

Measurements of Oil Mist Concentrations from the Cirrus Smoke Machine
Cirro Lite Europe Ltd

Stanger 

Stanger Science & Environment
The Lansdowne Building
Lansdowne Road, Croydon CR0 2BX
Telephone: (0181) 256 4800
Fax: (0181) 256 4862

Report

Measurement of Oil Mist Concentrations from the Cirrus Smoke Machine

Prepared By



Beatriz Garcia

Approved By



Jon Pullen

Prepared for Mr J.P. Coppen
Cirro Lite Ltd
3 Star Works
Salter Street
London
NW10 6UN

22 January 1997

Our ref 331/4133/96
Your ref
Document ref SSE/AQ/1112



| Contents | | Page |
|-----------------|-------------------------|-------------|
| 1 | Introduction | 1 |
| 2 | Site Description | 1 |
| 3 | Method and Observations | 1 |
| 4 | Results and Discussion | 2 |
| 5 | Conclusions | 2 |
| 6 | References | 3 |



1 Introduction

A request was received from Mr J. Coppen of Cirro Lite Europe Ltd asking Rendel Science and Environment to carry out an assessment of the smoke generated by the Cirrus Smoke Machine in view of the COSHH Regulations and Occupational Exposure Limits as defined by the Health and Safety Executive.

The Cirrus smoke machine is designed to produce a oil mist smoke to accentuate the effects of spotlights in theatre situations by slightly diffusing the light so that the audience can actually see the beam, thus giving a more pleasing visual effects. It is not used for special effects such as mist or fog.

The equipment is portable and comprises of two parts, a compressor and the oil reservoir/generator. The action of the air pressure through several small orifices in a manifold in the oil produces the oil mist. No heating is involved.

A previous assessment has already been undertaken by RSE into the general safety of the Cirrus Smoke machine (Ref LFCDA/FB/IPS/ENTS).

2 Site Description

In order to provide a representative sampling location the demonstration studio at Samuelson Concert Production was selected. This is a large room with dimensions approximately 22 metres by 16 metres and 10 metres high. Lighting is provided on overhead gantries and controlled at a mixing desk at the rear of the studio.

3 Method and Observations

Smoke was generated using the Cirrus Smoke Machine in two controlled experiments. The first of these was conducted on the 14th June 1991 and the second on the 28th June 1991.

The first test duplicated the 'worst normal condition' that would be experienced with a relatively high smoke density, using the smoke generator for about 30 minutes over the 2½ hour sampling period.

The second test used the smoke machine under normal conditions generating enough smoke to give the special lighting effect normally required at concerts and in theatres. The machine was run for about 5 minutes in this case.

The sampling method used was to sample over a period of between 2½ to 4½ hours using battery powered samplers. These were run at a measured flow rate of between 2 and 3.5 litres per minute drawing onto cellulose acetate filters. The filters were analysed gravimetrically in the laboratory using an analytical balance weighing with an accuracy of +/- 10 microgrammes.



4 Results and Discussion

The results of this survey are reported in Table 1. Details are given of the perceived smoke density, the location and the smoke concentration.

Table 1 Monitoring of Oil Mist Concentrations from Cirrus Smoke Machine

| Filter No. | Location | Mass (mg) | Volume (l) | Concentration (mg m ⁻³) |
|------------|-------------------------------|-----------|------------|-------------------------------------|
| SM01 | Next to smoke generator | 7.53 | 0.60 | 12.55 |
| SM02 | Mixing Desk/2m from Smoke Gen | 2.58 | 0.57 | 4.56 |
| SM03 | Under stage lights | 1.41 | 0.63 | 2.25 |
| SM04 | Under stage lights | 1.09 | 0.52 | 2.10 |
| SM05 | Blank | 0.04 | | |

It can be seen from these results that the level on sample SM01 exceeds the OES of 5 mg/m³ and that of SM02 is close to this value. The levels measured away from the generator on SM03 and SM04 are still relatively high but not significantly so.

The concentration measured on the second test are much lower, reflecting the lower level of smoke that was generated. These levels are well below the OES value by at least an order of magnitude.

The room used for the experiment was not forced ventilated. It is difficult to state how much the machine could be used before people were exposed to concentrations of oil mist that would exceed the OES. However the information supplied in this report can give an indication of the amount a Cirrus smoke machine could be used based on the room size (volume), ventilation rate and smoke level/effect required.

5 Conclusions

The smoke generated by the Cirrus smoke machine is acceptable in terms of its use to produce the effects outlined above. In some extreme situations oil mist concentrations can be made to be very high such that the Occupational Exposure Limits could be exceeded. It is recommended that the machine only be used for its intended purpose of producing a light beam illumination effect, if the HSE oil mist standard is not to be exceeded. This can happen in an extreme situation.



6 References

1. Report from RSE on Cirrus Smoke Machine dated 2 February 1989.
LFCDA/FB/IFS/ENTS.
2. HSE Guidance Note Occupational Exposure Limits - EH40/90.