

**Confidential Report for Surrey Diagnostics  
by Corkwise Limited  
Report 2008002945-2959**

**Background**

Surrey Diagnostics are leading experts in the monitoring and elimination of allergens, micro-organisms and volatile organic compounds.

Previous work performed both in the USA and Spain has indicated that the Airocide photocatalytic oxidation equipment is capable of removing 2,4,6-trichloroanisole (TCA) from the atmosphere.

TCA is one of the major causes of taint in the wine industry (as well as other packaging industries). If this equipment is able to virtually eliminate TCA from the atmosphere in warehouses, cellars and stores, the potential cost savings are considerable.

In order to launch this equipment to the UK wine industry, it was considered prudent to enable supportive data from a respected independent UK laboratory to be made available.

**Protocol**

A small room of 28m<sup>3</sup> was thoroughly cleaned and all shelving and superfluous material removed. The base level of airborne TCA was determined.

The room was sealed and TCA released into the room in order to achieve a stable airborne level. Initially, stability was attempted at a level of 200ppb. However, due to various factors, including settling of the introduced material, the target level was reduced to 200ppt and a fan introduced to gently circulate the air.

Once stability was achieved, an Airocide model ACS -100 was positioned horizontally in the room on a previously cleaned table. The room was sealed and only entered during the regular air sampling procedures.

The initial experiment was conducted with a room temperature of 15°C. A second run was conducted with the room temperature at 25 °C in order to determine whether an increase in temperature was seen to improve the decontamination procedure.

## **Analytical Protocol**

Sampling utilised a calibrated environmental pumping system, followed by solid phase micro-extraction (SPME) and gas chromatography / mass spectrometry (GC/MS). The samples were placed in a headspace vial and TCA-d5 added as an internal standard. Salt was also added to encourage the volatiles into the headspace. The vial was then heated to further increase the concentration of headspace volatiles and the SPME fibre introduced to the headspace. The TCA then bonded to the fibre, after which the fibre was removed from the headspace and placed in the injector of the GC/MS where the volatiles were removed by heating.

Specific analysis was then carried out for TCA using a GC/MS/MS method. Quantitation was carried out using the TCA-d5 as an internal standard. The Limit of Quantitation was determined each time the analysis was performed, typically <1ppt.

## **Results and Discussion**

The results are tabulated as attached reports.

Report 2008002945-2949 shows the initial calibration of the air borne TCA in the room after introduction of the fan. The background levels were found to equilibrate at around 110ppt over the 144 hours test period.

Report 2008002950-2953 clearly demonstrates that the Airocide photocatalytic equipment was able to dramatically reduce the levels of air borne TCA. Whilst initial reduction during the first 24 hours was impressive, decreases thereafter were seen to slow considerably. However, it must be stated that a low level of TCA was achieved after 24 hours. This finding is of practical significance to the wine industry.

The very low level of TCA still evident after 144 hours will most likely be due to TCA present on the walls and floor of the room becoming volatilised.

Report 2008002954-2959 shows the results after heating the room to 25°C. The trend in reduction of TCA levels is similar to report 2008002950-2953 conducted at 15 °C, indicating that no advantage is gained by increasing the room temperature in an attempt to increase the rate at which TCA is removed by this system.

**Further Experiments**

Further testing is recommended in order to determine whether the equipment is effective against the other anisoles known to be implicated in taint (2,4 & 2,6 Dichloroanisole, 2,4,6 Tribromoanisole, 2,3,4,6 Tetrachloroanisole & 2,3,4,5,6 Pentachloroanisole) and their precursors the phenols.

In addition, further experiments using the current protocol should be performed in order to substantiate the statistical significance of this data.

## Corkwise Certificate of Analysis

SURREY DIAGNOSTICS  
PO BOX 156  
CRANLEIGH  
GU6 8ZU

Report Date : 17-November-2008

Base Level of TCA in room prior to inoculation

Sample ID :2008002945

Size : Vintage : Alc %: UNSPECIFIED  
Customer Ref/PO: Country :  
Batch Code: UNSPECIFIED Closure Type :

Parameter	Result	Unit
Trichloroanisole (TCA)	<1	ppt

After 72 hours with fan running @15°C

Sample ID :2008002946

Size : Vintage : Alc %: UNSPECIFIED  
Customer Ref/PO: Country :  
Batch Code: UNSPECIFIED Closure Type :

Parameter	Result	Unit
Trichloroanisole (TCA)	110	ppt

After 96 hours with fan running @ 15°C

Sample ID :2008002947

Size : Vintage : Alc %: UNSPECIFIED  
Customer Ref/PO: Country :  
Batch Code: UNSPECIFIED Closure Type :

Parameter	Result	Unit
Trichloroanisole (TCA)	115	ppt

After 120 hours with fan running @ 15°C

Sample ID :2008002948

Size : Vintage : Alc %: UNSPECIFIED  
Customer Ref/PO: Country :  
Batch Code: UNSPECIFIED Closure Type :

Parameter	Result	Unit
Trichloroanisole (TCA)	111	ppt

*G A Taylor BSc(Hons) CChem CSci MRSC*

These results only relate to the sample(s) tested. Corkwise cannot be held liable in respect of the use to which this information is put.

## Corkwise Certificate of Analysis

SURREY DIAGNOSTICS  
PO BOX 156  
CRANLEIGH  
GU8 8ZU

Report Date : 17-November-2008

After 144 hours with fan running @ 15°C

Sample ID :2008002949

Size :

Customer Ref/PO:

Batch Code: UNSPECIFIED

Vintage :

Country :

Closure Type :

Alc %: UNSPECIFIED

Parameter	Result	Unit
Trichloroanisole (TCA)	108	ppt

## Corkwise Certificate of Analysis

SURREY DIAGNOSTICS  
PO BOX 158  
CRANLEIGH  
GU8 8ZU

Report Date : 17-November-2008

After 72 hours with fan running @ 25°C  
Airocide at 0 hours

Sample ID :2008002954		
Size :	Vintage :	Aic %: UNSPECIFIED
Customer Ref/PO:	Country :	
Batch Code: UNSPECIFIED	Closure Type :	
Parameter	Result	Unit
Trichloroanisole (TCA)	117	ppt

After 96 hours with fan running @ 25°C  
Airocide after 24 hours

Sample ID :2008002955		
Size :	Vintage :	Aic %: UNSPECIFIED
Customer Ref/PO:	Country :	
Batch Code: UNSPECIFIED	Closure Type :	
Parameter	Result	Unit
Trichloroanisole (TCA)	21	ppt

After 120 hours with fan running @ 25°C  
Airocide after 48 hours

Sample ID :2008002956		
Size :	Vintage :	Aic %: UNSPECIFIED
Customer Ref/PO:	Country :	
Batch Code: UNSPECIFIED	Closure Type :	
Parameter	Result	Unit
Trichloroanisole (TCA)	11	ppt

After 144 hours with fan running @ 25°C  
Airocide after 72 hours

Sample ID :2008002957		
Size :	Vintage :	Aic %: UNSPECIFIED
Customer Ref/PO:	Country :	
Batch Code: UNSPECIFIED	Closure Type :	
Parameter	Result	Unit
Trichloroanisole (TCA)	9	ppt

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## Corkwise Certificate of Analysis

SURREY DIAGNOSTICS  
PO BOX 156  
CRANLEIGH  
GU6 8ZU

Report Date : 17-November-2008

After 168 hours with fan running @ 25°C  
Airocide after 96 hours

Sample ID :2008002958

Size :

Customer Ref/PO:

Batch Code: UNSPECIFIED

Vintage :

Country :

Closure Type :

Aic %: UNSPECIFIED

Parameter	Result	Unit
Trichloroanisole (TCA)	9	ppt

After 216 hours with fan running @ 25°C  
Airocide after 120 hours

Sample ID :2008002959

Size :

Customer Ref/PO:

Batch Code: UNSPECIFIED

Vintage :

Country :

Closure Type :

Aic %: UNSPECIFIED

Parameter	Result	Unit
Trichloroanisole (TCA)	8	ppt

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## Corkwise Certificate of Analysis

SURREY DIAGNOSTICS  
PO BOX 156  
CRANLEIGH  
GU6 8ZU

Report Date : 17-November-2008

After 72 hours with fan running @15°C  
Airocide at 0 hours

Sample ID :2008002950		
Size :	Vintage :	Alc %: UNSPECIFIED
Customer Ref/PO:	Country :	
Batch Code: UNSPECIFIED	Closure Type :	
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Parameter	Result	Unit
Trichloroanisole (TCA)	105	ppt

After 96 hours with fan running @15°C  
Airocide after 24 hours

Sample ID :2008002951		
Size :	Vintage :	Alc %: UNSPECIFIED
Customer Ref/PO:	Country :	
Batch Code: UNSPECIFIED	Closure Type :	
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Parameter	Result	Unit
Trichloroanisole (TCA)	12	ppt

After 120 hours with fan running @15°C  
Airocide after 48 hours

Sample ID :2008002952		
Size :	Vintage :	Alc %: UNSPECIFIED
Customer Ref/PO:	Country :	
Batch Code: UNSPECIFIED	Closure Type :	
<hr/>		
Parameter	Result	Unit
Trichloroanisole (TCA)	8	ppt

After 144 hours with fan running @15°C  
Airocide after 72 hours

Sample ID :2008002953		
Size :	Vintage :	Alc %: UNSPECIFIED
Customer Ref/PO:	Country :	
Batch Code: UNSPECIFIED	Closure Type :	
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Parameter	Result	Unit
Trichloroanisole (TCA)	6	ppt

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