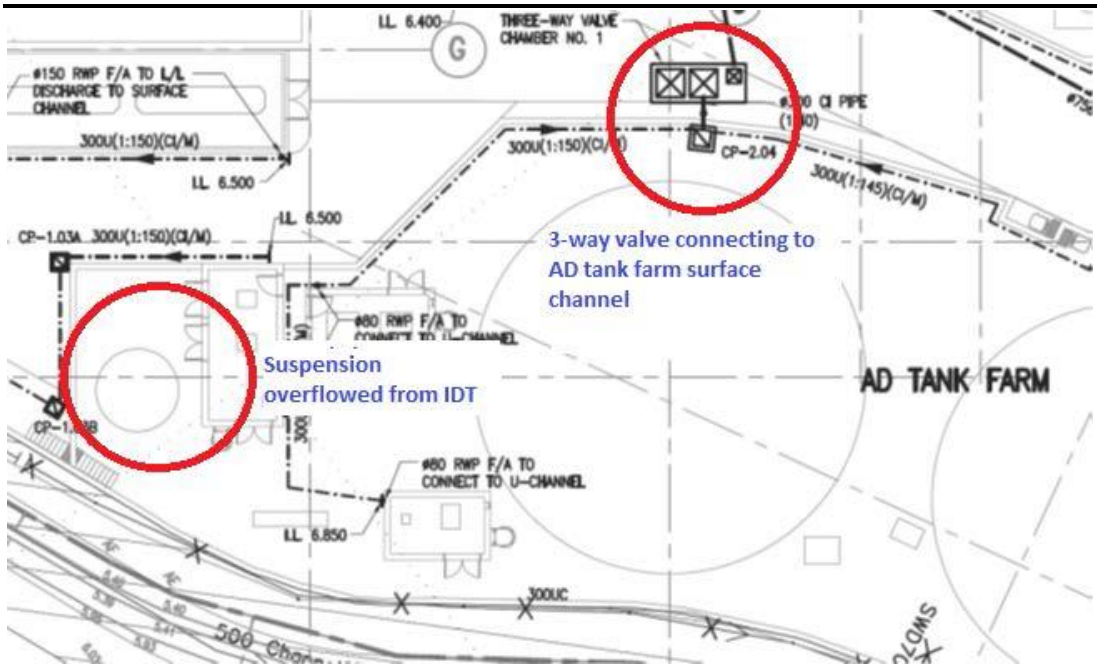
Figure.2 Completed cleanup of tank farm and nearby surface channels

Figure.3 Complete cleanup of nullah

Root Cause Analysis

1. After the dewatering process, the team started flushing the system. However, the team did not aware that process water was injecting to the IDT.
2. Process water will stop injecting to IDT by a default period. However, the process water injection was not stopped. (*To be further investigated by system programmer*)
3. The team did not aware the IDT tank was reaching high level and overflowed to the overflow tank
4. Process water with residual suspension overflowed from IDT to the overflow tank.
5. Process water with residual suspension overflowed to the surface channel at AD tank farm and discharged to the nullah.
6. The 3-way valve (*Figure 4*) is believed opened 1-2 months ago because of a heavy rainstorm. The 3-way valve however did not close after the heavy rainstorm.

Figure.4 Location map of the incident



Description of Corrective Actions (1)

1. Stopped all the feedings to the IDT
2. Arranged to clean up the suspension leaked to the nullah by a vacuum tanker truck
3. Arranged to clean up the suspension at the surface channel near the IDT

Description of Preventive Actions (2)

1. To close the 3-way gate valve to prevent possible leakage to nullah (*Figure 5*)
2. To keep close monitoring the IDT level for each flushing process (duty suspensor will monitor each flushing process every time with the assistant of CCTV
3. To increase the routine patrol frequency by one time per shift to 2 times per shift
4. To further investigate by system programmer to check if there have any programming bugs

(1) The corrective actions have been closed on 5 November 2019

(2) The preventive actions have been closed on 5 November 2019. Continuous monitoring and training to SS and P&C Technician Patrol will be arranged to increase to 2 times per shift in mid Nov 2019. The system checking takes time and is expected to be complete by mid Dec 2019.

*Figure**Error! No text of specified style in document.**.5 Preventive action: AD tank from stormwater 3-way gate valve is closed*

Investigation Report of Treated Effluent Leakage

Date	23 November 2019
Time	5:30 am
Monitoring Location	Treated Effluent Pump Room
Parameter	Overflow pipeline
Exceedance Description	Treated effluent leakage was found outside the treated effluent pump room on 23 November 2019.
Action Taken / Action to be Taken	The Contractor stopped the wastewater discharge to the treated effluent tank, arranged sandbags near the outlet and arranged for clean-up of the nearby surface channel and the road outside the treated effluent pump room. The Contractor investigation reported that the overspill of treated effluent was caused by the plant power blackout test which cause the system to reset the decant process and decanted twice. The overflow pipeline was not directly pointed to the drain pit which cause the spillage.
Remedial Works and Follow-up Actions	The Contractor installed a PVC pipe from the overflow pipe that is directed to the drain pit and erect sandbag wall inside the treated effluent pump room.

Prepared by: Bonia Leung, MT Representative
Date 11 December 2019

Extract of the Incident Notification Form on Treated Effluent Spillage Prepared by the Contractor

Description of the Process

Wastewater generated from plant operation is treated before discharge to Drainage Service Department (DSD) sewage system. Treated wastewater / Treated Effluent is temporary stored inside treated effluent (TE) tank. Treated effluent pump room is equipped with discharge pumps to discharge back to the plant as process recycle water. The tank also equipped with an overflow pipeline in case of high level inside the tank. There is an actuation valve to control the discharge of TE to public sewer. When the level inside the tank reaches a set point (say 40%), the valve will be opened and discharge TE to public sewer.

Description of the Incident

On 23rd November 2019 around 0530, brown water was found leaked from the treated effluent pump room. It was found that the brown water was leaked from an overflow pipe inside the room. The brown water was treated effluent and also leaked to nearby stormwater channel. The 3-way gate valve was closed a month ago and the leaked treated effluent was considered retain at the stormwater channel.

Immediate Corrective Actions

The team immediate stopped the decanting process from SBR (i.e. stopped wastewater discharge to TE tank) and lower the TE tank. Sandbags were also used to control and divert the wastewater to a drain pit inside TE pump room. The team also immediate arranged road sweeper to cleanup nearby surface channel and the road outside TE pump room. The cleanup work was completed at around 6:30am.

Suspected Incident

At around 8:00am, it was reported that some brown colour water was found at the pit of nullah (*Figure 1*). However, water from the plant's stormwater discharge outlet was clean (*Figure 2*). The team immediately checked the plant and did not find any leakage at that moment. The team therefore double checked the 3-way gate valve and found that the 3-way gate valve was not at "fully closed" position. The brown colour water was suspected leaked during the early morning incident through the 3-way gate valve. It is considered only small amount of TE was leaked to nullah during the early morning incident. This is because most of the overflowed TE was diverted to the drain pit inside the TE pump room and only some of TE end up at the nearby stormwater channel. Moreover, the 3-way gate valve is at an "almost close" position.

Figure.1 Slightly brown colour water at the pit of nullah

Figure.2 Clean water at the stormwater discharge outlet

Root Cause Analysis

1. The cause of high level TE was resulted from previous plant blackout test and caused SBR system power down. The system reset the decant process status and decant again. Twice decant caused high level TE.
2. The overflow pipeline was not directly pointed to the drain pit inside the TE pump room (*Figure 3*)

3. Overflowed TE was discharged on the floor inside the TE pump room rather than to the drain pit
4. Small amount of overflowed TE was leaked outside the TE pump room through the gap of the pre-installed sandbags
5. A small amount of TE end up at nearby stormwater channel and is suspected leak to the nullah through the "not fully closed" 3-way gate valve.

Figure.3 Misalignment of overflow pipeline to the drain pit inside the TE pump room

Description of Corrective Actions (1)

1. Stopped the decanting process from SBR to TE tank
2. Placed sandbags to control and divert the wastewater to a drain pit inside TE pump room.
3. Used road sweeper to cleanup nearby surface channel and the road outside TE pump room.

Description of Preventive Actions (2)

1. To install PVC Pipe to divert the overflow pipeline to the drain pit inside TE pump room
2. To place and erect a better sandbags wall inside the TE pump room
3. To fully close the 3-way gate valve
4. To erect a 200mm height bund wall to prevent similar incidents.
5. To review the redesign of the overflow pipeline

(1) The corrective actions have been closed on 23 November 2019
(2) Items 1 to 3 have been closed on 30 November 2019. Items 4 and 5 are expected to be done in Q1 2020.