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On behalf of VICI industries, AF-IPK Inc. has done measurements, at the company's location in Mariestad, Sweden, to control the amount of pollution of the exhausting air from the combustion chamber.

The results of the measurements are being presented in the table below.

Table 1. A summary of the measurements after a complete burn cycle.

Parameter	Without catalytic converter	With catalytic converter	Reduction (%)
CO pollution (g CO/h)	12	1.8	85
Dust pollution (g/h)	0.4	0.4	0
NH3 pollution (g/h)	6.5	5.8	11
Sulfur poll. (g/h)	<0.05	0.06	0
VOC poll. (g C/h)	5.4	1.9	65
Level of odor (l.e./h)	240 000	120 000	50

Explanation:
Ppm = parts per million
VOC = Volatile organic compound
l.e. = number of smell equivalents
< = content was less than what the machine could measure

The overall pollution is very small. The catalytic converter reduces CO, VOC, and the level of odor. The measurements of level of odor are very low, but other odors in the environment could cause the measurements to be higher than what they actually are.

Table of content

1. Introduction

On behalf of VICI industries, AF-IPK Inc. has done measurements, at the company's location in Mariestad, Sweden, to control the amount of pollution of the exhausting air from the combustion chamber.

The tests were done the 19th of September, 2000. Johan Mars is responsible for the testing and the complete test report.

2. Background

The company has an "environmental friendly toilet" that burns all the waste products in a combustion chamber, which is directly connected to the toilet. The combustion process runs by propane/butane gas or oil.

At the time of the measurements the toilet received waste products, which was transported by a screw into a combustion chamber, after the lid had been closed, where a propane gas burner burned all the waste products. The burner is regulated by the temperature in the combustion chamber and is turned on and off at certain predetermined temperatures. At these measurements, the burner was turned off at 400 degrees Celsius and turned on at 300 degrees Celsius. After seven combustion cycles (when the temperature has been 400 degrees Celsius seven times) all the waste products that has been combusted was counted.

The purpose of these measurements is to check the released gases from the toilet and its burner, and also to check the effect of a catalyst that has been developed in order to reduce the toxic gases.

3. Implementation

The measurement was done in the chimney for outgoing gases from the combustion chamber. The measurements were done with two "loads of waste products" without a catalytic converter and two "loads" with a catalytic converter connected. Every burning cycle lasted for about 25 minutes.

The following parameters were tested at these measurements: gas flow, gas temperature, dust content, ammoniac content, CO content, volatile organic compound, and strength of odor.

The following analysis and testing methods have been used:

The dust content was determined through part gas content which was isokinesheticly sucked through a filter made of quartz fiber. The dust content is acquired from the increase in weight divided by gas volume that has been sucked into and through the quarter fiber.

The volatile organic compound was determined with help of a test gas that was added on regularly throughout the test. A FID instrument of the brand Bernath Atomic 3005 was used. The instrument calibrates with a known amount of C_3H_8 and the results is presented as equivalent amount (C)

The ammonia (NH_3) has been determined with help of part gas current led through an absorption fluid in which its content of NH_4 has been analyzed. H_2So_4 has been used as the absorption fluid. The analysis has been made of KM-lab in Linkoping, Sweden.

The sulfur content has been determined with help of part gas current led through an absorption fluid in which its content of SO_4 has been analyzed. H_2O_2 has been used as the absorption fluid. The analysis has been made of KM-lab in Linkoping, Sweden.

The Gas flow was determined according to Prandtl with pitot tube and micromanometer.

The Gas Temperature was determined with thermo electric element and temperature indicator.

The CO and CO_2 was determined through part gas current was added on regularly in combination with registered instrument that calibrated together with know amounts of respective substance.

The implementation of the sensory odor evaluation is described more in detail in attachment 1.

The primary results from the measurements can be found in attachment 2.

The primary results from the sensory odor analysis can be found in attachment 3.

4. RESULTS

In the table below, the results of the measurements are being presented.

Parameter	Without catalytic converter	With catalytic converter	Reduction (%)
Gas flow (m3ntg/h)	49	34	-
Temperature (C)	180	180	-
CO2 content (vol. %)	2.9	3.8	-
CO content (ppm)	200	43	-
CO pollution (g CO/h)	12	1.8	85
Dust content (mg/m3/ntg)	8.4	13	-
Dust pollution (g/h)	0.4	0.4	0
NH3 content (mg/m3ntg)	130	170	-
NH3 pollution (g/h)	6.5	5.8	11
Sulfur content (mg/m3ntg)	<1	1.9	-
Sulfur poll. (g/h)	<0.05	0.06	0
VOC content (mg C/m3 norm.)	110	56	-
VOC poll. (g C/h)	5.4	1.9	65
Level of odor (l.e./m3ngt)	4 380	3 060	-
Level of odor (l.e./h)	240 000	120 000	50

Explanation:
ppm = parts per million
VOC = Volatile organic compound
l.e. = number of smell equivalents
< = content was less than what the machine could measure

5. Discussion

The overall pollution is very small. The Catalytic Converter clearly reduces the results of the CO, VOC and level of odor; however the level of dust, sulfur, and ammonia is not reduced.

The ammoniac content of 130-170mg/m3ntg ought to be possible to reduce even more. The easiest way to reduce any kind of odor is to increase the length of the chimney.

ATTACHMENT 1

Implementation of sensory odor analysis

The test and analysis of the products are based on the European standard of air quality and determination of odor concentration by dynamic olfatometry. For further information about how the measurements is done, please contact the institution of European standard of air quality. Determination of odor concentration by dynamic olfatometry, which in general is built in the German guide lines VDI 3831.

Odor analysis

The analysis is done with help of a dilution item- a so called olfatometry as well as an experienced panel. The panel is made of at least 4 people. The olfatometry used in the test is called TO5 #1158. In the olfatometry, testing gas is mixed together with diluted air, which in this case is room temperature breathing air.

ATTACHMENT 2

RESULT

Primary result for measurements of gases after used in a combustion chamber the 19th of September of 2000.

Gas flow and temperature

Parameter	Test 1 Without catalytic converter	Test 2 With catalytic converter
Gas Temp (C)	180	180
Gas Flow (m3/h)	90	63
Gas Flow, normal wet (m3/norm/h)	54	38
Gas Flow, normal (dry m3ntg/h)	49	34

Ammonia, sulfur, and dust content

Parameter	Test 1 Without catalytic converter	Test 2 With catalytic converter
Ammoniac content	130	170
Sulfur Content	<1	1.9
Dust content	8.4	13

ATTACHMENT 3

Primary results: sensory odor evaluation
Odor evaluation for VICI Industries Inc. Mariestad, Sweden

Date testing: 09/19/00
Date analysis: 09/20/00
Measure point: Warm start with no Catalyst
Testing bag #: 849

Panelist	Test 1	Test 2	Average
1	3,615	3,651	3,651
2	3,9645	3,651	3,80775
3	3,9645	3,9645	3,9645
4	2,7594	3,046	2,9027
			3,5814875
Z50			**3815**

Date testing: 09/19/00
Date analysis: 09/20/00
Measure point: Warm start with Catalyst
Testing bag #: 850

Panelist	Test 1	Test 2	Average
1	3,046	3,651	3,3485
2	3,651	3,651	3,651
3	3,651	3,651	3,651
4	3,046	3,046	3,046
			3,424125
Z50			**2655**

Date testing: 09/19/00
Date analysis: 09/20/00
Measure point: Operation without catalyst
Testing bag #: 851

Panelist	Test 1	Test 2	Average
1	3,9645	3,651	3,80775
2	3,651	3,9645	3,80775
3	3,9645	3,9645	3,9645
4	3,3425	3,046	3,19425
			3,693563
Z50			**4938**

Date testing: 09/19/00
Date analysis: 09/20/00
Measure point: Operation with catalyst
Testing bag #: 856

Panelist	Test 1	Test 2	Average
1	3,651	3,046	3,651
2	3,651	3,651	3,651
3	3,651	3,9645	3,80775
4	3,046	3,046	3,046
			3,538938
Z50			**3459**