AC/ES/2233/03 11 April 2003

AIR QUALITY ASSESSMENT FOR OZONIZER JIMCO MODEL OZ 500

FOR GENMECH ENGINEERING (S) PTE LTD

21, TOH GUAN EAST, #07-14,

TOH GUANG CENTRE,

SINGAPORE 069906

Date of Survey	:	04 April 2003
Reported	:	11 April 2003
Report No.	:	AC/ES/2233/03

Surveyed and Reported by:-

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1.0 SUBJECT

Air Quality Assessment for Ozonizer JIMCO Model OZ 500 was conducted by Environmental Services of Analytical Laboratories (S) Pte Ltd on 04 April 2003 for Genmech Engineering (S) Pte Ltd located at No. 21, Toh Guan Road East, #07-14, Toh Guan Centre, Singapore 608609.

2.0 OBJECTIVE

The purpose of this study was to evaluate and assess the efficiency of the product namely Ozonizer JIMCO Model OZ 500.

The working principal of the product, Ozonizer JIMCO Model OZ 500 is by means of generating low level ozone that is below acceptable human ozone exposure limit of 0.05 ppm (8 hours), where the air is induced across a UV-C lamp which disinfects bacteria, yeasts and moulds, viruses, neutralise airborne odours and other organics compounds (please refer to Appendix A for product details).

3.0 METHODOLOGY

3.1 Test Location

The "trial test" for all the air contaminants throughout the entire course of this study was carried out at Genmech Engineering (S) Pte Ltd conference room size of approx. 15 ft (length) x 12 ft (width) x 10 ft (height).

The conference room floor area is approx. 180 ft^2 (16.72m^2) whilst the room volume is approx. 1,800 ft^3 (50.97m^3).

3.2 Test Methodology

a) ***Total Bacterial Count (TBC) and Total Fungal Count (TFC)***

A portable microbiological air sampler SAS Super 100 was used to collect indoor air particulates for microbial activity. Plate Count Agar for Total Bacterial Count was used as a sample medium for 2-minutes sampling period and was then incubated for 48 hours at 37^oC prior to microbial counts. Rose Bengal Agar was used for Total Fungal Count and was then incubated for 5 days at 25^oC prior to fungi counts.

b) ***Ozone (O_3)***

Ozone was measured using a portable Crowcon's Triple Plus Ozone Analyser for 30 second interval over the 1 hour sampling duration.

4.0 TEST RESULTS

All the respective test results obtained are tabulated below and reflect our findings on 04 April 2003.

Please refer to Pages 2 to 3 of this report.

4.1 Total Bacterial Count (TBC) and Total Fungal Count (TFC)

Cumulative Time (mins)	TBC (CFU/m³)	TFC (CFU/m³)	SIAQG (CFU/m³)
0	280	60	TBC: 500 TFC: 500
15	900	1190	
30	370	630	
45	310	320	
60	230	220	

Remarks: ***Both Bacteria and Fungi were introduced into the indoor environment with common airborne bacteria and fungi cultures media for the first 5 minutes of test duration.***

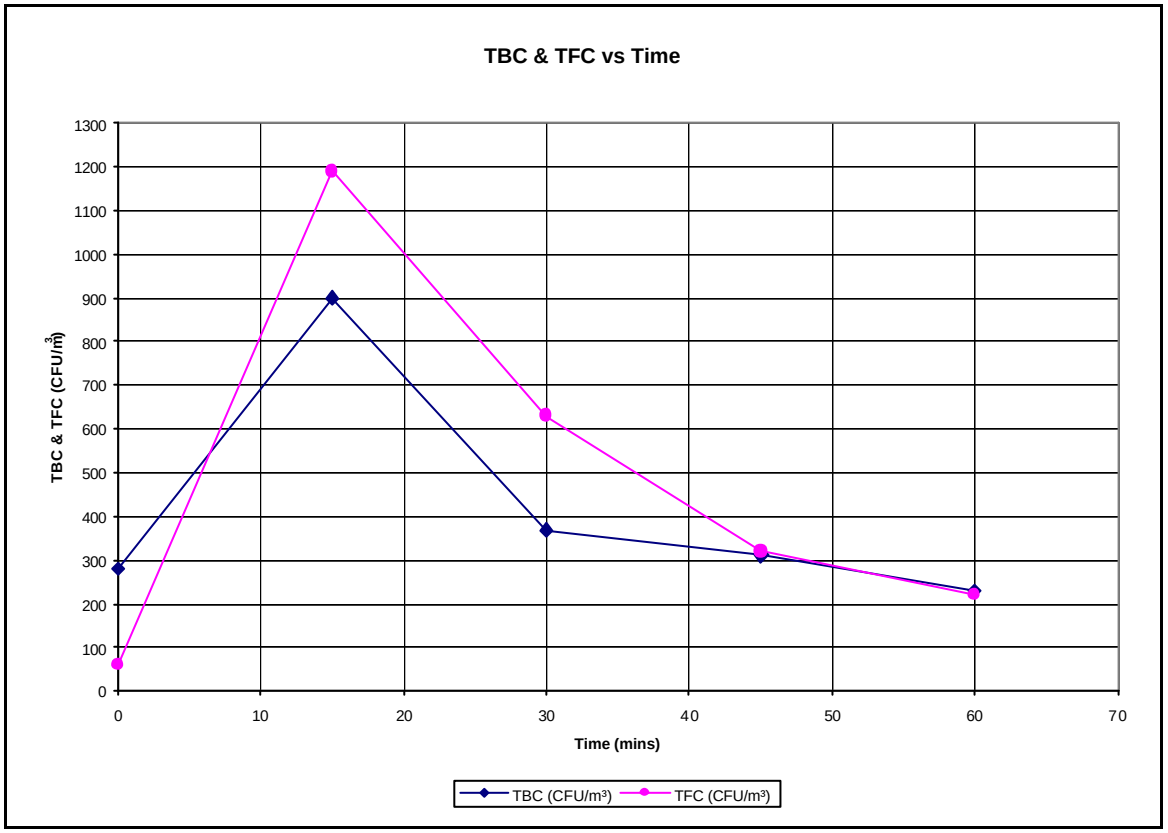

Figure 1: Graph of Total Bacterial Count and Total Fungal Count versus Cumulative Time

4.2 Ozone (O_3)

Cumulative Time (mins)	Ozone (ppm)	SIAQG (ppm)
0	<0.01	**0.05**
15	<0.01	
30	<0.01	
45	<0.01	
60	<0.01	

Remarks: ***Ozone concentrations remained relatively constant at low level ozone In the conference room throughout the entire test duration (for reference purpose only).***

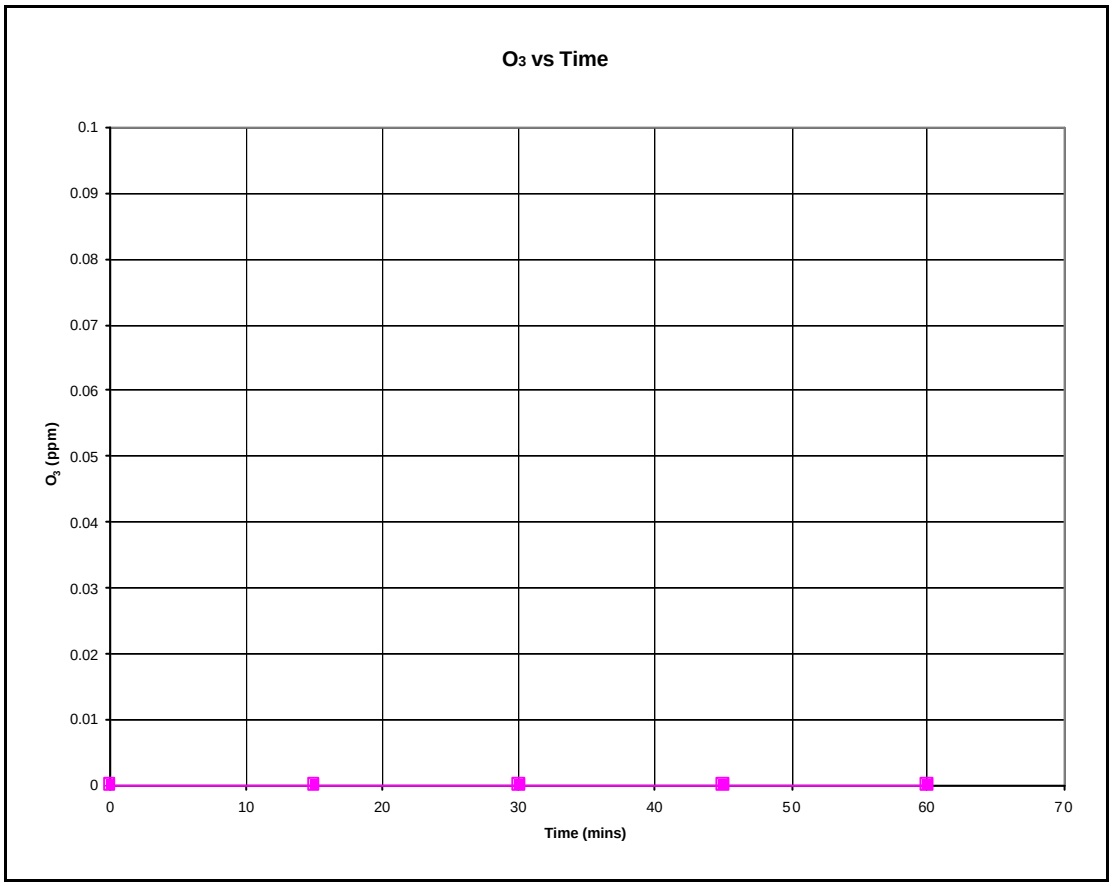

Figure 2: Graph of Ozone Concentration versus Cumulative Time

5.0 CONCLUSION

In general, the results obtained for Ozone levels were within the Ministry of the Environment (ENV)'s "Guidelines for Good IAQ in Office Premises" and ASHRAE's IAQ Guidelines as well as other established international organisations such as OSHA, NIOSH and ACGIH.

In conclusion, the overall Air Quality Assessment of Total Bacterial Counts, Total Fungal Counts and Ozone Levels showed that the Ozonizer JIMCO Model OZ 500 can be considered as **"acceptable"** and **"efficient"** by means of generating low level ozone that is below acceptable human ozone exposure limit of 0.05 ppm (8 hours), which disinfects bacteria, yeasts and moulds, viruses, neutralise airborne odours and other organics compounds based on the findings of the "trial test" in this study.

It should be noted that this study is based upon limited information gathered during the execution of this project and reflects our findings at the date/time and location monitored.

6.0 ABBREVIATIONS GUIDE

AIHA	American Industrial Hygiene Association, US
ACGIH	American Conference of Governmental Industrial Hygienists, US
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers, US
CFU	Colony Forming Units
CO_2	Carbon Dioxide
CO	Carbon Monoxide
ENV	Ministry of the Environment, Singapore
HCHO	Formaldehyde
IAQ	Indoor Air Quality
MOM	Ministry of Manpower, Singapore
mg/m^3	milligram per cubic metre
NPAAQS	National Primary Ambient Air Quality Standards
NIOSH	National Institute for Occupational Health and Safety, US
OSHA	Occupational Safety and Health Administration, US
O_3	Ozone
PELTS	Permissible Exposure Levels of Toxic Substances
ppm	Parts per million
RH	Relative Humidity
RSP	Respirable Suspended Particulates
SIAQG	Singapore Indoor Air Quality Guidelines
STEL	Short-Term Exposure Level
T	Temperature
TVOC	Total Volatile Organic Compounds
USEPA	United States Environmental Protection Agency, US

7.0 REFERENCES

ASHRAE, "Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard 62-1989", The Society, Atlanta, GA, 1989.

Hines, A., Ghosh, T., Loyalka, S., Warder, R., "Indoor Air Quality and Control", PTR Printice Hall, New Jersey, 1993.

NIOSH, "Manual of Analytical Methods", Fourth Edition, January 1998.

MOM, "The Factories (Permissible Exposure Levels of Toxic Substances) Order 1996", Ministry of Manpower, Singapore.

ENV, "Guidelines for Good Indoor Air Quality in Office Premises", Institute of Environmental Epidemiology, Ministry of the Environment, Singapore, 1996.

ENV, "Pollution Control Reports, 1991 - 2000", Ministry of the Environment, Singapore

APPENDIX A – PRODUCT DETAILS