



ÍSLENSKA KALKÞÖRUNGAFÉLAGIÐ

MEASUREMENTS OF SUSPENDED PARTICULATE MATTER (SPM) IN EXHAUST DUCT



PROJECT NO: 08351003 REPORT NO: 15	DISTRIBUTION: <input type="checkbox"/> Open <input type="checkbox"/> Closed <input checked="" type="checkbox"/> Subject to clients approval
DATE: 2019-01-17	
PAGES:9 COPIES: 1	

REPORT TITLE:
MEASUREMENTS OF PARTICLES IN EXHAUST DUCT

AUTHOR(S):
Birgir Tómas Arnar
Rannveig Anna Guicharnaud

PROJECT MANAGER:
Birgir Tómas Arnar

CLIENT:
Íslenska kalkþörungafélagið
MANAGER: EINAR SVEINN ÓLAFSSON

CO-OPERATORS:
Rannsóknarþjónustan Sýni ehf.

TYPE OF REPORT/STATUS:
Subject to client's approval

ABSTRACT:

Measurements of suspended particulate matter (SPM) from the exhaust duct in the plant of the Íslenska kalkþörungafélagið where carried out on January 17th, 2019 by Verkís Ltd.

The following factors were measured: Total amount of suspended particulate matter (SPM), flue gas velocity and flue gas temperature.

The average particulate content was found to be 6,5 mg/Nm³.

KEYWORDS (ENGLISH):
Sampling of particulate matter, duct exhaust measurements

KEYWORDS (ICELANDIC):
Rykmælingar, útblástursmælingar

PROJECT MANAGER 'S SIGNATURE:

REVIEWED BY:
GPJ

Contents

Contents 3

1 Introduction..... 4

2 Measurement and sampling..... 5

3 Results..... 6

3.1 Exhaust duct measurement results6

4 References..... 8

1 Introduction

Exhaust duct sampling at Íslenska kalkþörungafélagið were carried out on January 17th by Verkís staff. Measured factors were suspended particulates, air velocity, flow volume and temperature.

2 Measurement and sampling

All measurements are carried out according to the International Standards ISO 10780 and EN-3284. Air velocity flowing through the duct is measured with a velocity meter consisting of a inclined manometer and pitot tube. The number of traverse points for measuring velocity are dictated by the dimension of the duct, in this case 0.67 m. The velocity measurements are then used to calculate the proper flow through the sample probe in order to maintain isokinetic conditions. This is achieved by keeping the velocity at the nozzle equivalent to the velocity of the flue gas in the duct. By doing this a representative sample of the particles flowing in the stack can be gained. The diameter of the nozzle used in the exhaust duct from the plant was 3.2 mm (1/8"). Duct gas temperature is measured with a thermocouple. In principle the flue gas enters the sampling train system through a nozzle on the tip of the sampling probe, passes through the filter thimble where suspended particulate matter (SPM) is removed and reaches the sampling train/condenser assembly in the cold box section. Here the gases cool down and bubble through impinges consisting of silica gel and distilled water. After this the gas is drawn through the vacuum pump and exhausted into the atmosphere. The equipment consists of Apex XD-502 console for isokinetic dust sampling, along with necessary equipment as a pitot tube, and a thermocouple. The filters used are of glass fibre type. They are dried and weighted prior to use and then dried and weighted again. The weight difference is the amount of dust collected in the sampling. The volume of sampled air is calculated to standard conditions, STP, (273 K, 101.3 kPa).

3 Results

3.1 Exhaust duct measurement results

The results of the measurements are shown in the tables below.

Velocity measurements and source sampling was done in 12 points in the sampling plane according to the standards ISO 10780 and EN 13284, see layout of duct below:

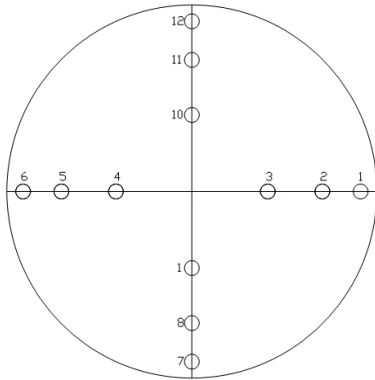


Table 3.1.1

Duct	Value	Unit
Duct inside diameter	0.67	m
Duct area	0.35	m ²

Table 3.1.2

Exhaust measurements		
Parameter	Measured (average)	Discharge
SPM measured	6,5 mg/Nm ³	0,1 kg/hour
Air velocity	24,1 m/s	
Flow volume (actual)	30,589 m ³ /h	
Atmospheric pressure at metering point	830,8 mmHg	
Temperature of exhaust air in duct (T _s)	40°C	
Temperature at metering point (T _a)	1°C	

Table 3.1.3

SPM		Filter #	Time	Discharge
Sample run	Measured			
Sample 1	5,4 mg/Nm ³	12	20:32-21:02	0,1 kg/klst
Sample 2	8,0 mg/Nm ³	13	21:25-21:55	0,2 kg/klst
Sample 3	6,1 mg/Nm ³	10	22:15-22:45	0,1 kg/klst

4 References

1. ISO 10780 International Standard – Stationary Source Emissions – Measurement of velocity and flowrate of gas streams in ducts
2. EN 13284 Stationary source emissions-Determination of low range mass concentration of dust-Part 1: Part 1: Manual gravimetric method



Rannsóknaniðurstöður

Verkís hf.
Ofanleiti 2
103 Reykjavík

Skýrsla nr.: 4277-19
Gerð sýnis: Ryksýni
Dags. beiðni: 25/01/2019
Dags. rannsóknar: 28/01/2019
Sýnataka: Verkís hf.
Tengiliður: Birgir Tómas Arnar
Starfsstöð: Birgir Tómas Arnar - Ofanleiti 2

Sýni nr.	Mæling	Niðurstöður	Mælieining	Aðferð
19-1734	Sía, nr.10			
	þurrkun og vigtun á ryksíum	1,5	mg	
19-1736	Sía, blankur			
	þurrkun og vigtun á ryksíum	-13,1	mg	
19-1737	Sía, nr.12			
	þurrkun og vigtun á ryksíum	1,2	mg	
19-1738	Sía, nr.13			
	þurrkun og vigtun á ryksíum	1,8	mg	
19-1739	Acetone, nr.10			
	þurrkun og vigtun á ryksíum	0,0006	mg	
19-1740	Acetone, nr.12			
	þurrkun og vigtun á ryksíum	0,001	mg	
19-1741	Acetone, nr.13			
	þurrkun og vigtun á ryksíum	-0,0008	mg	

Kópavogur, 28/01/2019

Þetta er prófunarskýrsla sem hefur verið yfirfarin og samþykkt á rafrænan hátt. Skýrslan er gild án undirskriftar

Kristján Einar Guðmundsson
Matvælafræðingur M.Sc.,