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DPS SOP


Continuous Emissions Monitoring System (CEMS)

Installation, Operation & Maintenance

Revision List


Revision No.	Description	Date	Written By/ Reviewed By
0	First Issue	20.10.2012	C. Brincat
1	<ul style="list-style-type: none"> - Updating of EU and local legislation - Replacement of name of local authority by generic term - Introduction of new roles in Section 4 "Responsibilities" - Omission of reference to CO₂ emissions in Section 5.6 	26.08.2016	C. Abela
2			
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Reviewed by: [Signed] C. Abela ER Legal Obligations	Verified by: [Signed] J. Zammit Manager Energy Services	Approved by: [Signed] I. D'Amato Generation Manager
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1. Aim and Scope

The objective of this Procedure is to establish the installation, operation, and maintenance of the Continuous Emissions Monitoring System (CEMS) installed on the stacks of the Delimara combustion installation in line with legal obligations.

2. References

EN ISO 14001:2004, clause 4.4.6

EN ISO 14001:2004, clause 4.5.1

EN 14181: 2004 Stationary source emissions - Quality assurance of automated measuring systems (AMS)

EN 15267-3:2007 Air quality. Certification of automated measuring systems. Performance criteria and test procedures for automated measuring systems for monitoring emissions from stationary sources

ISO 14956:2002 Air quality -- Evaluation of the suitability of a measurement procedure by comparison with a required measurement uncertainty

ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories

S.L. 549.78 (L.N. 11 of 2013): Industrial Emissions (Large Combustion Plants) Regulations

S.L. 549.77 (L.N. 10 of 2013 as amended by Act XXV of 2015) Industrial Emissions (Integrated Pollution Prevention and Control) Regulations


EU Directive 2010/75/EU: Industrial Emissions (Integrated Pollution Prevention and Control)

Directive (Recast)

DPS IPPC Permit, No. IP 0002/07 (latest revision)

3. Terms and Definitions


CEMS (or AMS):	Continuous Emissions Monitoring System (or Automated Measurement System)
SRM:	Standard Reference Method, a method described and standardised to define an air quality characteristic, temporarily installed on site for verification purposes
ELV:	Emission Limit value as defined by the EU and national legislation, and as stated in the IPPC permit, on a plant by plant basis

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QAL 1:	Under EN 14181, before a CEMS can be installed it must first be proven to be suitable for the intended application. This process is called QAL1.
QAL 2:	Under EN 14181, QAL2 is the full-scale validation of the CEMS and requires a minimum of 15 valid parallel measurements to be made over at least 3 days. The monitoring must be carried out evenly throughout the period for all determinands continuously measured. QAL 2 includes an in-depth commissioning and independent validation, including parallel measurements with the applicable SRM, establishing the corresponding calibration function/s of the CEMS, and the calculation of variabilities in order to ensure that uncertainty levels are within acceptable levels and compliant with the ELV's.
QAL 3:	Under EN 14181, the QAL3 section governs the ongoing quality assurance of the CEMS and the data it generates. This essentially requires zero and span calculations, using control charts, to ensure that the accuracy and reliability of data is acceptable.
AST:	Under EN 14181, the Annual Surveillance Test is carried out between QAL2 tests to demonstrate that the CEMS functions correctly, its performance remains valid, and that the calibration function and variability derived during the QAL2 remains as previously determined. It is an ongoing re-validation programme.
RE:	Responsible Engineer, Maintenance Electrical Engineer

4. Responsibilities

Generation Manager:	Carries out the overall management of power station with the help of the various Managers. Ensures that stack emissions are within acceptable limits as specified in the IPPC permit. Ensures that the CEMS on each stack is operational and adequately maintained and that standard EN 14181 quality procedures are duly followed. Plans for the annual surveillance tests (AST), and keeps records of maintenance and calibration tests of the CEMS equipment.
Manager Energy Services:	Ensures that maintenance and calibration of CEMS is carried out at the required intervals and the necessary spare parts for the equipment are available.

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Technical Manager D3:	Ensures that the CEMS on each stack at D3 plant is operational and adequately maintained. Keeps records of CEMS data and processes CEMS data as necessary.
RE:	Carries out operational checks of the CEMS components and maintenance as necessary, and in line with the standard EN 14181 procedures. Keeps records of maintenance and calibration tests of the CEMS equipment.
Shift Operations Engineers:	Monitor the CEMS operation on an ongoing basis to ensure satisfactory emissions levels in line with the IPPC permit obligations and equipment performance. Report any non conforming stack emission levels and any malfunctions of the CEMS to the RE
SPE, Regulatory Affairs:	Checks for consistency of the emissions reports generated by the CEMS and submits reports to the authority.
Third Party laboratories:	Laboratories accredited to ISO/IEC 17025:2005, hired for carrying out QAL2 & AST test obligations

5. Operative Rules

5.1 CEMS Procurement: QAL1

The Generation Manager and Managers , together with the help of the RE, shall ensure that the complete or part installation of CEMS components installed on each stack shall be certified by an accredited third party laboratory as evidence of compliance with the QAL1 requirements. Testing of CEMS equipment at the supplier shall be based upon a set of laboratory and field procedures that test the performance of the system against predefined limits. These procedures are defined in standard EN 15267-3.

The RE should check that the certification of the instruments or replacement parts that are proposed meets as closely as possible his specific requirements and informs the Station Manager accordingly.

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5.2 CEMS Operation: QAL2

QAL 2 testing must be conducted by an approved independent third party laboratory certified to EN ISO/IEC 17025: 2005.

The Generation Manager, together with the assistance of the RE, shall ensure that the QAL 2 testing procedures are followed to verify that each CEMS installation will meet the accuracy requirements laid down by EN 14181. The performance of the complete installation is to be monitored and compared against a series of measurements made with approved Standard Reference Methods.

QAL2 procedures must be carried out:

- After installation and commissioning of the CEMS
- If there is subsequently a significant change in plant operation which changes the emission levels
- If there has been a failure of the CEMS equipment, or major changes or repairs to the CEMS which will influence the results obtained significantly
- If there has been an upgrade or other significant change to the CEMS that affects its calibration
- After corrective action following a failure of the CEMS in either the QAL 3 or AST procedures
- At least every 5 years for every CEMS or more frequently if so required by legislation or the authority


The results of QAL2 tests shall be reported within 6 months after the changes and to include the information as detailed in EN 14181.

It is a requirement of QAL 2 to ensure that the CEMS is:

- Installed in the correct location for a representative measurement of emissions.
- Installed where there is sufficient **safe** access to maintain, assess and control it.
- Calibrated and operating correctly.

5.3 CEMS Operation: QAL3

The RE shall ensure that QAL 3 procedure is followed in order to maintain ongoing satisfactory quality. This is accomplished by detecting and recording drift or changes in precision in the CEMS through regular checks

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of the zero and span readings against reference materials (such as bottled protocol gases or optical filters in the case of opacity/dust monitors). The results are to be recorded and drifts noted. This will determine whether the CEMS requires maintenance or not.

The RE, is responsible for the implementation and performance of the QAL 3 procedure. It does not require an approved laboratory to carry out the procedures and the duration of the QAL3 stage is 1 year (between successive AST).

QAL 3 requires that the following information shall be recorded:

- CEMS details; monitoring technique, operating range, make and model
- CEMS changes; details of change in make, model and serial number
- Manufacturer's maintenance and service visit records
- Communication records with manufacturer's; corrective actions taken
- Drift tabulation


The frequency of QAL 3 checks is determined by the maintenance interval determined in the QAL 1 testing. Equipment with longer specified maintenance intervals requires less frequent QAL 3 testing.

5.4 CEMS Operation: AST

It is the responsibility of the Generation Manager and/or Manager Energy Services , together with the help of the RE, to ensure that the Annual Surveillance Test is carried out on every CEMS. It is essentially a mini QAL 2 procedure, performed annually to verify the continuing validity of the calibration function. The requirements and responsibilities for carrying out the AST tests are the same as for QAL 2. During AST at least five parallel measurements with an SRM shall be performed, as per EN 14181 requirements, together with the reporting obligations.

Responsibility for the tests must be with an accredited third party laboratory, although either Enemalta or the CEMS supplier may perform the tests. In such cases, these tests should be verified by audit by the accredited laboratory and included in their report. The AST should also adhere to the obligations stated in the MPS IPPC permit.

Should the CEMS fail the AST then appropriate corrective action must be taken and the full QAL 2 test must be repeated.

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5.5 CEMS Records


It is the responsibility of the Manager Energy Services to maintain records of the QAL1/2/3/AST levels readily available for inspection and review by internal and external auditors.

In addition the RE shall ensure that a system to record the dates when calibration gases are due to expire has to be in place to ensure gases are within date and new gases ordered well in advance to ensure gases are always available.

5.6 CEMS Operation: Air Emissions Reporting

In line with the obligations of the IPPC permit, the CEMS should be able to generate the air emissions details as per templates provided in the same permit. Emissions details shall include the following reports that have to be submitted to the authority regularly on a stack-by-stack basis:

1. **Monthly reporting for dust, SO₂, NO_x & CO concentrations:**
 - a. Validated hourly averages (see Tables in Schedule 4, IPPC permit) of concentrations **(mg/Nm³)**
 - b. Validated Diurnal data of concentrations over a whole month period (see Tables in Schedule 4, IPPC permit) **(mg/Nm³)**
 - c. Monthly statistical concentration data (see Table in Schedule 4, IPPC permit)
2. **Quarterly reporting for SO₂ & NO_x loads (tonnes)** (see Schedule 3, Tables 3.2.2.1/2)
3. **Annually, as part of the AER, for dust, SO₂, NO_x & CO:**
 - a. Summary of emissions (concentrations) (see Schedule 2, Tables S2.4.1.1 & S2.4.1.2) **(mg/Nm³)**
 - b. Monthly Loads **(tonnes)** (see Schedule 2, Table S2.4.2) [Note: this data is also currently being submitted on a monthly basis, together with the other IPPC monthly reports.]
 - c. Annual Loads **(tonnes)** (see Schedule 2, Tables S2.4.3.1)
4. **Annually, as part of the AER, for Ammonia [for diesel engine plants ONLY]:**
 - a. Concentrations **(mg/Nm³)** (see Schedule 2, table S2.4.1.6)
 - b. Loads **(tonnes)** (see Schedule 2, table S2.4.3.3)

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In the context of the above reports generated by the CEMS, the SPE of the RAO shall enter the fuel consumption data in the monthly loads reports prior submission of the reports to the authority.

In addition, following an agreement with the authority, the SPE of the RAO shall also calculate the SO₂ monthly loads from each stack, based on the standard stoichiometric combustion equation for sulphur, and on a monthly weighted average of percentage Sulphur for fuel consignments and monthly beginning and end stocks values. This report is submitted to the authority and is used as the basis for SO₂ National Emissions Ceiling (NEC) annual data. In cases where the measured values of NO_x may, for some reason, not show consistency with past performance data the SPE shall inform the Station Manager to initiate checks on the CEMS operation. A calculated value based on pro-rata fuel consumption and past emission data may be used for reporting purposes and the authority shall be informed accordingly.

6. Reference Documents

CEMS equipment suppliers' specifications

CEMS suppliers' maintenance instructions

IPPC Permit Tables in Schedules 2, 3 and 4