

Assessment of Mist Levels Generated by Cirro Cracked Oil Machines
Cirro Lite Europe Ltd

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Report

Assessment of Mist Levels Generated by Cirro Cracked Oil Machines

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2 Method of Assessment

Mist generated from the Cirro Strata cracked oil machine was assessed visually, and further interpretations were made based on comparisons with levels measured in the COSHH assessment undertaken by London Scientific Services (LSS) on 28 June 1991.

On that occasion, monitoring was carried out using relevant guidance taken from the HSE MDHS 14. The Cirrus System machine was run for about 5 minutes in a large room (approximately 3520 m³) to give the mist effect normally required in studios, theatres or concerts. Background mist concentrations inside the studio were then measured using four personal pumps over a period of between 2.5 and 4.5 hours. Concentrations of mist varied between 0.06 and 0.4 mg m⁻³ and were categorised as low.

The present survey was carried out at Cirro Lite premises by running the Cirro Strata and the original Cirrus System machine, over a period of time until the conditions used in the previous assessment (e.g. the mist density) were fully recreated. The test room was partially occupied by equipment and the available volume of air for the dispersion of the mist was therefore substantially reduced. On this basis, the machines were run for three minutes instead of five to achieve the same mist level used in the 1991 assessment and most commonly required in working situations. The tests were run consecutively and the room was thoroughly ventilated between tests until the mist from the previous test was fully dissipated.

After the three minutes, the machines were switched off and the mist concentrations were visually assessed. In order to further characterise mist intensities, the lights were then switched off and a hand held light similar to those used in the theatre and cinema was used to give a beam of light. The mist level was then further assessed by looking at the definition of the light beam. Denser mists result in more defined beams and vice versa.

3 Legislation

The Health and Safety Executive in its Guidance Note EH 40/95 stipulates an Occupational Exposure Limit (OEL) for total mist of 5 mg m⁻³. This is based on an 8-hour weighed average reference period.

The OEL is the concentration of an airborne substance, averaged over a reference period, that should not be exceeded. If it is exceeded, the employer must promptly identify the reasons and take appropriate steps to reduce exposures as soon as reasonably possible.



4 Results and Discussion

Cirro Strata (CS6)

The Cirro Strata cracked oil machine is the latest oil machine developed by Cirro Lite Ltd. It can be split (compressor and oil tank) and the consumption rate of oil is approximately 150 ml every four hours.

The mist output generated by the Cirro Strata machine was observed to be lower than that generated by the Cirrus System. It was pointed out by Mr J. Coppen that the levels of mist were slightly lower than normal and that the machine was underperforming. The volume of mist coming out created a very thin background mist compared to the original Cirrus System. The observation of the mist through the light beam showed the beam edges defined only very slightly.

Levels of mist generated by the Cirro Strata machine were observed to be significantly below those given by the original Cirrus System machine. Although the machine was slightly underperforming, it was stated by the client that levels of mist would normally be below those generated by the Cirrus System. On this basis, mist concentrations of well below the OEL of 5 mg m^{-3} are expected, and there would be considered as acceptable by the HSE.



5 Conclusions

The mist produced by the Cirro Strata cracked oil machine is considered to be as acceptable in terms of its use to produce the mist effects normally required and outlined above.

The Cirro Strata machine was observed to produce levels of mist lower than those generated by the original Cirrus System when used for the same intended purpose of producing a light beam illumination effect. The mist levels under these conditions should not exceed the peak concentration of 0.4 mg m^{-3} measured with the Cirrus System machine which is well under the OEL of 5 mg m^{-3} .

6 Disclaimer

We confirm that in preparing this report we have exercised all reasonable skill and care.

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

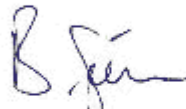
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1 Introduction

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.