Statement of Verification

Technology:	**Jimco KPC-Total**
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	Verification Body		**Proposer**
Name:	ETA-Danmark A/S	Name:	JIMCO A/S
Contact:	Thomas Bruun	Contact:	Jimmy K. Larsen
Address	Göteborg Plads 1 DK-2150 Nordhavn	Address:	Ellehaven 4 A DK-5900 Rudkøbing Denmark
Telephone:	+45 72 24 59 00	Telephone:	+45 62 51 54 56
E-mail:	tb@etadanmark.dk	E-mail:	jkl@jimco.dk
Web:	www.etadanmark.dk	Web:	www.jimco.dk

Signed, 18 June 2015

Verification responsible

Thomas Bruun

Managing Director

Jimmy K. Larsen

DANAK

Reg. Nr. 9099

This ETV Statement of Verification summarizes the results from verification of the KPC-Total system for reduction of grease and oil deposits and bacterial growth in hoods and ducts and reductions of odour concentration in ventilation air from commercial kitchen cooking hoods, manufactured and supplied by JIMCO A/S, Rudkøbing, Denmark.

The EU Environmental Technology Verification (ETV) pilot programme is a programme, which is voluntary. It aims to establish a framework for independent, qualified, third-party assessment of the performance of eco-innovative technologies, to facilitate their entry into the market. The programme has been active since 2011.

A Danish ETV programme was established in 2008 as a partnership between five Danish technological service centres, which provides experts and test facilities for the verification procedure. The partners are DHI, Danish Technological Institute, FORCE Technology, AgroTech and DELTA.

ETA-Danmark A/S is a subsidiary in Danish Standard, and is the Danish verification body for Environmental Technology Verification. ETA-Danmark is accredited by the Danish Accreditation body, DANAK, according to EN 17020 for performing environmental technology verifications. This is based on the cooperation with the DANETV-partners

The statement of verification is available on the ETV Registry at the following webpage http://www.etv-danmark.dk/

1 TECHNOLOGY DESCRIPTION

The technology (KPC-total) to be verified comprises of the following components:

- An effective grease and oil filter mounted in the kitchen cooking hood
- A treatment with Ultraviolet radiation in the C band (UV-C covering the wavelength range of 10 - 280 nm, in the cooking hood just behind the grease and oil filter.
- A treatment in a catalyst before discharging the air to the environment.

The grease and oil filters in the hood mechanically reduce the grease and oil droplets in the air.

The UV-C radiation has a strong germicidal effect on fungi, bacteria and viruses, and it will effectively prevent growth of these in the ducts. The UV radiation and the produced ozone will also attack and break down organic compounds close to the tubes, and the effect will continue throughout the exhaust system until all the ozone has reacted or removed by the final catalyst.

The final catalyst removes effectively ozone and remaining organic compounds, such as odour components. The final catalyst can be omitted from the installation, if the odour emissions is of less concern for neighbours, and lower investment and operational cost will be achieved.

2 APPLICATION

The intended application of the product for verification is defined in terms of the matrix and the purpose. The JIMCO KPC-total is especially designed for commercial kitchen cooking hood ventilation systems.

2.1. Matrix

The matrix is ventilation air from commercial kitchen cooking hoods.

2.2. Purpose

The purpose of KPC-total is to reduce emission of odour in ventilation air as well as to prevent grease and oil deposits and bacteria growth in the ventilation system from commercial cooking hoods.

2.3. Conditions of operation and use

The UV must always be in operations simultaneously when the hood ventilation in operation and regularly cleaning of the filters and UV lamps are mandatory to achieve the optimal effect from the product. Cleaning of the filters in a dishwashing machine should be done on daily basis as a starting point, and the frequency should only be reduced, if the deposits in the filters for sure can be washed out.

2.4. Verification parameters definition summary

The performance parameters for the verification comprise parameters that describe the reduction of grease and oil deposition in the ventilation system, the reduction of bacteria growth in the ventilation system, and the reduction of the emission of odour.

The selected performance claims are the following:

- A reduced deposition of grease and oil in the cooking hoods and in the ventilation system compared to normal equipped commercial kitchen cooking hoods.
- An effective prevention of bacterial growth in the ventilation system.
- The odour emission is in total reduced to less than 500 OU/m³.
- A catalyst durability of at least one year.

The parameters are equally important for many commercial kitchens, but for those where odour emission is of less concern, the catalyst can be omitted and the two last claims are consequently not relevant.

3 TEST AND ANALYSIS DESIGN

The test are performed as an on-site test in a newly build restaurant, with the Jimco KPC-total mounted in the kitchen hoods and ventilation system, and it has been in operation from the first day of frying and griddling in the kitchen. It means that no contamination of the exhaust system from ineffective oil and grease removal on the hood exist, and the test of oil and grease deposition in the ducts was measured from the starting up date for operating the kitchen in middle of August 2014.

The restaurant was not equipped with a catalyst, and two small test catalyst was installed operated with partial accelerated flows, which also was necessary to evaluate the durability.

The data for the installed and tested KPC-total items and the test catalyst are listed in the table below.

Item	Deep frying stations	Grill station
Filter type	Double metal oil mist filter consisting of a 25 mm labyrinth separator and a 16 mm knitted stainless steel mesh	
Filter elements, no.	4 in each of the two station	4
Filter element dimension	240x374x41 mm	240x490x41 mm
UV-C units	KPC 800HO-M HEX WP One unit in each of the two hoods	KPC 400HO-S HEX WP Two units in the hood
Residence time in catalyst	0.3 seconds	0.17 seconds
KPC-total design residence time	1.5 seconds	

3.1. Existing and new data

An ETV verification of the earlier KPC system, without the improved grease and oil filter, improved UV-C system and without a catalyst was performed in 2013. Data for deposition of oil and grease in the ducts from this test are included in this verification and the reduction in deposition rate in relation to these data is calculated.

3.2. Laboratory or field conditions

The test measurements was performed at normal operating conditions in the kitchen, but as the activity varies over the day, with more activity at lunch and dinner time, the measurement has been performed in these periods.

3.3. Matrix compositions

The matrix is ventilation air from commercial kitchen cooking hoods, and the composition is normal indoor air containing the emissions from the food cooking operations.

3.4. Test and analysis parameters

Odour concentration, bacteria activity, and grease and oil deposition are the main verification parameters. Air velocity, temperature, humidity, ozone concentration, TOC concentration are secondary parameters used for calculations and support of the main test parameters

3.5. Tests and analysis methods summary

Oil and grease deposition are measured by weighing inspections doors, odour reduction is measured by measuring the odour concentration without UV treatment before the catalyst, and with UV treatment before and after the catalyst. The catalyst durability is calculated from detection of breakthrough of odour after the catalyst. Bacteria activity is measured by determination of bacteria in surface samples from inside the ventilation system.

See the Verification Report for details about the used test and measuring methods.

3.6. Parameters measured

1. Deposition rate of oil and grease in the ventilation duct
2. Prevention of bacteria growth in hoods and ducts
3. Odour reduction after UV treatment and after catalyst
4. The catalyst durability

4 VERIFICATION RESULTS

4.1. Performance parameters

The overall results of the verification are shown in the table below.

Parameter	Claim	Results for frying system	Results for grill system
Deposition of grease	Reduced compared to "normal" cooking hood ventilation systems	Reduced 50-75% compared to similar restaurant and positions	Reduced 60-85% compared to similar restaurant and position
Bacterial growth	Effective prevention of bacteria growth	No bacteria growth at all	No bacteria growth at all
Odour concentration	Reduced to less than 500 OU/m³	On average reduced to 152 OU/m³.	On average reduced to 72 OU/m³.
Catalyst durability	One year	1.5 years	> 1.5 years *

* Breakthrough was not detected in the test period, and consequently the calculated durability is a minimum durability. The durability is also calculated only for the air flow of 3.000 m³/h from the grill hood containing the entire odour, to make the figure comparabele with the frying, where the test actually included app. 2000 m³/h ventilation air from the kitchen with low odour concentration. It gives a shorter durability than the originally calculated > 2½ years based on the total flow, but the catalyst is also proportionally smaller.

The odour emission is in total reduced by at least 91 % by the Jimco KPC-total system.

All the performance claims are fulfilled.

Notice, that the durability of the catalyst depends on the load of organic compounds (mainly oil and grease vapours), which include odorous compounds, and the load will vary during the day, because of the varying cooking activity in the kitchen. Consequently, the verified durability cannot be directly transformed to other kitchens without taking the activity level and the load of organic compounds into considerations.

4.2. Operational parameters

The KPC-total system can only be on or off, and no regulation is possible. The UV-lamps automatically switches on, when hood ventilation is turned on. For safety reasons to prevent anybody from looking directly to the UV light, the UV lamps are turned off by switches, if any of the filters are removed, or not mounted correctly.

The restaurant is open and operates every weekday from 07 to 01, but the cooking activities in the kitchen vary during the opening hours, with the highest activity at lunch and dinnertime, app. 12 to 14 and 18 to 20.

4.3. Environmental parameters

Not investigated

4.4. Additional parameters

The user manual and installation guide for the KPC-total has been evaluated in the verification protocol, and a new version has been provided from the proposer, but the conclusions are still:

- to highlight the recommendation to thorough clean the hoods and ducts before installing KPC-total, and clearly explain why it is so important for the performance;
- to highlight the recommendation and description of the importance of regularly cleaning of the grease and oil filter and the UV lamps;
- include information about the catalyst, how to determine when the durability is exceeded and how to replace it.

5. Additional information

The test is performed with the KPC-total equipment listed in Paragraph 3, and the test-restaurant is in operations every weekday from 07 to 01, but with varying cooking activities during the period. Consequently, the test results cannot be transformed directly to other restaurants with different activity levels, opening hours, load of grease and oil mist to the filters and content of grease and oil vapours captured by the catalyst, without considering the differences.

6. Quality assurance and deviations

During testing an external test systems audits were performed by ETA Danmark A/S.