
TENDER REF: GN/MPS/T/PC1/19/2010

Period Contract for Stack Air Emissions Monitoring

Report of the third session of sampling and analysis at Marsa and Delimara Power Stations, carried out in January 2012

**Report submitted to
Enemalta Corporation**

by



and



ECOSERV'S REPORT REFERENCE: 058-12

APRIL 2012

Introduction

1. In March 2010 the Enemalta Corporation issued a call for tenders titled “*Period Contract for Stack Air Emissions Monitoring (Advert No. GN/MPS/T/PC1/19/2010)*”. The tender is for the supply of services for stack air emissions monitoring, which is required by Enemalta Corporation in order to fulfil its environmental obligations as stipulated in the IPPC permits for the operation of the Marsa and Delimara Power Plants.
2. CADA s.n.c. and Ecoserv Ltd submitted a joint bid for this tender and were subsequently informed by Enemalta Corporation (Letter of Acceptance dated 4th August 2010) that our offer for the collection of stack emissions data from the Marsa and Delimara Power Stations had been accepted as per conditions published in the call for tenders and as described in our tender submission.
3. The sampling and analysis involves 4 chimney stacks at Marsa Power Station (MPS) and 1 chimney stack (serving as an emission point of the exhaust gases from 2 boilers) at Delimara Power Station (DPS). Each emission point requires sampling and analysis for the following parameters:
 - (i) Dioxins and Furans (PCDDs and PCDFs) as per EN 1948 Parts 1 to 3:2006;
 - (ii) Cadmium and thallium together as per EN 14385:2004;
 - (iii) Arsenic, chromium, cobalt, copper, manganese, nickel, lead, antimony and vanadium together as per EN 14385:2004; and
 - (iv) Polyaromatic hydrocarbons (PAHs) (ng/Nm³ in dust), including:
 - naphthalene,
 - anthracene,
 - phenanthrene,
 - fluoranthene,
 - benzo(a)anthracene,
 - chrysene,
 - benzo(a)pyrene,
 - benzo(ghi) perylene,
 - benzo(k)fluoranthene,
 - indeno-pyrene, and
 - PAH (total of the PAH components listed above).
4. Sampling was required on a half-yearly basis for parameters listed in 3(i) – 3(iii) above, and on a yearly basis for the parameters listed in 3(iv). Both sampling and analysis were required to be carried out at laboratories that are accredited to ISO 17025:2005 standard for the sampling and analysis of emissions to air from stationary sources.
5. The first session for monitoring stack air emissions at the MPS and DPS was carried out in September 2010. The parameters listed in 3(i)-(iv) were monitored. The results from this monitoring session were presented in CADA and Ecoserv’s report (see CADA and Ecoserv, 2010). The second session for monitoring of stack emissions at the MPS and DPS was carried out in July 2011, for the parameters listed in 3(i) to (iii) above. The results for the second

- monitoring session were presented in CADA and Ecoserv's report (see CADA and Ecoserv, 2011).
6. CADA and Ecoserv were informed by correspondence received from Enemalta on the 7th December, 2011 that an extension of contract was being granted to cover the required monitoring of emissions for Marsa and Delimara Power Stations, as per parameters stipulated in the relevant IPPC permit.
 7. The following schedule for sampling and analyses was requested:
 - a) December 2011 – PAHs
 - b) 2012
 - i) Dioxins and Furans to be performed 24 months after the analysis carried out in June 2010;
 - ii) Heavy metals to be carried out January-June 2012 and July-December 2012;
 - iii) PAHs annually
 - Subsequently, due to logistic reasons the session requested for December 2011 was re-scheduled to January 2012, by approval of Enemalta.
 8. The present report presents the results of analysis for the third sampling session from the MPS and DPS, held in January 2012. The parameters required to be monitored during this session are listed in 3 (iv) above.

Methodology

9. Sampling from the MPS and DPS emission stacks was initiated on the 25th January 2012 and continued until the 2nd February 2012. Sampling was carried out by CADA personnel, assisted by staff from Ecoserv. Sampling from stack labelled E4 at MPS was undertaken on 31 January 2012, on this day we were informed by Enemalta personnel that the boilers 5 and 6 feeding this emission point were being operated at maximum load.
10. The sample from each emission point consisted of a 6-hourly (daily) sample as specified in the relevant methodology for sampling from stationary emission sources. The sampling methodology for the different groups of parameters followed the details provided in the standard international methods as shown in Table 1.

Table 1. Details of the sampling methodology

Analyte group	Standard method reference	Title of standard method
PAHs	ISO 11338-1:2003	Stationary source emissions -- Determination of gas and particle-phase polycyclic aromatic hydrocarbons. Part 1: Sampling

11. The analytical methodology applied for the respective parameters and the limits of detection that could be met by the laboratory are given in Table 2.

Table 2. Details of the analytical methodology

Analyte	Method	Detection limits
PAHs		
Naphthalene		
Anthracene		
Phenanthrene		
Fluoranthene		
Benzo(a)anthracene		
Chrysene	ISO 12884:2000	0.1 ng/Nm ³
Benzo(a)pyrene		
Benzo(ghi) perylene		
Benzo(k)fluoranthene		
Indeno-pyrene		
Sum of PAHs		

Results

12. Ecoserv's report reference for analyses reported on in the present document is **058-12**. Sample reference codes are as follows:

Enemalta stack reference	Date of sampling	Ecoserv reference code
Delimara Power Station E1	25-01-2012	A-006-12
Delimara Power Station E2	26-01-2012	A-007-12
Marsa Power Station E4	27-01-2012	A-008-12
Marsa Power Station E2	31-01-2012	A-009-12
Marsa Power Station E1	02-02-2012	A-010-12

13. The results of chemical analyses of the 5 samples collected from MPS and DPS are summarised in Tables 3 and 4 respectively.

Table 3. Summary of results of analysis for (iv) polycyclic aromatic hydrocarbons recorded from the 3 emission points at Marsa Power Station (Marsa E1, E2 and E4).

Analyte	Units	Marsa Power Station		
		E1	E2	E4
		A-010-12	A-009-12	A-008-12
iv) PAHs (Total of list below)	ng/Nm ³	16150	803	2009
Naphthalene	ng/Nm ³	16014	799	1946
Anthracene	ng/Nm ³	ND < 0.01	ND < 0.01	ND < 0.01
Phenanthrene	ng/Nm ³	124	4	48
Fluoranthene	ng/Nm ³	12	ND < 0.01	15
Benzo(a)anthracene	ng/Nm ³	ND < 0.01	ND < 0.01	ND < 0.01
Chrysene	ng/Nm ³	ND < 0.01	ND < 0.01	ND < 0.01
Benzo(a)pyrene	ng/Nm ³	ND < 0.01	ND < 0.01	ND < 0.01
Benz(hi)perylene	ng/Nm ³	ND < 0.01	ND < 0.01	ND < 0.01
Benzo(k)fluoranthene	ng/Nm ³	ND < 0.01	ND < 0.01	ND < 0.01
Indeno-pyrene	ng/Nm ³	ND < 0.01	ND < 0.01	ND < 0.01

Table 4. Summary of results of analysis for (iv) polycyclic aromatic hydrocarbons recorded from the 2 emission points at Delimara Power Station (Delimara E1 – E2).

Analyte	Units	Delimara Power Station	
		E1	E2
		A-006-12	A-007-12
iv) PAHs (Total of list below)	ng/Nm ³	7851	7435
Naphthalene	ng/Nm ³	7673	7234
Anthracene	ng/Nm ³	ND < 0.01	ND < 0.01
Phenanthrene	ng/Nm ³	138	143
Fluoranthene	ng/Nm ³	37	54
Benzo(a)anthracene	ng/Nm ³	ND < 0.01	ND < 0.01
Chrysene	ng/Nm ³	3	4
Benzo(a)pyrene	ng/Nm ³	ND < 0.01	ND < 0.01
Benz(hi)perylene	ng/Nm ³	ND < 0.01	ND < 0.01
Benzo(k)fluoranthene	ng/Nm ³	ND < 0.01	ND < 0.01
Indeno-pyrene	ng/Nm ³	ND < 0.01	ND < 0.01

14. The comprehensive reports for each individual sampling point as certified by CADA s.n.c., are included herewith as an Appendix, in the following order:
- (i) Delimara Power Station E1
 - (ii) Delimara Power Station E2
 - (iii) Marsa Power Station E4
 - (iv) Marsa Power Station E2
 - (v) Marsa Power Station E1

15. The comprehensive reports include additional information about the sampling procedures and the emissions resulting from each sampling point, such as:
 - (i) the percentage gas composition and humidity;
 - (ii) flow speed and related physical characteristics;
 - (iii) chimney stack specifications,
 - (iv) recorded values of individual metals tested;
 - (v) equipment used; and
 - (vi) quality assurance.

References

CADA and Ecoserv (2010) Period Contract for Stack Air Emissions Monitoring. Report of the first session of sampling and analysis at Marsa and Delimara Power Stations, made in September 2010, unpublished report; 31pp.

CADA and Ecoserv (2011) Period Contract for Stack Air Emissions Monitoring. Report of the second session of sampling and analysis at Marsa and Delimara Power Stations, made in July 2011, unpublished report; 30pp.

APPENDIX

Certified Reports for the 5 Sampling Points

- **Delimara Power Station E1**
- **Delimara Power Station E2**
- **Marsa Power Station E4**
- **Marsa Power Station E2**
- **Marsa Power Station E1**



**Chimica
Applicata
Depurazione
Acque s.n.c.**
di Filippo Giglio & C.

- Autorizzazione MIPAAF per analisi nel Settore Oleicolo D.M. 06-04-2011
- Inserimento tra i "Tecnici Competenti" di cui al punto 7 art. n°2 della Legge Quadro sull' inquinamento acustico per la redazione dei "Piani di Risanamento Acustico"
- Inserimento tra i laboratori atti al rilievo dei materiali e/o polveri contenenti amianto di cui al D.M. 07/07/1997



ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

LAB N°0439

Test Report n°

2105744-001

Description:

**Flue gas in atmosphere from emission point resulting from
the chimney of Steam Blr/Tur Units – E1**

**Customer:
Enemalta Corporation
Delimara Power Station
Delimara - Malta**

Collection Records: **2105744**

Sampling Date: **25/01/2012**

Reception Date **25/01/2012** Initiation Date of the tests **25/01/2012**

Date Test Report: **05/04/2012** End Date of the test **02/04/2012**

Sampling Procedure **Sampled by the Laboratory C.A.D.A. snc: ISO 11338-1:2003**

Reference for the
Limits **IPPC**

TEST	U.M.	Metodo	Risultato	Incrt.	Recup.	L.Min	L.Max
PARAMETERS CHEMICAL							
1. PAH	ng/Nm ³	ISO 11338-1:2003	7851				
1.1 Anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.2 Fluoranthene	ng/Nm ³	ISO 11338-1:2003	37				
1.3 Naphtalene	ng/Nm ³	ISO 11338-1:2003	7673				
1.4 Phenanthrene	ng/Nm ³	ISO 11338-1:2003	138				
1.5 Benzo(a)anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.6 Benzo(a)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.7 Benzo(k)fluoranthene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.8 Benzo(g,h,i)perylene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.9 Crysene	ng/Nm ³	ISO 11338-1:2003	3				
1.10 Indeno(1,2,3,cd)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				

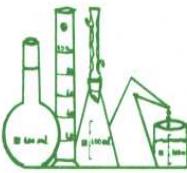
(*) = The tests are marked on the side of the result, are not accredited by ACCREDIA

Parameters marked with the letter 'C' have been corrected for recovery

<Do not evaluable for less than the detection limit of the test method.
The sample is kept for two weeks from the date of acceptance unless otherwise provided by regulations.
When given the uncertainty it is expressed with the same units as the measurand to which it relates:
- the measure to a probability of 95% and a coverage factor K = 2 for the chemical tests;
- the limits of reproducibility SR, with an expanded uncertainty U with SR equal to the coverage factor K = 2 for the microbiological testing of food;
- a confidence interval with the probability to 95% with coverage factor K = 2 for testing microbiological water.
This report relates to the sample tested and it can not be reproduced in part, without the prior written approval from the CADA snc.
The record concerning the above sample is retained for a period of not less than 4 years.

Opinions and interpretations - not the subject of accreditation ACCREDIA

- For the parameters marked with the symbol on the side the measured value, taking into account the uncertainty, is not significantly greater than the limit value, the level of 95% confidence



Segue Rapporto di
prova n°

2105744-001

Test Finality

Evaluation of the Emissions to air from power station

Staff of the company present during sampling

Environmental condition during the sampling

Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
18	1000	55

Standard Conditions

Temperature: 0 °C	Pressure: 101,3 kPa	Oxygen: 3 %
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Terms of the facility

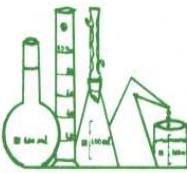
Facility description	electricity generation
Process characteristics	Boiler for electricity generation
Emission's font	Boiler chimney
Operating conditions	Full load
Frequency of emission (event/day)	1
During of emission (hour/event)	24
Emission type	<input type="checkbox"/> continuous / constant <input checked="" type="checkbox"/> continuous / variable <input type="checkbox"/> discontinuous / constant <input type="checkbox"/> discontinuous / variable
Abatement system	nothing
Changes detected during sampling or during the measurements	nothing

Caratteristiche del camino d'emissione e Conformità della Piattaforma di campionamento

Chemney geometry	Circular
Chemney section (m ²)	7,065 m ²
Chemney Height (m)	m
Sampling point height (m)	m
Sampling point numbers	2
Deck Area sampling >5 m ²	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of artificial lighting	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of adequate electrical system	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Workspace with support concentrated > 400 kg	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of the handrail or railing (for high altitude platforms)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Compliance sampling platform	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Photo indicative of the Camino Issue





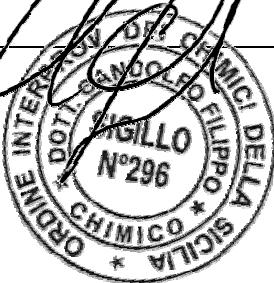
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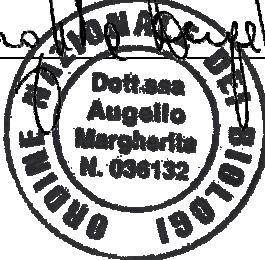
Speed and flow					
Date	Calculation method 25/01/2012	Start Time 12:30	UNI 10169:2001	End Time 18:30	
Compliance with the sampling plan			<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
No. diameters upstream of the sampling point	> 5			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
No. diameters downstream of the site	> 2 (> 5 with an outlet in direct atm)			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Gas composition					
Oxygen (on dry)	Metodica IO.17.58 rev.2	u.o.m. %	Result 4,2		
Carbon dioxide (on dry)	IO.17.58 rev.2	u.o.m. %	Result 10,2		
Humidity	UNI 10169:2001	Molar fraction	Result 0,11		
Average molar mass	UNI 10169:2001	g	Result 28,5		
Volumic mass	UNI 10169:2001	kg/m ³	Result 0,807		
Equipment used					
Device for measuring the flow:	Zambelli ISO Plus				
Device for measuring the velocity and temperature	Type S pitot tube				
Pitot tube constant measurement (K)	0,82				
Calibration certificate	CETIAT n° A080190/2869161 of 29/05/2008				
Measured values in flue gas					
Parameter	Method	u.o.m.	Result	Limits	
Pressure differential	UNI 10169:2001	mmH ₂ O	11,6	///	
Flue average speed (v)	UNI 10169:2001	m/s	14,3	///	
Flue direction	///	///	Vertical	///	
Average temperature of gas	UNI 10169:2001	°C	151,9	///	
Sampling point pressure	UNI 10169:2001	hPa	1000,0	///	
Actual extent gases (Qe)	UNI 10169:2001	m ³ /h	364271	///	
Flue normalized wet gases (Qn)	UNI 10169:2001	Nm ³ /h	231013	///	
Flue normalized dry gases (Qns)	Calculated	Nm ³ /h	205971	///	
Flue normalized dry gases correct for O ₂	Calculated	Nm ³ /h	192239	///	

Responsible of Department

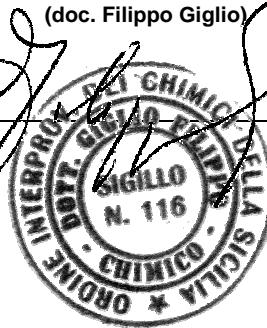
Monitoring and Control
(doc. Filippo Cannolfo)



Director of Division Analytical
(doc. Margherita Augello)



Chemist
(doc. Filippo Giglio)





**Chimica
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di Filippo Giglio & C.

- Autorizzazione MIPAAF per analisi nel Settore
Oleicolo D.M. 06-04-2011
- Inserimento tra i "Tecnici Competenti" di cui al
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sull' inquinamento acustico per la redazione dei
"Piani di Risanamento Acustico"
- Inserimento tra i laboratori atti al rilievo dei
materiali e/o polveri contenenti amianto di cui al
D.M. 07/07/1997



ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

LAB N°0439

Test Report n°

2105744-002

Description:

**Flue gas in atmosphere from emission point resulting from
the chimney of Steam Blr/Tur Units – E2**

**Customer:
Enemalta Corporation
Delimara Power Station
Delimara - Malta**

Collection Records: **2105744**

Sampling Date: **26/01/2012**

Reception Date **26/01/2012** Initiation Date of the tests **26/01/2012**

Date Test Report: **05/04/2012** End Date of the test **02/04/2012**

Sampling Procedure **Sampled by the Laboratory C.A.D.A. snc: ISO 11338-1:2003**

Reference for the
Limits **IPPC**

TEST	U.M.	Metodo	Risultato	Incrt.	Recup.	L.Min	L.Max
PARAMETERS CHEMICAL							
1. PAH	ng/Nm ³	ISO 11338-1:2003	7435				
1.1 Anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.2 Fluoranthene	ng/Nm ³	ISO 11338-1:2003	54				
1.3 Naphtalene	ng/Nm ³	ISO 11338-1:2003	7234				
1.4 Phenanthrene	ng/Nm ³	ISO 11338-1:2003	143				
1.5 Benzo(a)anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.6 Benzo(a)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.7 Benzo(k)fluoranthene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.8 Benzo(g,h,i)perylene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.9 Crysene	ng/Nm ³	ISO 11338-1:2003	4				
1.10 Indeno(1,2,3,cd)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				

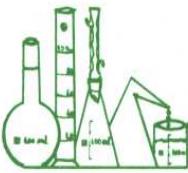
(*) = The tests are marked on the side of the result, are not accredited by ACCREDIA

Parameters marked with the letter 'C' have been corrected for recovery

<Do not evaluable for less than the detection limit of the test method.
The sample is kept for two weeks from the date of acceptance unless otherwise provided by regulations.
When given the uncertainty it is expressed with the same units as the measurand to which it relates:
- the measure to a probability of 95% and a coverage factor K = 2 for the chemical tests;
- the limits of reproducibility SR, with an expanded uncertainty U with SR equal to the coverage factor K = 2 for the microbiological testing of food;
- a confidence interval with the probability to 95% with coverage factor K = 2 for testing microbiological water.
This report relates to the sample tested and it can not be reproduced in part, without the prior written approval from the CADA snc.
The record concerning the above sample is retained for a period of not less than 4 years.

Opinions and interpretations - not the subject of accreditation ACCREDIA

- For the parameters marked with the symbol on the side the measured value, taking into account the uncertainty, is not significantly greater than the limit value, the level of 95% confidence



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- Autorizzazione MIPAAF per analisi nel Settore Oleicolo D.M. 06-04-2011
- Inserimento tra i "Tecnici Competenti" di cui al punto 7 art. n°2 della Legge Quadro sull'inquinamento acustico per la redazione dei "Piani di Risanamento Acustico"
- Inserimento tra i laboratori atti al rilievo dei materiali e/o polveri contenenti amianto di cui al D.M. 07/07/1997



ACCREDIA
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LAB N°0439

Segue Rapporto di
prova n°

2105744-002

Test Finality

Evaluation of the Emissions to air from power station

Staff of the company present during sampling

Environmental condition during the sampling

Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
17	1000	55

Standard Conditions

Temperature: 0 °C	Pressure: 101,3 kPa	Oxygen: 3 %
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Terms of the facility

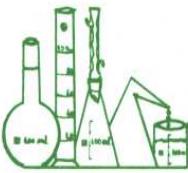
Facility description	electricity generation
Process characteristics	Boiler for electricity generation
Emission's font	Boiler chimney
Operating conditions	Full load
Frequency of emission (event/day)	1
During of emission (hour/event)	24
Emission type	<input type="checkbox"/> continuous / constant <input checked="" type="checkbox"/> continuous / variable <input type="checkbox"/> discontinuous / constant <input type="checkbox"/> discontinuous / variable
Abatement system	nothing
Changes detected during sampling or during the measurements	nothing

Caratteristiche del camino d'emissione e Conformità della Piattaforma di campionamento

Chemney geometry	Circular
Chemney section (m ²)	7,065 m ²
Chemney Height (m)	m
Sampling point height (m)	m
Sampling point numbers	2
Deck Area sampling >5 m ²	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of artificial lighting	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of adequate electrical system	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Workspace with support concentrated > 400 kg	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of the handrail or railing (for high altitude platforms)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Compliance sampling platform	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Photo indicative of the Camino Issue





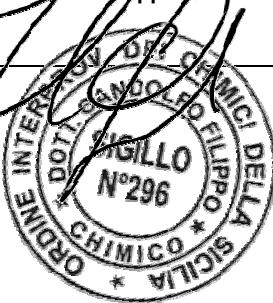
Segue Rapporto di
prova n°

2105744-002

Speed and flow			
Calculation method	Start Time	UNI 10169:2001	End Time
Date 08/07/2011	10:00	10:00	16:00
Compliance with the sampling plan		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
No. diameters upstream of the sampling point	> 5	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
No. diameters downstream of the site	> 2 (> 5 with an outlet in direct atm)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Gas composition			
Oxygen (on dry)	Metodica IO.17.58 rev.2	u.o.m. %	Result 3,8
Carbon dioxide (on dry)	IO.17.58 rev.2	%	11,1
Humidity	UNI 10169:2001	Molar fraction	0,11
Average molar mass	UNI 10169:2001	g	28,6
Volumic mass	UNI 10169:2001	kg/m ³	0,822
Equipment used			
Device for measuring the flow:	Zambelli ISO Plus		
Device for measuring the velocity and temperature	Type S pitot tube		
Pitot tube constant measurement (K)	0,82		
Calibration certificate	CETIAT n° A080190/2869161 of 29/05/2008		
Measured values in flue gas			
Parameter	Method	u.o.m.	Result
Pressure differential	UNI 10169:2001	mmH ₂ O	10,0
Flue average speed (v)	UNI 10169:2001	m/s	13,2
Flue direction	///	///	Vertical
Average temperature of gas	UNI 10169:2001	°C	145,7
Sampling point pressure	UNI 10169:2001	hPa	1000,0
Actual extent gases (Qe)	UNI 10169:2001	m ³ /h	335446
Flue normalized wet gases (Qn)	UNI 10169:2001	Nm ³ /h	215837
Flue normalized dry gases (Qns)	Calculated	Nm ³ /h	192512
Flue normalized dry gases correct for O ₂	Calculated	Nm ³ /h	183956
Limits			

Responsible of Department

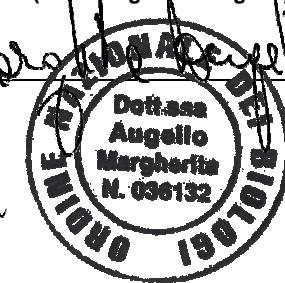
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Chemist
(doc. Filippo Giglio)



Director of Division Analytical
(doc. Margherita Augello)





**Chimica
Applicata
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Acque s.n.c.**
di Filippo Giglio & C.

- Autorizzazione MIPAAF per analisi nel Settore Oleicolo D.M. 06-04-2011
- Inserimento tra i "Tecnici Competenti" di cui al punto 7 art. n°2 della Legge Quadro sull'inquinamento acustico per la redazione dei "Piani di Risanamento Acustico"
- Inserimento tra i lavoratori atti al rilievo dei materiali e/o polveri contenenti amianto di cui al D.M. 07/07/1997



ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

LAB N°0439

Test Report n°

2105745-003

Description:

**Flue gas in atmosphere from emission point resulting from
the chimney of Steam Blr/Tur Units – E4**

**Customer:
Enemalta Corporation
Marsa Power Station
Marsa - Malta**

Collection Records: **2105745**

Sampling Date: **27/01/2012**

Reception Date **27/01/2012** Initiation Date of the tests **27/01/2012**

Date Test Report: **05/04/2012** End Date of the test **02/04/2012**

Sampling Procedure **Sampled by the Laboratory C.A.D.A. snc: ISO 11338-1:2003**

Reference for the
Limits **IPPC**

TEST	U.M.	Metodo	Risultato	Incrt.	Recup.	L.Min	L.Max
PARAMETERS CHEMICAL							
1. PAH	ng/Nm ³	ISO 11338-1:2003	2009				
1.1 Anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.2 Fluoranthene	ng/Nm ³	ISO 11338-1:2003	15				
1.3 Naphtalene	ng/Nm ³	ISO 11338-1:2003	1946				
1.4 Phenanthrene	ng/Nm ³	ISO 11338-1:2003	48				
1.5 Benzo(a)anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.6 Benzo(a)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.7 Benzo(k)fluoranthene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.8 Benzo(g,h,i)perylene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.9 Crysene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.10 Indeno(1,2,3,cd)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				

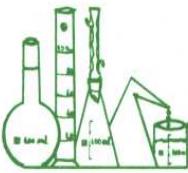
(*) = The tests are marked on the side of the result, are not accredited by ACCREDIA

Parameters marked with the letter 'C' have been corrected for recovery

<Do not evaluable for less than the detection limit of the test method.
The sample is kept for two weeks from the date of acceptance unless otherwise provided by regulations.
When given the uncertainty it is expressed with the same units as the measurand to which it relates:
- the measure to a probability of 95% and a coverage factor K = 2 for the chemical tests;
- the limits of reproducibility SR, with an expanded uncertainty U with SR equal to the coverage factor K = 2 for the microbiological testing of food;
- a confidence interval with the probability to 95% with coverage factor K = 2 for testing microbiological water.
This report relates to the sample tested and it can not be reproduced in part, without the prior written approval from the CADA snc.
The record concerning the above sample is retained for a period of not less than 4 years.

Opinions and interpretations - not the subject of accreditation ACCREDIA

- For the parameters marked with the symbol on the side the measured value, taking into account the uncertainty, is not significantly greater than the limit value, the level of 95% confidence



**Chimica
Applicata
Depurazione
Acque s.n.c.**
di Filippo Giglio & C.

- Autorizzazione MIPAAF per analisi nel Settore Oleicolo D.M. 06-04-2011
- Inserimento tra i "Tecnici Competenti" di cui al punto 7 art. n°2 della Legge Quadro sull'inquinamento acustico per la redazione dei "Piani di Risanamento Acustico"
- Inserimento tra i laboratori atti al rilievo dei materiali e/o polveri contenenti amianto di cui al D.M. 07/07/1997



ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

LAB N°0439

Segue Rapporto di
prova n°

2105745-003

Test Finality

Evaluation of the Emissions to air from power station

Staff of the company present during sampling

Environmental condition during the sampling

Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
12	1003	55

Standard Conditions

Temperature: 0 °C	Pressure: 101,3 kPa	Oxygen: 3 %
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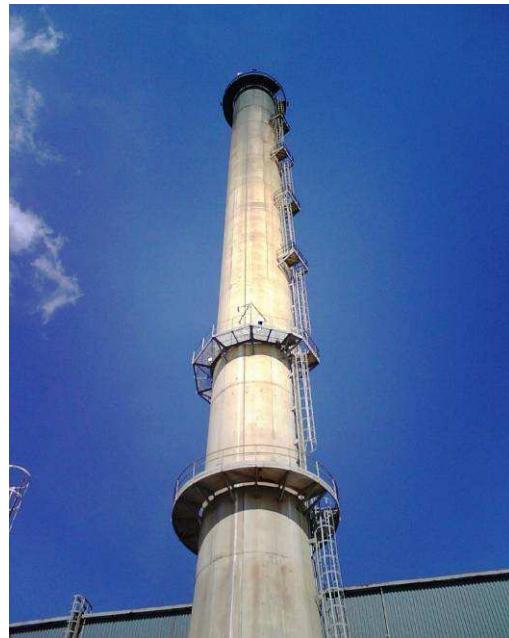
Terms of the facility

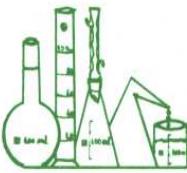
Facility description	electricity generation
Process characteristics	Boiler for electricity generation
Emission's font	Boiler chimney
Operating conditions	Full load
Frequency of emission (event/day)	1
During of emission (hour/event)	24
Emission type	<input type="checkbox"/> continuous / constant <input checked="" type="checkbox"/> continuous / variable <input type="checkbox"/> discontinuous / constant <input type="checkbox"/> discontinuous / variable
Abatement system	nothing
Changes detected during sampling or during the measurements	nothing

Caratteristiche del camino d'emissione e Conformità della Piattaforma di campionamento

Chemney geometry	Circular
Chemney section (m ²)	7,065 m ²
Chemney Height (m)	m
Sampling point height (m)	m
Sampling point numbers	2
Deck Area sampling >5 m ²	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of artificial lighting	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of adequate electrical system	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Workspace with support concentrated > 400 kg	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of the handrail or railing (for high altitude platforms)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Compliance sampling platform	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Photo indicative of the Camino Issue





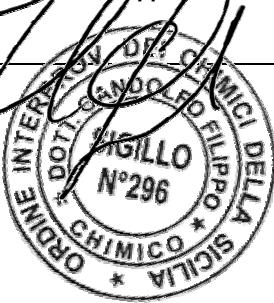
Segue Rapporto di
prova n°

2105745-003

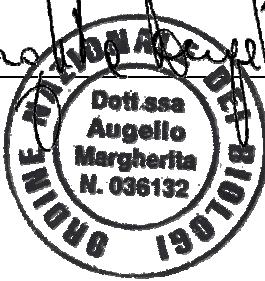
Speed and flow					
Calculation method	Start Time	10:30	UNI 10169:2001	End Time	17:00
Date	02/02/2012				
Compliance with the sampling plan			<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
No. diameters upstream of the sampling point	> 5			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
No. diameters downstream of the site	> 2 (> 5 with an outlet in direct atm)			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Gas composition					
Oxygen (on dry)	Metodica	u.o.m.	Result		
Carbon dioxide (on dry)	IO.17.58 rev.2	%	5,7		
Humidity	IO.17.58 rev.2	%	10		
Average molar mass	UNI 10169:2001	Molar fraction	0,11		
Volumic mass	UNI 10169:2001	g	28,6		
	UNI 10169:2001	kg/m ³	0,820		
Equipment used					
Device for measuring the flow:	Zambelli ISO Plus				
Device for measuring the velocity and temperature	Type S pitot tube				
Pitot tube constant measurement (K)	0,82				
Calibration certificate	CETIAT n° A080190/2869161 of 29/05/2008				
Measured values in flue gas					
Parameter	Method	u.o.m.	Result	Limits	
Pressure differential	UNI 10169:2001	mmH ₂ O	1,8	///	
Flue average speed (v)	UNI 10169:2001	m/s	5,6	///	
Flue direction	///	///	Vertical	///	
Average temperature of gas	UNI 10169:2001	°C	147,4	///	
Sampling point pressure	UNI 10169:2001	hPa	1003,0	///	
Actual extent gases (Qe)	UNI 10169:2001	m ³ /h	141865	///	
Flue normalized wet gases (Qn)	UNI 10169:2001	Nm ³ /h	91192	///	
Flue normalized dry gases (Qns)	Calculated	Nm ³ /h	81491	///	
Flue normalized dry gases correct for O ₂	Calculated	Nm ³ /h	69267	///	

Responsible of Department

Monitoring and Control
(doc. Filippo Canofolo)

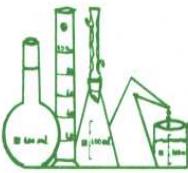


Director of Division Analytical
(doc. Margherita Augello)



Chemist
(doc. Filippo Giglio)





**Chimica
Applicata
Depurazione
Acque s.n.c.**
di Filippo Giglio & C.

- Autorizzazione MIPAAF per analisi nel Settore
Oleicolo D.M. 06-04-2011
- Inserimento tra i "Tecnici Competenti" di cui al
punto 7 art. n°2 della Legge Quadro
sull'inquinamento acustico per la redazione dei
"Piani di Risanamento Acustico"
- Inserimento tra i lavoratori atti al rilievo dei
materiali e/o polveri contenenti amianto di cui al
D.M. 07/07/1997



ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

LAB N°0439

Test Report n°

2105745-002

Description:

**Flue gas in atmosphere from emission point resulting from
the chimney of Steam Blr/Tur Units – E2**

**Customer:
Enemalta Corporation
Marsa Power Station
Marsa - Malta**

Collection Records: **2105745**

Sampling Date: **31/01/2012**

Reception Date **31/01/2012** Initiation Date of the tests **31/01/2012**

Date Test Report: **05/04/2012** End Date of the test **02/04/2012**

Sampling Procedure **Sampled by the Laboratory C.A.D.A. snc: ISO 11338-1:2003**

Reference for the
Limits **IPPC**

TEST	U.M.	Metodo	Risultato	Incrt.	Recup.	L.Min	L.Max
PARAMETERS CHEMICAL							
1. PAH	ng/Nm ³	ISO 11338-1:2003	803				
1.1 Anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.2 Fluoranthene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.3 Naphtalene	ng/Nm ³	ISO 11338-1:2003	799				
1.4 Phenanthrene	ng/Nm ³	ISO 11338-1:2003	4				
1.5 Benzo(a)anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.6 Benzo(a)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.7 Benzo(k)fluoranthene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.8 Benzo(g,h,i)perylene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.9 Crysene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.10 Indeno(1,2,3,cd)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				

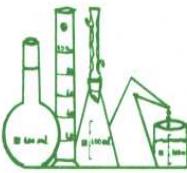
(*) = The tests are marked on the side of the result, are not accredited by ACCREDIA

Parameters marked with the letter 'C' have been corrected for recovery

<Do not evaluable for less than the detection limit of the test method.
The sample is kept for two weeks from the date of acceptance unless otherwise provided by regulations.
When given the uncertainty it is expressed with the same units as the measurand to which it relates:
- the measure to a probability of 95% and a coverage factor K = 2 for the chemical tests;
- the limits of reproducibility SR, with an expanded uncertainty U with SR equal to the coverage factor K = 2 for the microbiological testing of food;
- a confidence interval with the probability to 95% with coverage factor K = 2 for testing microbiological water.
This report relates to the sample tested and it can not be reproduced in part, without the prior written approval from the CADA snc.
The record concerning the above sample is retained for a period of not less than 4 years.

Opinions and interpretations - not the subject of accreditation ACCREDIA

- For the parameters marked with the symbol on the side the measured value, taking into account the uncertainty, is not significantly greater than the limit value, the level of 95% confidence



**Chimica
Applicata
Depurazione
Acque s.n.c.**
di Filippo Giglio & C.

- Autorizzazione MIPAAF per analisi nel Settore Oleicolo D.M. 06-04-2011
- Inserimento tra i "Tecnici Competenti" di cui al punto 7 art. n°2 della Legge Quadro sull'inquinamento acustico per la redazione dei "Piani di Risanamento Acustico"
- Inserimento tra i laboratori atti al rilievo dei materiali e/o polveri contenenti amianto di cui al D.M. 07/07/1997



ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

LAB N°0439

Segue Rapporto di
prova n°

2105745-002

Test Finality

Evaluation of the Emissions to air from power station

Staff of the company present during sampling

Environmental condition during the sampling

Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
10	1003	55

Standard Conditions

Temperature: 0 °C	Pressure: 101,3 kPa	Oxygen: 3 %
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Terms of the facility

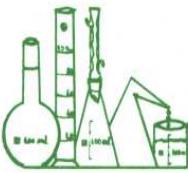
Facility description	electricity generation
Process characteristics	Boiler for electricity generation
Emission's font	Boiler chimney
Operating conditions	Full load
Frequency of emission (event/day)	1
During of emission (hour/event)	24
Emission type	<input type="checkbox"/> continuous / constant <input checked="" type="checkbox"/> continuous / variable <input type="checkbox"/> discontinuous / constant <input type="checkbox"/> discontinuous / variable
Abatement system	nothing
Changes detected during sampling or during the measurements	nothing

Caratteristiche del camino d'emissione e Conformità della Piattaforma di campionamento

Chemney geometry	Circular
Chemney section (m ²)	7,065 m ²
Chemney Height (m)	m
Sampling point height (m)	m
Sampling point numbers	2
Deck Area sampling >5 m ²	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of artificial lighting	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of adequate electrical system	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Workspace with support concentrated > 400 kg	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of the handrail or railing (for high altitude platforms)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Compliance sampling platform	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Photo indicative of the Camino Issue





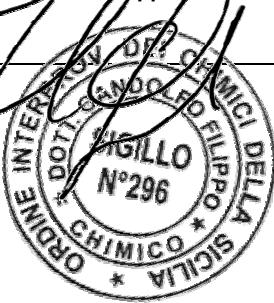
Segue Rapporto di
prova n°

2105745-002

Speed and flow				
Calculation method	Start Time	11:00	UNI 10169:2001	End Time
Date	01/02/2012			18:00
Compliance with the sampling plan		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
No. diameters upstream of the sampling point	> 5			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
No. diameters downstream of the site	> 2 (> 5 with an outlet in direct atm)			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Gas composition				
Oxygen (on dry)	Metodica	u.o.m.	Result	
Carbon dioxide (on dry)	IO.17.58 rev.2	%	5,5	
Humidity	IO.17.58 rev.2	%	10	
Average molar mass	UNI 10169:2001	Molar fraction	0,11	
Volumic mass	UNI 10169:2001	g	28,6	
	UNI 10169:2001	kg/m ³	0,856	
Equipment used				
Device for measuring the flow:	Zambelli ISO Plus			
Device for measuring the velocity and temperature	Type S pitot tube			
Pitot tube constant measurement (K)	0,82			
Calibration certificate	CETIAT n° A080190/2869161 of 29/05/2008			
Measured values in flue gas				
Parameter	Method	u.o.m.	Result	Limits
Pressure differential	UNI 10169:2001	mmH ₂ O	2,7	///
Flue average speed (v)	UNI 10169:2001	m/s	6,7	///
Flue direction	///	///	Vertical	///
Average temperature of gas	UNI 10169:2001	°C	129,5	///
Sampling point pressure	UNI 10169:2001	hPa	1003,0	///
Actual extent gases (Qe)	UNI 10169:2001	m ³ /h	169843	///
Flue normalized wet gases (Qn)	UNI 10169:2001	Nm ³ /h	114028	///
Flue normalized dry gases (Qns)	Calculated	Nm ³ /h	102042	///
Flue normalized dry gases correct for O ₂	Calculated	Nm ³ /h	87869	///

Responsible of Department

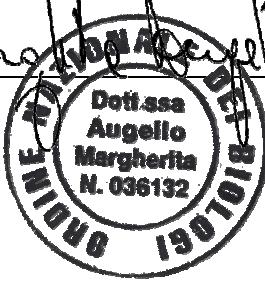
Monitoring and Control
(doc. Filippo Giglio)

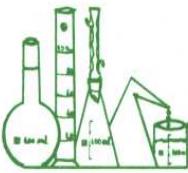


Chemist
(doc. Filippo Giglio)



Director of Division Analytical
(doc. Margherita Augello)





**Chimica
Applicata
Depurazione
Acque s.n.c.**
di Filippo Giglio & C.

- Autorizzazione MIPAAF per analisi nel Settore Oleicolo D.M. 06-04-2011
- Inserimento tra i "Tecnici Competenti" di cui al punto 7 art. n°2 della Legge Quadro sull'inquinamento acustico per la redazione dei "Piani di Risanamento Acustico"
- Inserimento tra i lavoratori atti al rilievo dei materiali e/o polveri contenenti amianto di cui al D.M. 07/07/1997



ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

LAB N°0439

Test Report n°

2105745-001

Description:

**Flue gas in atmosphere from emission point resulting from
the chimney of Steam Blr/Tur Units – E1**

**Customer:
Enemalta Corporation
Marsa Power Station
Marsa - Malta**

Collection Records: **2105745**

Sampling Date: **02/02/2012**

Reception Date **02/02/2012** Initiation Date of the tests **02/02/2012**

Date Test Report: **05/04/2012** End Date of the test **02/04/2012**

Sampling Procedure **Sampled by the Laboratory C.A.D.A. snc: ISO 11338-1:2003**

Reference for the
Limits **IPPC**

TEST	U.M.	Metodo	Risultato	Incrt.	Recup.	L.Min	L.Max
PARAMETERS CHEMICAL							
1. PAH	ng/Nm ³	ISO 11338-1:2003	16150				
1.1 Anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.2 Fluoranthene	ng/Nm ³	ISO 11338-1:2003	12				
1.3 Naphtalene	ng/Nm ³	ISO 11338-1:2003	16014				
1.4 Phenanthrene	ng/Nm ³	ISO 11338-1:2003	124				
1.5 Benzo(a)anthracene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.6 Benzo(a)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.7 Benzo(k)fluoranthene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.8 Benzo(g,h,i)perylene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.9 Crysene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				
1.10 Indeno(1,2,3,cd)pyrene	ng/Nm ³	ISO 11338-1:2003	NV<0,01				

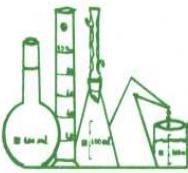
(*) = The tests are marked on the side of the result, are not accredited by ACCREDIA

Parameters marked with the letter 'C' have been corrected for recovery

<Do not evaluable for less than the detection limit of the test method.
The sample is kept for two weeks from the date of acceptance unless otherwise provided by regulations.
When given the uncertainty it is expressed with the same units as the measurand to which it relates:
- the measure to a probability of 95% and a coverage factor K = 2 for the chemical tests;
- the limits of reproducibility SR, with an expanded uncertainty U with SR equal to the coverage factor K = 2 for the microbiological testing of food;
- a confidence interval with the probability to 95% with coverage factor K = 2 for testing microbiological water.
This report relates to the sample tested and it can not be reproduced in part, without the prior written approval from the CADA snc.
The record concerning the above sample is retained for a period of not less than 4 years.

Opinions and interpretations - not the subject of accreditation ACCREDIA

- For the parameters marked with the symbol on the side the measured value, taking into account the uncertainty, is not significantly greater than the limit value, the level of 95% confidence



Segue Rapporto di
prova n°

2105745-001

Test Finality

Evaluation of the Emissions to air from power station

Staff of the company present during sampling

Environmental condition during the sampling

Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
12	1005	48

Standard Conditions

Temperature: 0 °C	Pressure: 101,3 kPa	Oxygen: 3 %
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Terms of the facility

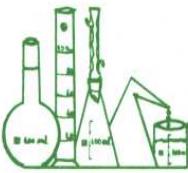
Facility description	electricity generation
Process characteristics	Boiler for electricity generation
Emission's font	Boiler chimney
Operating conditions	Full load
Frequency of emission (event/day)	1
During of emission (hour/event)	24
Emission type	<input type="checkbox"/> continuous / constant <input checked="" type="checkbox"/> continuous / variable <input type="checkbox"/> discontinuous / constant <input type="checkbox"/> discontinuous / variable
Abatement system	nothing
Changes detected during sampling or during the measurements	nothing

Caratteristiche del camino d'emissione e Conformità della Piattaforma di campionamento

Chemney geometry	Circular
Chemney section (m ²)	7,065 m ²
Chemney Height (m)	m
Sampling point height (m)	m
Sampling point numbers	2
Deck Area sampling >5 m ²	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of artificial lighting	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of adequate electrical system	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Workspace with support concentrated > 400 kg	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Presence of the handrail or railing (for high altitude platforms)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Compliance sampling platform	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Photo indicative of the Camino Issue





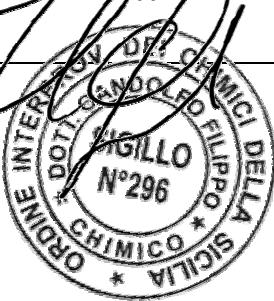
Segue Rapporto di
prova n°

2105745-001

Speed and flow				
Calculation method	Start Time	End Time	UNI 10169:2001	
Date 27/01/2012	10:30	17:30		
Compliance with the sampling plan <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
No. diameters upstream of the sampling point	> 5		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
No. diameters downstream of the site	> 2 (> 5 with an outlet in direct atm)		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Gas composition				
Oxygen (on dry)	Metodica IO.17.58 rev.2	u.o.m. %	Result 3,8	
Carbon dioxide (on dry)	IO.17.58 rev.2	%	11	
Humidity	UNI 10169:2001	Molar fraction	0,11	
Average molar mass	UNI 10169:2001	g	28,6	
Volumic mass	UNI 10169:2001	kg/m ³	0,825	
Equipment used				
Device for measuring the flow:	Zambelli ISO Plus			
Device for measuring the velocity and temperature	Type S pitot tube			
Pitot tube constant measurement (K)	0,82			
Calibration certificate	CETIAT n° A080190/2869161 of 29/05/2008			
Measured values in flue gas				
Parameter	Method	u.o.m.	Result	Limits
Pressure differential	UNI 10169:2001	mmH ₂ O	1,9	///
Flue average speed (v)	UNI 10169:2001	m/s	5,8	///
Flue direction	///	///	Vertical	///
Average temperature of gas	UNI 10169:2001	°C	146,2	///
Sampling point pressure	UNI 10169:2001	hPa	1005,0	///
Actual extent gases (Qe)	UNI 10169:2001	m ³ /h	147150	///
Flue normalized wet gases (Qn)	UNI 10169:2001	Nm ³ /h	95053	///
Flue normalized dry gases (Qns)	Calculated	Nm ³ /h	84838	///
Flue normalized dry gases correct for O ₂	Calculated	Nm ³ /h	81067	///

Responsible of Department

Monitoring and Control
(doc. Filippo Giglio)



Chemist
(doc. Filippo Giglio)



Director of Division Analytical
(doc. Margherita Augello)

