



ÍSLENSKA KALKÞÖRUNGAFÉLAGIÐ

MEASUREMENTS OF SUSPENDED PARTICULATE MATTER (SPM) IN EXHAUST DUCT



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REPORT TITLE:
MEASUREMENTS OF PARTICLES IN EXHAUST DUCT

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ABSTRACT:

Measurements of suspended particulate matter (SPM) from the exhaust duct in the new plant of the Íslenska kalkþörungafélagið where carried out on May 17th - 18th 2015 by Verkís Ltd.

The following factors were measured: Total amount of suspended particulate matter (SPM), flue gas velocity, static pressure in duct, moisture content and flue gas temperature.

The average particulate content was found to be 18.3 mg/Nm³.

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

KEYWORDS (ICELANDIC):
Rykmælingar, mengunarmælingar

PROJECT MANAGER 'S SIGNATURE:

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1 Introduction

Exhaust duct sampling at Íslenska kalkþörungafélagið were carried out on May 17th - 18th by Verkís staff. Measured factors were suspended particulates, air velocity, static pressure, flow volume, temperature and moisture content.

2 Measurement and sampling

All measurements are carried out according to the International Standards ISO 10780 and ISO 9096. 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 is 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 consist of Vayubodhan VSS3 Stack Sampler and a Velocity Meter APM 602, along with necessary equipment as a pitot tube, and a thermocouple. The filters used are of glass fiber 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

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 ISO 9096, see layout of duct below:

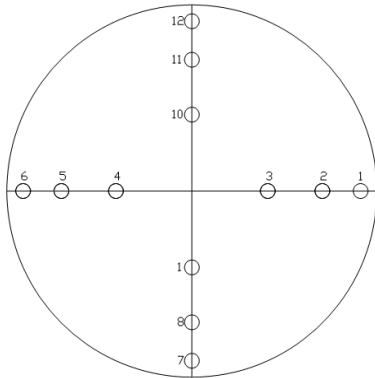


Table 3.1 Duct dimensions

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

Table 3.2 Exhaust Measurements

Exhaust measurements		
Parameter	Measured (average)	Discharge
SPM	18,3 mg/Nm ³	0,0 kg/hour
Air velocity	19,9 m/s	
Flow volume	25.257,8 m ³ /h	
Static pressure in duct	762,4 mmHg	
Atmospheric pressure at metering point	758,6 mmHg	
Temperature in duct (T _s)	37,0°C	
Temperature at metering point (T _a)	0,0°C	
Moisture content	90%	

Table 3.3 Particulates

	SPM	Time	Discharge
Sample run	Measured		
Sample 1	26,4 mg/Nm ³	22:00-22:30	0,1 kg/hour
Sample 2	18,4 mg/Nm ³	02:00-02:30	0,0 kg/hour
Sample 3	10,0 mg/Nm ³	06:00-06:30	0,0 kg/hour

4 References

1. ISO 10780 International Standard – Stationary Source Emissions – Measurement of velocity and flowrate of gas streams in ducts
2. ISO 9096 International Standard – Stationary Source Emissions – Manual determination of mass concentration of particulate matter
3. Vayubodhan Stack Sampler VSS3 – Instruction Manual – Vayubodhan Upkaran PVT. L



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NIÐURSTÖÐUR EFNA- OG ÖRVERUGREININGA

Sýni nr.: E-3097 – 3099-15

Gerð sýnis:	Síur	Móttakið:	18.05.2015
Sendandi:	Verkís	Rannsað:	18.05.2015
Sýnataka:	Verkís	Verkkaupi:	Verkís v/ Kalkþörungaverksmiðjan Bíldudal

Nr. sýnis	Merking sýnis	Þyngd fyrir notkun (g)	Þyngd eftir notkun (g)	Ryk (mg)
E-3097	Sía nr. 1	1.5540	1.5603	6.3
E-3098	Sía nr. 2	1.4186	1.4230	4.4
E-3099	Sía nr. 3	1.4464	1.4488	2.4

Athugasemdir: Síurnar voru þurrkaðar við 103°C í 2 klst.

Reykjavík, 21. maí 2015

Hörður Ólason

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Efnaverkfræðingur

Niðurstöður eiga einungis við um það sýni sem mælt var.

Upplýsingar um aðferðafræði, nákvæmni og næmni aðferða má fá hjá Rannsóknarþjónustunni Sýni hf.

Óheimilt er að afrita prófunarskýrslur nema í heilu lagi ef ekki liggur fyrir skriflegt samþykki frá Rannsóknarþjónustunni Sýni ehf.

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