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DRAGER

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BP 80121
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TEST REPORT



N°: 19502839-1- VERSION 1 DATE OF

REPORT: 17/12/2020

CONTROL OF ATMOSPHERIC EMISSIONS

INSTALLATION(S) CHECKED

SMOKE TREATMENT UNIT

PLACE OF INTERVENTION

SDIS 85
LOUIS JOUVET
STREET
85000 LA ROCHE SUR YON

DATE OF INTERVENTION

26/12/2020

INTERVENANT(S)

MENARD

NAME AND FUNCTION OF THE SIGNATAIRE

MENARD - TECHNICIENNE

ACCOMPANYED BY

M.SENGLER

REPORT A

M.SENGLER

SIGNATURE

MENARD Marion

Validation électronique



Accreditation No. 1-
0292 List of sites and
scopes
available at www.cofrac.fr

Report version tracking		
Version	Summary of changes	Chapter(s), Amended Table(s)
1	Creating the document	/

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1 COMPLIANCE WITH LIMIT VALUES

The following tables specify the pollutants that exceed the emission limit values. Details of the values are given in paragraph 3.

WITH DRAGER TREATMENT

No overruns are to be reported, compliance with ELVs

WITHOUT TREATMENT

The Dust concentration is higher than the regulatory value.

2 OBJECTIVE

APAVE has been commissioned to carry out checks on atmospheric emissions as part of the performance testing of the smoke treatment unit. The emission limit value for dust was set at 20mg/m³ according to European regulations.

3 SUMMARY OF RESULTS

3.1 WITH DRAGER TREATMENT

3.1.1 Operating conditions

Operating conditions during testing, provided by the operator:	
15 PALLETS OF UNTREATED WOOD OF 15KG	
Rated capacity of the installation, provided by the operator:	
INSTALLATION OF GAS TREATMENT FOR FIREFIGHTER TRAINING CONTAINERS	

3.1.2 Results

Designation	Unit	COFRAC	Trial 1	Trial 2	Trial 3	Average	Site blank		ELV ⁽¹⁾	
		Yes/No					Value	C/NC ⁽²⁾	Value	C/NC ⁽²⁾
Date of measurements	-	-	26-Nov-20			-	-	-	-	-
Smoke temperature	°C	N	12,0			12	-	-	-	-
Oxygen content (on dry gas)	%	O	19,87	-	-	19,87	-	-	-	-
co2 content (on dry gas)	%	N	0,51	-	-	0,5	-	-	-	-
Volume humidity	%	O	1,8	-	-	1,8	-	-	-	-
Flow velocity (in the measuring section)	m/s	O	12,9	-	-	13	-	-	-	-
Flow rate brought back to regulatory conditions without O2 or CO2 correction	m ³ /h	O	13 701	-	-	13 701	-	-	-	-
Compounds			Concentration on dry gas and without oxygen correction and mass flow				Value	C/NC ⁽²⁾	Value	C/NC ⁽²⁾
Nitrogen oxides (NOx in eq NO2)	mg/m0 ³	O	0	-	-	0	-	-	-	-
	Kg/h	O	0,000	-	-	0,000	-	-	-	-
Total dust	mg/m0 ³	O	4,93	-	-	4,93	0,000	C	20	C
	Kg/h	O	0,07	-	-	0,07	-	-	-	-
Oxides of Sulphur (SO2)	mg/m0 ³	O	0,5	-	-	0,5	0,06	-	-	-
	Kg/h	O	0,007	-	-	0,007	-	-	-	-

(1) ELV: Limit Value (d'Emission)

2) C: Compliant, NC: Non-Compliant

3.1.3 Results other compounds

Customer & Business :	19502839 DREDGE
Installation :	TREATMENT
Date:	26/11/2020
Sampling point	1
Start time	10:28
End time	11:08
Sampling time	40 min
PM2.5 concentration	0,68 mg/Nm ³
PM10 concentration	0,75 mg/Nm ³
Total raw dust concentration	1,455 mg/Nm ³

These measurements allow to obtain the gravimetric classification of a dust sample by size class. The impinger measurement underestimates the total dust concentration but allows to establish the proportion of dust with a diameter lower than 10µ and lower than 2.5µ.

3.2 WITHOUT TREATMENT

3.2.1 Operating conditions

Operating conditions during testing, provided by the operator:
17 PALLETS OF UNTREATED WOOD
Rated capacity of the installation, provided by the operator:
Fire Fighting Training Structure

3.2.2 Results

Designation	Unit	COFRAC	Trial 1	Trial 2	Trial 3	Average	Site blank		ELV ⁽¹⁾	
		Yes/No					Value	C/NC ⁽²⁾	Value	C/NC ⁽²⁾
Date of measurements	-	-	26-Nov-20			-	-	-	-	-
Smoke temperature	°C	N	33,0	-	-	33	-	-	-	-
Oxygen content (on dry gas)	%	O	20,07	-	-	20,07	-	-	-	-
coz content (on dry gas)	%	N	0,28	-	-	0,3	-	-	-	-
Volume humidity	%	O	1,6	-	-	1,6	-	-	-	-
Flow velocity (in the measuring section)	m/s	O	13,5	-	-	14	-	-	-	-
Flow rate brought back to regulatory conditions without O2 or CO2 correction	m ³ /h	O	13 451	-	-	13 451	-	-	-	-
Compounds			Concentration on dry gas and without oxygen correction and mass flow				Value	C/NC ⁽²⁾	Value	C/NC ⁽²⁾
Nitrogen oxides (NOx in eq NO2)	mg/m ³	O	0	-	-	0	-	-	-	-
	Kg/h	O	0,000	-	-	0,000	-	-	-	-
Total dust	mg/m ³	O	40,7	-	-	40,7	0,00	C	20	NC
	Kg/h	O	0,55	-	-	0,55	-	-	-	-

(1) ELV: Limit Value (d'Emission)

(2) C: Compliant, NC: Non-Compliant

4 GAP SYNTHESIS AND INFLUENCE

4.1 DEVIATIONS FROM THE ORDER

This service is in accordance with our proposal referenced 19502839. The addition of the measures of on the installation without treatment was decided on the day of the controls.

4.2 DEVIATIONS FROM STANDARDS

4.2.1 WITH DRAGER TREATMENT

During our tests, we found the following deviations, in addition to the increase in uncertainty, the influence of these deviations is described below.

Insufficient downstream straight length.
This difference concerns the configuration of the installation. It does not affect compliance judgements but increases the uncertainty of the speed/flow and pollutant flux results.
The sampling time for dust measurement is less than 1 hour.
The sampling time has been adjusted to the exercise time in the fire-fighting training structure. This difference has no impact on the results.

4.2.2 WITHOUT TREATMENT

During our tests, we found the following deviations, in addition to the increase in uncertainty, the influence of these deviations is described below.

Insufficient downstream straight length.
This difference concerns the configuration of the installation. It does not affect compliance judgements but increases the uncertainty of the speed/flow and pollutant flux results.
The sampling time for dust measurement is less than 1 hour.
The sampling time has been adjusted to the exercise time in the fire-fighting training structure. This difference has no impact on the results.

5 INTERVENTION PROTOCOL

5.1 REFERENCE DOCUMENTS

5.1.1 Regulatory texts :

Order of July 7, 2009 "relating to the methods of analysis in air and water in the ICPE and reference standards".

Document LAB REF 22 of COFRAC " Specific requirements Air quality - Emissions from stationary sources ".

GA X43-551: Air Quality - Stationary Source Emissions - Harmonization of Standard Procedures for of their simultaneous implementation.

GA X43-552: Air quality - Stationary source emissions - Elaboration of test reports for emission measurements.

5.1.2 Methodology

The methodologies for sampling and analysis of the compounds listed below are specified in the appendix.

Some elements of validation of methodologies that are not specific to this service are not provided in this report. They are available on request from APAVE.

5.2 MEASUREMENT PROGRAM

For each installation, the following table shows the number of measurements performed for each parameter:

Parameter (* outsourced analysis)	WITH TREATMENT	WITHOUT TREATMENT
Temperature	1 one-time trial(s)	1 one-time trial(s)
Speed, flow rate	1 one-time trial(s)	1 one-time trial(s)
Humidity (H ₂ O)	1 test of 40 min	1 test of 40 min
Carbon Dioxide (CO ₂)	1 test of 40 min	1 test of 40 min
Nitrogen oxides (NO _x)	1 test of 40 min	1 test of 40 min
Oxygen (O ₂)	1 test of 40 min	1 test of 40 min
Dust	1 test of 40 min	1 test of 40 min
Sulphur oxide (SO ₂)	1 test of 40 min	-
PM2.5 /PM10	1 test of 40 min	-

6 GENERAL

6.1 REPORT EXPLOITATION

Reproduction of this report is only permitted in its entirety.

The results of this test report refer only to the object under test at the time the test measures.

Only certain results are provided under COFRAC accreditation. They are marked by the mention "O" in the tables of results.

Detailed results and uncertainties (including sampling and analyses) are provided in the appendix of this report.

Concentrations and flow rates are expressed under standard conditions (101.3 kPa, 273 K) symbolized by "m0".³

In deciding whether or not to declare compliance with the specification, the uncertainty associated with the result.

The declaration of conformity is carried out under accreditation if the corresponding measurement is carried out under accreditation.

For the parameters for which limit values were not provided, no declaration of conformity has been issued. carried out.

In accordance with the proof convention accepted by the customer, this report is distributed exclusively in dematerialized form.

APPENDIX 1 CHARACTERISTICS OF THE FACILITIES

A/ DESCRIPTION OF THE INSTALLATION

Identification	fr	WITH DRAGER TREATMENT	WITHOUT TREATMENT
Description of the process		Installation for the treatment of DRAGER gases from fire-fighting training containers.	Gas from fire-fighting training containers.
Mode	fr	Cyclic	Cyclic
Système	fr	Bag filter	-
om		Dehumidification	
Location of the measuring point in the gas circuit		Discharge stack	Discharge stack

B/ DESCRIPTION OF THE MEASUREMENT SECTION

Measuring section	Shape of the duct	Dimensions		Number and nature of ports		Straight length in Ø-equivalent		Number of axes usable for		Nature of the work area	Lifting means	Protection against bad weather
		Ø or l*L in m	Wall thickness	Ø 10 mm +	NFX 44-trapdoors	Upstream	Downstream	Dust probe	Speed measurement			
WITH DRAGER TREATMENT	Circular	0,63		0	3	8	3	1	1	Gateway	None	No
WITHOUT TREATMENT	Circular	0,63		0	3	8	3	1	1	Gateway	None	No

C/ HOMOGENEITY OF THE MEASURING SECTION

Measuring sections	Elements allowing to characterize the homogeneity of the flow	Homogeneity of the measuring section
WITH DRAGER TREATMENT	Homogenization system upstream of the measuring section and no air inlet between this system and the measuring section.	Section considered homogeneous
WITHOUT TREATMENT	Homogenization system upstream of the measuring section and no air inlet between this system and the measuring section.	Section considered homogeneous

D/ DEVIATIONS OF THE MEASURING SECTION FROM THE REFERENCE FRAMES

WITH DRAGER TREATMENT

The measurement section deviates from ISO 10780 for the following reasons :

Insufficient downstream straight length: the recommendation of a downstream straight length at least equal to 2 times (bend) or 5 times (outlet) the hydraulic diameter of the pipe is not respected.

The measuring section complies with the NF EN 13284-1 standard.

WITHOUT TREATMENT

The measurement section deviates from ISO 10780 for the following reasons :

Insufficient downstream straight length: the recommendation of a downstream straight length at least equal to 2 times (bend) or 5 times (outlet) the hydraulic diameter of the pipe is not respected.

The measuring section complies with the NF EN 13284-1 standard.

APPENDIX 2

SAMPLING AND ANALYSIS METHODOLOGY

A/ SAMPLING STRATEGY

In application of the NF EN 15259 standard and LAB REF 22, the sampling strategy with respect to the homogeneity of the gaseous effluents is as follows :

- ✓ for particulate and vesicular pollutants: measurement by squaring the measuring section.
- ✓ for gaseous pollutants with isokinetic sampling: grid measurement of the cross-section of the measurement.
- ✓ for gaseous pollutants with non-isokinetic sampling :
 - measurement at any point of the measurement section when the measurement section is deemed to be homogeneous.
 - measurement at a representative point when the measurement section is heterogeneous and that it includes a representative point.
 - grid measurement of the measuring section when it is heterogeneous and that it does not include a representative point.

B/ CALCULATION RULES

For each parameter measured, the value provided in the results tables is equal to the arithmetic mean of all the results obtained when several measurements were performed.

In accordance with the COFRAC document LAB REF 22, the following rules are in place to perform the calculations.

For each compound :

When the measurement is below the detection limit, the measured value is taken as zero in the calculations.

When the measurement is below the limit of quantification, half of this limit is taken into account in the calculations.

When the value of the measurement is lower than the white value, the white value is taken as the measurement value.
account in the results.

In case it is necessary to sum several elements from different phases (e.g. metals): The above rules are applied and the blank value is compared to each phase.

For automatic measurements :

The above rules are applied to the average values of each test.

C/ METHODOLOGY IMPLEMENTED

ISOKINETIC SAMPLING OF PARTICULATE POLLUTANTS

METHOD WITHOUT FLOW DIVISION AND IMMERSED FILTER

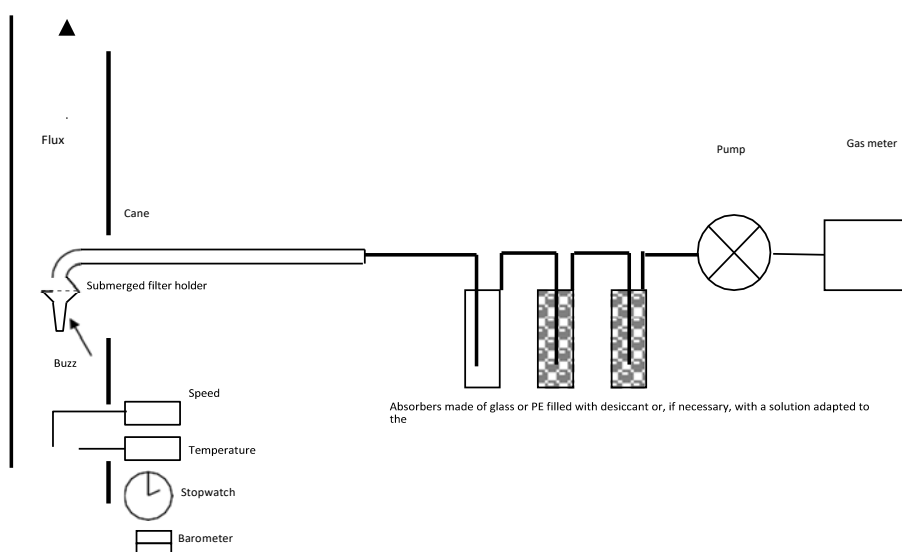
I) Principle of sampling :

Isokinetic sampling of the fumes using an unheated stainless steel probe according to the dust standard, equipped with a device for measuring the volume taken from dry gas with filtration in the duct.

II) Applicable standards, sampling media and analytical methods :

Desired compoun	Corresponding standard	Filter	Rinse	Analysis
Dust	NF EN 13284-1	Quartz	-	Avant essai, étuvage à 180°C et pesée. Après essai, étuvage à 160°C et pesée ou 80°C dans le cas de heat-sensitive dust

III) Diagram :



NON-ISOKINETIC SAMPLING ON SOLID SUPPORT OR SPLASHES

I) Principle of sampling :

Non-isokinetic sampling of the fumes using a borosilicate glass probe, equipped with a device for measuring the volume sampled from dry gas with filtration. The temperature of the probe is maintained above the dew point of the gases + 20°C. The gaseous pollutants are trapped by bubbling with the help of scrubber flasks equipped with diffusers.

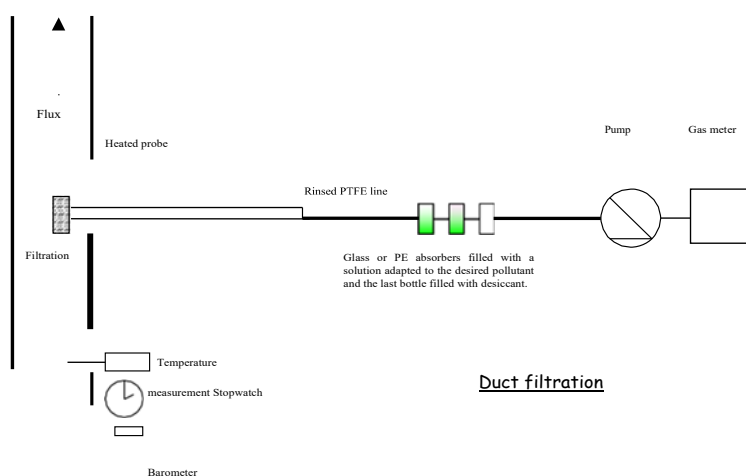
II) Applicable standards, sampling media and analytical methods :

Desired compound	Corresponding standard	Support of	RoW ⁽¹⁾	Type of diffuser	Rinse	Analysis
SO ₂	NF EN 14791	H ₂ O ₂ 3% H ₂ O ₂	> 95 %	Fritté	Solution of	Ion Chromatography

⁽¹⁾ Absorption efficiency

⁽²⁾ according to the protocol for self-monitoring of gaseous effluents from surface treatment workshops defined by CITEPA, AQA and the Ministry of the Environment

III) Diagram :



Measurements by analyzers

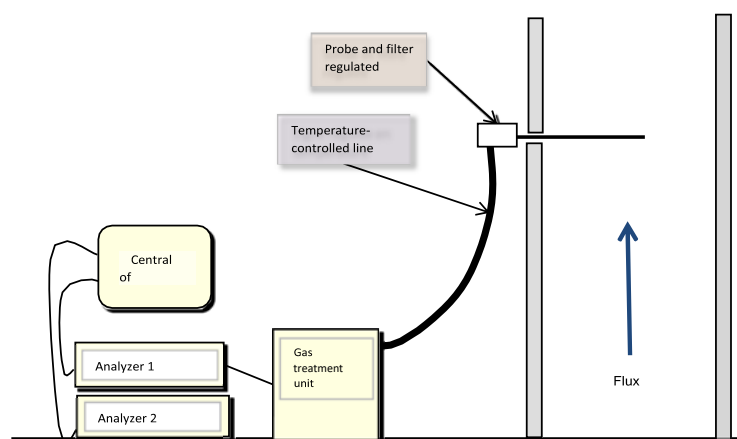
I) Measuring principle :

The analysis is carried out continuously. The analyzer is calibrated before and after each test using a certified standard gas mixture. The tightness of the line is checked by injecting the standard gas at the head of the line. Before entering the analyzer, the gases are sampled by a stainless steel probe. The analog output of the analyzer is connected to a digital recorder.

II) Applicable standards, sampling media and analytical methods :

Desired compound	Corresponding standard	Measuring principle	Packaging	Type of line
O ₂	NF EN 14789	Paramagnetism	Condensation	Heated
CO ₂	Internal method M.LAEX.028	Absorption of non-dispersive infrared	Condensation	Heated
NO _x	NF EN 14792	Chemiluminescence	Condensation	Heated

III) Diagrams :



Note: The number of analyzers varies according to the compounds being analyzed.

Principle of determination of various parameters

Parameter	Reference	Principle
Speed and throughput	ISO 10780	By means of a Pitot tube type L or S and a micromanometer by scanning the velocity field
Temperature	Internal method	By means of a Pt100 probe or a thermocouple connected to a digital display or recorder
Humidity	NF EN 14790	By condensation and/or absorption by desiccant and weighing
PM2.5/PM10	ISO 23210-1	By impactor

APPENDIX 3 VALIDATION OF RESULTS

A/ UNCERTAINTIES

The standard uncertainties calculated with an enlargement factor of 2, i.e. a confidence level of 95%, are shown in the appendix in the detailed results tables.

They take into account the uncertainty related to the oxygen correction when applicable.

B/ VALIDATION OF MEASUREMENTS

The validation of the main criteria for validating measurements is shown in the tables below.

WITH DRAGER TREATMENT :

Automatic Measurement		
Parameter	Criteria	Requirement met
Oxygen (O ₂)	Drift less than 5%.	Yes
	Leakage rate less than 2%.	Yes
Nitrogen Oxide (NO _x)	Drift less than 5%.	Yes
	Leakage rate less than 2%.	Yes
	Conversion efficiency greater than 95%.	Yes

Dust: NF EN 13284-1		
Parameter	Criteria	Requirement met
Leakage control	Leakage rate less than 2%.	Yes
Difference on the isokinetic rate test	-5% < T < +15%	Yes
Site blank	Less than 10% ELV site or 0.5 mg/Nm ³	Yes

SO ₂ : NF IN 14791		
Parameter	Criteria	Requirement met
Leakage control	Leakage rate less than 2%.	Yes
Absorption efficiency	Greater than 95% or content in the last absorber <LQ	Yes
Site blank	Less than 10% ELV site	-

Validation of the QL against the ELV

Designation	Symbol	Value			
		LQ under ELV conditions	VLE	LQ/VLE ratio %	Requirements met
Nitrogen oxides	NOx	2,5			
Total dust	-	0,2	20	1	Yes
Oxides of Sulphur	SO2	0,2			

WITHOUT TREATMENT :

Automatic Measurement		
Parameter	Criteria	Requirement met
Oxygen (O2)	Drift less than 5%.	Yes
	Leakage rate less than 2%.	Yes
Nitrogen Oxide (NOx)	Drift less than 5%.	Yes
	Leakage rate less than 2%.	Yes
	Conversion efficiency greater than 95%.	Yes

Dust: NF EN 13284-1		
Parameter	Criteria	Requirement met
Leakage control	Leakage rate less than 2%.	Yes
Difference on the isokinetic rate test	-5% < T < +15%	Yes
Site blank	Less than 10% ELV site or 0.5 mg/Nm3	Yes

Validation of the QL against the ELV

Designation	Symbol	Value			
		LQ under ELV conditions	VLE	LQ/VLE ratio %	Requirements met
Nitrogen oxides	NOx	2,5			
Total dust	-	0,2	20	1	Yes

APPENDIX 4 DETAILED RESULTS

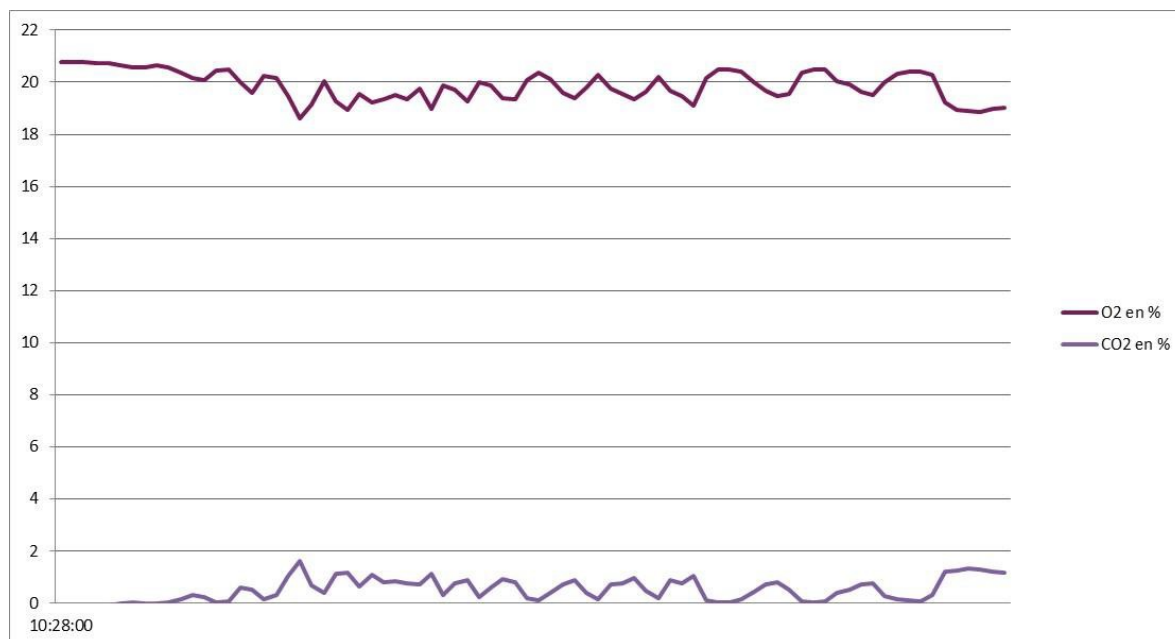
WITH DRAGER TREATMENT

WITH DRAGER TREATMENT Emission :				conditions Tests :	1
Designation	Unit	Trial 1	Trial 2	Trial 3	Average
Date of measurements	-	26-Nov-20			-
Atmospheric pressure Diameter	hPa	1 018			-
of the measuring section	m	0,63			-
Sampling start time Sampling end	h:min	10:28			-
time Sampling duration Flue gas	h:min	11:08			-
temperature	°C	0:40			-
Oxygen Content		12,00			12±0,4
- Analyzer range	%				-
- Standard gas concentration	%		25		-
- Relative uncertainty on gas concentration	%		20,90		-
- Zero drift	%		0,50		-
- Drift at scale point	%		0,00		-
- Oxygen content (on dry gas)	%		-0,48		-
CO ₂ content (on dry gas) Density	%	19,87			19,9±1,2
dry gas Density humidity	kg/m ³ ₀	0,51			0,5±0,2
Density of wet gases Average dynamic	%	1,30			1,30
pressure Average static pressure	kg/m ³ ₀	1,78			1,8±0,1
Flow velocity (in the measuring section) Uncertainty	Pa Pa	1,27			1,27
Volume flow rate of the gaseous discharge	m/s	101			-
- on raw gas	m/s	447			447
- brought back to normal conditions, dry without O ₂ or CO ₂ correction		12,86			12,9
	m ³ /h				1,55
	m ³ /h	14 428			14 428
		13 701			13 701

Normal conditions correspond to P=1013 mbar and T=273 K.

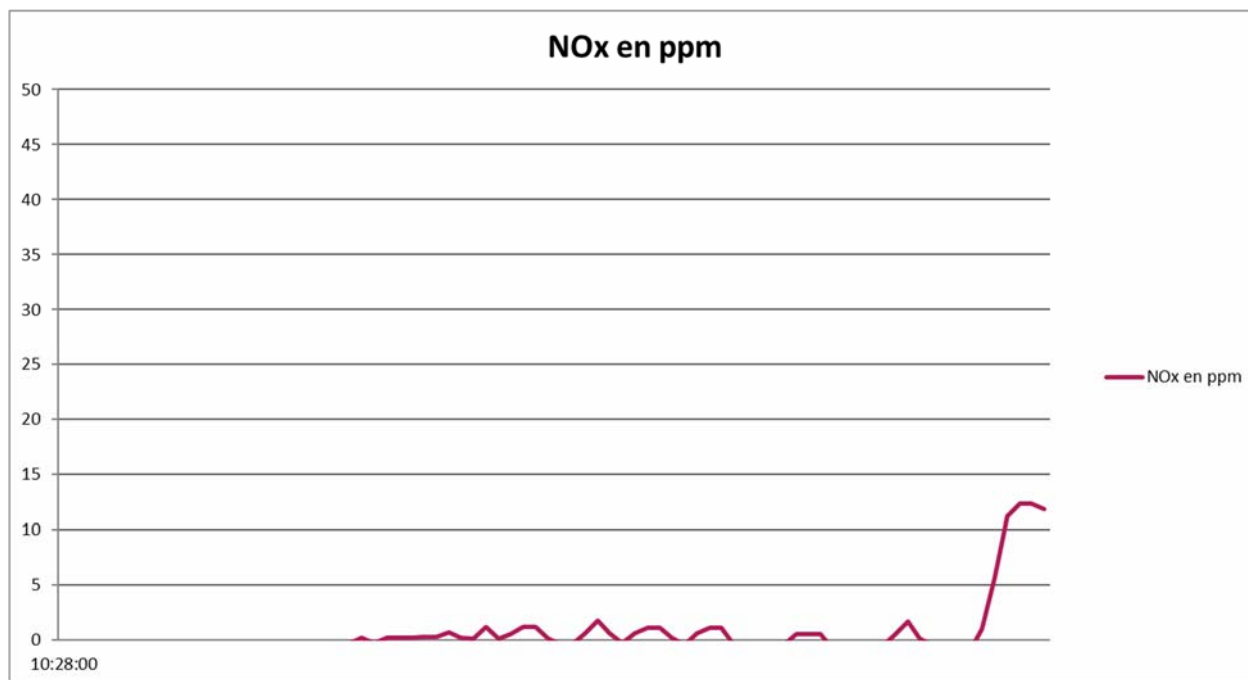
WITH DRAGER :		Humidité	TREATMENT Trials 1 to 3		
Designation	Unit	Trial 1	Trial 2	Trial 3	Average
Date of measurements		26-Nov-20			-
Sampling Start Time Sampling End	h:min	10:28			-
Time Sampling Interruptions	h:min	11:08			-
Sampling Duration Sampling	h:min	0:00			-
Volume Sampled (dry gas)	h:min	0:40			-
Mass of water recovered	h:min	0,151			-
Volume humidity on wet gas	h:min	2,2			-
Performance	h:min	1,8			1,78
	m ³ m ⁰	Compliant			-

Yield corresponds to the validation of silica gel discoloration <50%.



WITH DRAGER :		NOx :		TREATMENT Trials 1 to 3		
Designation	Unit	Trial 1	Trial 2	Trial 3	Average	
Date of measurements	-	26-Nov-20				-
Start time of sampling	h:min	10:28			-	
End time of sampling	h:min	11:08			-	
Duration of sampling		0:40			-	
Nitrogen oxides (NO + NO2)	ppm					
- measuring range of the analyzer	ppm		250		-	
-concentration of the standard gas	%		89,1		-	
-uncertainty on gas concentration	%		2,0		-	
-Zero drift	%		2,4		-	
-Drift at scale point	ppm		-4,6		-	
- concentration flight. (on dry)	mg/m0 ³	0,0			-	
- weight concentration (on dry basis)	mg/m0 ³	0,0			-	
- concentration brought back to the C.R.		0,0			0,00	

CR: the results are expressed in Regulatory Conditions, i.e. on dry gas under normal conditions (1013 mbar; 273 K) and without correction for oxygen.



WITH DRAGER :		SO2 :	TREATMENT Tests 1 to 3			26/11/2020
Designation	Unit	Trial 1	Trial 2	Trial 3	Average	Site blank
Date of measurements	-	26-Nov-20			-	-
Benchmark of sample No. 1	-	468384			-	459699
Benchmark of sample No. 2	-	466281			-	459699
Sampling Start Time Sampling End	h:min	10:28			-	-
Time Sampling Interruptions	h:min	11:08			-	-
Sampling Duration Sampling	h:min	0:00			-	-
Volume Sampled (dry gas)	h:min	0:40			-	-
Average sample flow rate, dry gas	h:min	0,151			-	-
Concentration of the solution in SO ₄ ²⁻ (step 1)	h:min	227			-	-
Concentration of the solution in SO ₄ ²⁻ (step 2)	h:min	1,1			-	<0,5
Adjusted volume of solution (step 1)	m ³	<0,5			-	-
Adjusted volume of solution (step 2)	l/h	83			-	58
SO2 content :	mg/l	81			-	-
- on dry gas,	mg/l				-	-
- on wet gas,	ml	0,49			-	-
- in the C.R.		0,48			-	-
Verification of bubbler efficiency Value of	mg/m ³	0,49			0,5±0,1	0,06
bubbling efficiency Conformity of bubbler	mg/m ³	-	-	-	-	-
efficiency Conformity of White (<10%/ENV)	mg/m ³	81,8			-	-
		Compliant			-	-
	%	-	-	-	-	-
	-					

CR: the results are expressed in Regulatory Conditions, i.e. on dry gas under normal conditions (1013 mbar; 273 K) and without correction for oxygen.

WITH DRAGER totales		TREATMENT :			Dust totales	Tests 1 to 3	26/11/2020
Designation	Unit	Trial 1	Trial 2	Trial 3	Average	Site blank	
Date of measurements	-	26-Nov-20			-	-	
Nozzle diameter used	mm	6,00			-	-	
Filter marker	-	456894			-	458253	
Sampling start time Sampling end	h:min	10:28			-	-	
time Sampling interruptions	h:min	11:08			-	-	
Sampling duration Sampling	h:min	0:00			-	-	
duration Total volume sampled,	h:min	0:40			-	-	
dry gases	h:min	0,92			-	-	
Average dry gas sampling rate Dust mass	h:min	1,38			-	-	
collected	h:min					-	
- on the filter	m ³	4,55			-	nd	
- corresponding to the test	m ³ /h	4,55			-	0.00	
Dust content :							
- on dry gas,	mg	4,93			4,93	0,00	
- on wet gas,	mg	4,84			-	-	
- in the C.R.		4,93			4,93±0,94	0,00	
White Report/VLE	mg/m ³	-	-	-	-	0,00	
Report	mg/m ³	11,4			-	-	

CR: the results are expressed in Regulatory Conditions, i.e. on dry gas under normal conditions (1013 mbar; 273 K) and without correction for oxygen.

WITH DRAGER TREATMENT :	Speed distribution at the measuring :	section
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Values of speeds and temperatures measured on map n°1

Point marker	Distance to wall (cm)	Speed in m/s				Temperature in °c			
		Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
		-	-	-	-				
1	9	13,08				12			
2	54	12,64				12			

Conformity of speed and temperature distribution

Parameter Designation	Measured value	Requirement met (<5%)
Maximum / minimum speed ratio	1,0	-

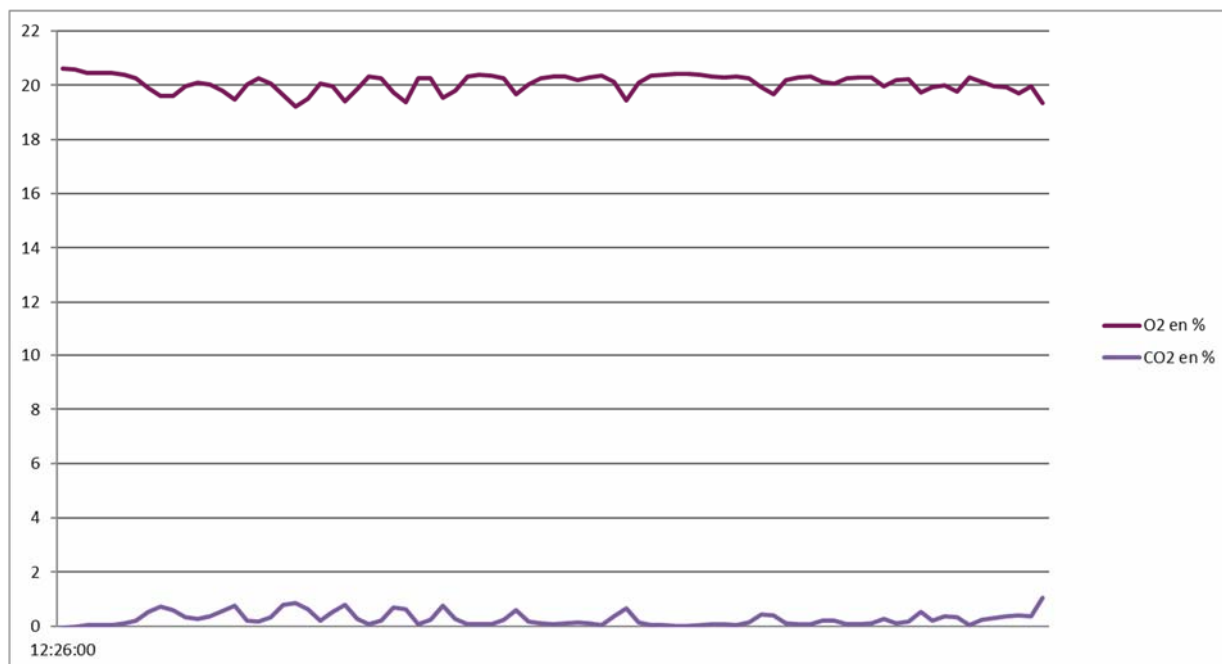
WITHOUT

WITHOUT TREATMENT Emission :				conditions Tests :	1
Designation	Unit	Trial 1	Trial 2	Trial 3	Average
Date of measurements	-	26-Nov-20			-
Atmospheric pressure Diameter	hPa	1 019			-
of the measuring section	m	0,63			-
Sampling start time Sampling end	h:min	12:26			-
time Sampling duration Flue gas	h:min	13:06			-
temperature	°C	0:40			-
Oxygen Content		33,00			33±1
- Analyzer range	%				-
- Standard gas concentration	%		25		-
- Relative uncertainty on gas concentration	%		20,90		-
- Zero drift	%		0,50		-
- Drift at scale point	%		0,00		-
- Oxygen content (on dry gas)	%		-0,48		-
CO ₂ content (on dry gas) Density	%	20,07			20,1±1,2
dry gas Density humidity	kg/m ³ ₀	0,28			0,3±0,1
Density of wet gases Average dynamic	%	1,30			1,30
pressure Average static pressure	kg/m ³ ₀	1,63			1,6±0,1
Flow velocity (in the measuring section) Uncertainty	Pa Pa	1,27			1,27
Volume flow rate of the gaseous discharge	m/s	104			-
- on raw gas	m/s	543			543
- brought back to normal conditions, dry without O ₂ or CO ₂ correction		13,51			13,5
	m ³ /h				1,62
	m ³ /h	15 156			15 156
		13 451			13 500

Normal conditions correspond to P=1013 mbar and T=273 K.

WITHOUT :	Humidité	TREATMENT Trials 1 to 3			
Designation	Unit	Trial 1	Trial 2	Trial 3	Average
Date of measurements		26-Nov-20			-
Sampling Start Time Sampling End	h:min	12:26			-
Time Sampling Interruptions	h:min	13:06			-
Sampling Duration Sampling	h:min	0:00			-
Volume Sampled (dry gas)	h:min	0:40			-
Mass of water recovered	h:min	0,120			-
Volume humidity on wet gas	h:min	1,6			-
Performance	h:min	1,6			1,63
	m ³ m ⁰	Compliant			-

Yield corresponds to the validation of silica gel discoloration <50%.



WITHOUT :		NOx :		TREATMENT Trials 1 to 3		
Designation	Unit	Trial 1	Trial 2	Trial 3	Average	
Date of measurements	-	26-Nov-20				-
Start time of sampling	h:min	12:26			-	
End time of sampling	h:min	13:06			-	
Duration of sampling		0:40			-	
Nitrogen oxides (NO + NO2)	ppm					
- measuring range of the analyzer	ppm		250		-	
-concentration of the standard gas	%		89,1		-	
-uncertainty on gas concentration	%		2,0		-	
-Zero drift	%		2,4		-	
-Drift at scale point	ppm		-4,6		-	
- concentration flight. (on dry)	mg/m ³	0,0			-	
- weight concentration (on dry basis)	mg/m ³	0,0			-	
- concentration brought back to the C.R.		0,0			0,00	

CR: the results are expressed in Regulatory Conditions, i.e. on dry gas under normal conditions (1013 mbar; 273 K) and without correction for oxygen.



WITHOUT totales		TREATMENT :			Dust totales	Tests 1 to 3	26/11/2020
Designation	Unit	Trial 1	Trial 2	Trial 3	Average	Site blank	
Date of measurements	-	26-Nov-20			-	-	
Nozzle diameter used	mm	6,00			-	-	
Filter marker	-	576251			-	577254	
Sampling start time	h:min	12:26			-	-	
Sampling interruptions	h:min	13:06			-	-	
Sampling duration	h:min	0:00			-	-	
Total volume sampled,	h:min	0:40			-	-	
dry gases	h:min	0,85			-	-	
Average dry gas sampling rate	h:min	1,27			-	-	
Dust mass collected	h:min					-	
- on the filter	m ³	34,51			-	N/A	
- corresponding to the test	m ³ /h	34,51			-	0.00	
Dust content :							
- on dry gas,	mg	40,70			40,7	0,0	
- on wet gas,	mg	40,04			-	-	
- in the C.R.		40,70			40,7±2,4	0,0	
Difference in isokinetic rate per test	mg/m ³	4,3			-	-	

CR: the results are expressed in Regulatory Conditions, i.e. on dry gas under normal conditions (1013 mbar; 273 K) and without correction for oxygen.

WITHOUT TREATMENT : Speed distribution at the measuring : section

Values of speeds and temperatures measured on map n°1

Point marker	Distance to wall (cm)	Speed in m/s				Temperature in °c			
		Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
		-	-	-	-	-			
1	9	13,86				33			
2	54	13,15				33			

Conformity of speed and temperature distribution

Parameter Designation	Measured value	Requirement met (<5%)
Maximum / minimum speed ratio	1,1	-

APPENDIX 5

APAVE is approved by the Minister in charge of classified facilities by the Order of December 5, 2019 (*O.J. of December 21, 2019*).

The details of the Nantes Agency's approvals in charge of levies are provided below.

Determination of speed and volume flow.	Sampling and determination of water vapor content.	Dust collection in a gas oven.	Prélèvement et analyse nitr oge n (NOx).	Prélèvement et analyse fr om monoxyde of carbon (CO).	Prélèvement et analyse ox ygen (O2).	Prélèvement et analyse of total Prélèvement et analyse vol
14	15	1a	11	12	13	2

Removal of hydrochloric acid (HCl).	Sulphur dioxide (SO2) sampling.	Ammonia (NH3) sampling.	Removal of hydrofluoric acid (HF).	Removal of heavy metals other than mercury	Sampling of mercury (Hg).	Sampling of dioxins and furans in a gaseous vein.	Sampling of polycyclic aromatic hydrocarbons (PAHs).
4a	10	16a	5a	6a	3a	7	9a

Details of the approvals of the APAVE laboratory of Châteauneuf-les-Martigues in charge of the analyses are provided below.

Quantification of dust in a gas stream.	Mercury (Hg) analysis.	Hydrochloric acid (HC) analysis.	Analysis of hydrofluoric acid (HF).	Analysis of heavy metals other than mercury	Sulphur dioxide (SO2) analysis.	Analysis of ammonia (NH3).
1b	3b	4b	5b	6b	10b	16b

The APAVE laboratory of Châteauneuf-les-Martigues is accredited under the number N°1-1457. (the scope of accreditation is available at www.cofrac.fr)