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LHTIO Project No: REX-LEEDS-01

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Date: 05/05/2022

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Lightico were asked to carry out an air quality audit to determine the air quality at the Rexel Leeds Distribution Hub The area of concern was the distribution office.

Summary:

Lightico Limited supplies Titanium Dioxide (TiO₂) photocatalytic LED light panels that are designed to produce antimicrobial activity in the area around the light panel during operation.

Rexel is a leading electrical wholesaler and operate a number of distribution hubs across the UK to support their local branch network. The area of the site Lightico visited manage the distribution of electrical products to the local area. The office surveyed is an administrative space defined as the Operations Office where staff come and go throughout the day. It is often necessary for the door to be closed to manage the noise and temperature from the warehouse. As a key hub unplanned staff absence not only affects their customers but the other REXEL businesses they support.

The objective of the Lightico Air Quality Audit is to identify areas within an environment where the potential risk of onwards transmission of disease is greater and/or where the quality of air, due to potentially raised level of pollution and pollutants is poor, leading to negative consequences for staff and visitors.

Measurements:

To establish air quality Lightico's audit measures the following:

- Background airborne bacteria – Total Viable Count (TVC)
- CO2 levels throughout the testing period

Methodology:

Background airborne bacteria is measured through the collection of viable bacteria using the 1/1/1 method for passive air sampling. This refers to the exposure of 18ml of nutrient agar contained in a 100mm diameter petri dish, 15mm deep for 1 hour. The dish is suspended 1m from the floor on a stand positioned 1m from the wall. 1 hour, 1m from the floor, 1m from the wall.

This ensures that whatever settles onto the plate during the 1-hour exposure period is from the air not contamination from surfaces or people. Lightico sample up to 3 separate locations with a room so that an average can be provided.

Once the plate has been exposed for 1 hour it is sealed and then incubated for 72 hours before a Total viable count (TVC) is made of the bacteria identified. This gives a quantitative estimate of the concentration of microorganisms such as bacteria, yeast, or mould spores in a sample. The count represents the number of colonies forming units per g of the sample.

The remaining measurement is conducted using the fixed CO2 monitor installed in the office together with a handheld CO2 monitor for comparison. After allowing the monitor to calibrate itself to the environment (taking approximately 5-10 mins) a numerical reading is taken for each of the measurements at 15 min intervals at each of the sample locations.

Environmental observations including air handling and ventilation:

The requirement for any organisation responsible for the health, safety, and wellbeing in a building under the law is clear and has not changed due to the recent COVID-19 pandemic. The following statements are set out by the Health and Safety Executive and UK Health Security Agency.

- All workers have a right to work in places where risks to their health and safety are properly controlled.
- The law says employers must make sure there's an adequate supply of fresh air (ventilation) in enclosed areas of the workplace. **This has not changed during the pandemic.**
- **Let fresh air in if you meet indoors.** Meeting outdoors is safer
- Control measures such as avoiding certain activities or gatherings, restricting, or reducing the duration of activities, providing ventilation breaks during or between room usage should be considered alongside ventilation for reducing the risk of airborne transmission.

At the time of sampling, it was a warm day. The roller shutter doors were up which allowed for fresh air when staff entered and exited the office. Occupancy was a maximum of 6 people and a minimum of 2 throughout the testing period. No extraction system in place. There is a window but rarely opened due to vehicles outside. An internal office is located within the space but will be treated as part of the overall office for the purpose of the report.

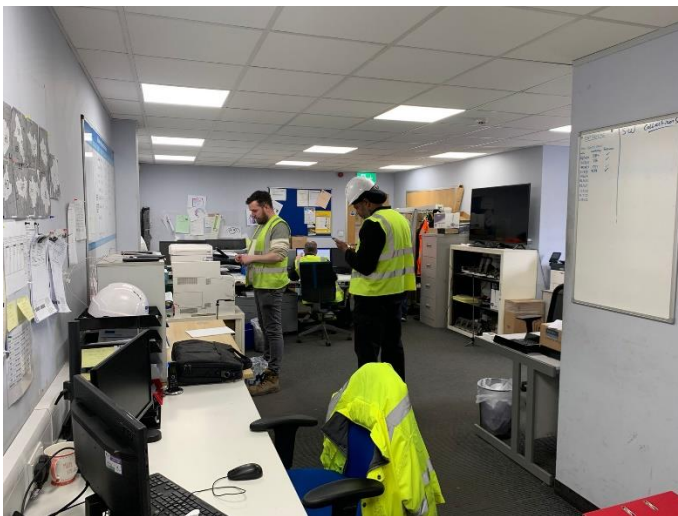
The lighting in the office is via 13 LED 600 x 600 flat luminaire and seemed adequate, although no lux readings were taken. The room appeared well lit with plenty of natural light.



No mechanical air handling – extract or fresh air intake



The area is in constant use and is located next to the warehouse



Social distancing or leaving the room to allow for CO2 to dissipate is impossible



CleanLight panels were installed in just over 1 hour

Background airborne bacteria – Total Viable Count (TVC) Sampling Results:1. GENERAL INFORMATION1.1 Test Laboratory

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1.2 Test Schedule

	Before CleanLight Installation	After CleanLight Installation
Sample Collection	9 th May 2022	6 th September 2022
Incubation of plates	9 th – 12 th May 2022	6 th – 9 th September 2022
Plate reading (colony counting)	23 rd May 2022	16 th September 2022

2. MATERIALS AND METHODS2.1 Culture media and other consumables

The following commercial culture medium was used:

Tryptone Soya Agar (LabM; LAB011) – TSA

TSA plates were prepared in accordance with the manufacturer's instructions and the DWS Media Preparation Manual.

2.2 Sampling procedures (settle plates)

2.2.1 Prepared 100 mm plates of sterile TSA were supplied by Darwin Biological to Lightico.

2.2.2 Lightico's representatives were responsible for the exposure of agar plates to monitor airborne bacteria.

2.2.3 All samples were collected in the putting on operations office at the Rexel Leeds

2.2.4 In each area selected for sampling, corresponding settle plate samples were collected as follows:

Before installation – 9th May 2022

After installation – 6th September 2022

2.2.5 In each area, airborne bacteria were collected using TSA settle plates: lids were removed, and the agar surface was exposed for 60 minutes.

2.2.6 Following sampling, plates were returned to the Test Laboratory on

2.2.7 Incubation and evaluation of agar plates

2.3.1 At the Test Laboratory, all returned TSA plates were placed in an incubator at 30°C ±1°C for 72 hours.

2.3.2 After incubation, bacterial colonies on each TSA plate were photographed and enumerated.

3. RESULTS AND DISCUSSION

3.1 Sample descriptions provided by Lightico, and the corresponding colony counts on each agar plate are presented in Table 1.

3.2 Photographs of the agar plates are presented in appendix A

Table 1 Bacterial colony counts on settle plates at each location

Plate location	Bacterial colony count (per plate) - TVC		% Diff
	Before Cleanlight	After CleanLight	
Office Position 1	60	38	37%
Office Position 2	87	40	54%
Office Position 3	201	51	75%
Office Position 4	102	70	31%
Office Position 5	117	35	70%
Total	567	234	59%

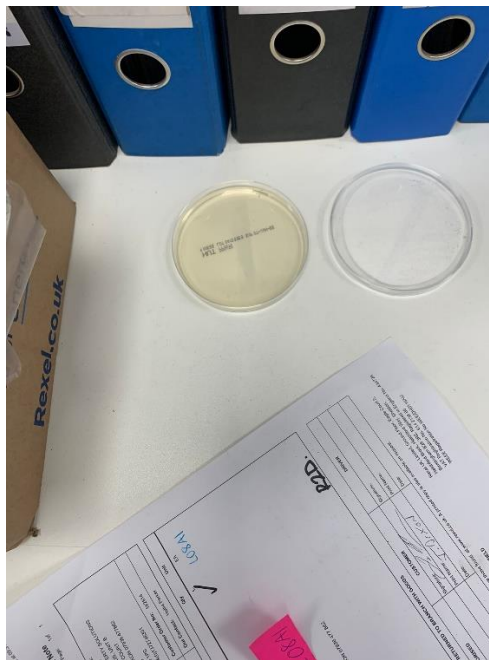
Table 2 CO2 levels recorded

Time	Fixed CO2 Monitor	
	Before CleanLight	After CleanLight
Start	1547ppm	642ppm
15 mins	1522ppm	685ppm
30 mins	1571ppm	667ppm
45 mins	1603ppm	685ppm
60 mins	1628ppm	551ppm

Appendix A - Photographs of collection locations



Location 1



Location 2



Location 3

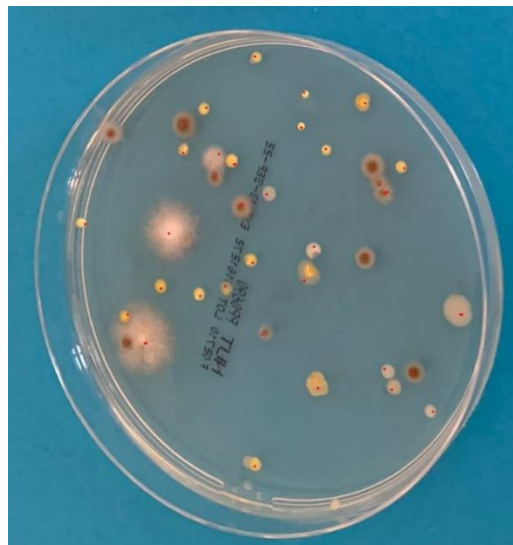


Location 4

Appendix B - Photographs of the agar plates



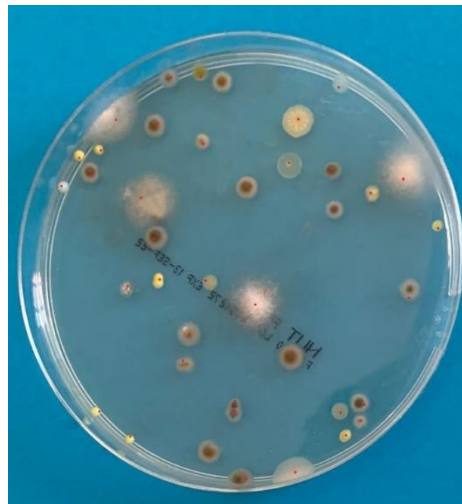
Office Position – 1 – BEFORE (60 TVC)



Office Position – 1 AFTER (38 TVC)



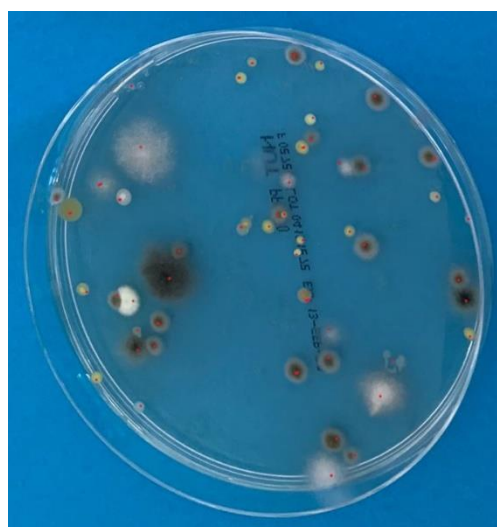
Office Position – 2 – BEFORE (87 TVC)



Office Position – 2 AFTER (40 TVC)



Office Position – 3 – BEFORE (201 TVC)



Office Position – 3 AFTER (51 TVC)



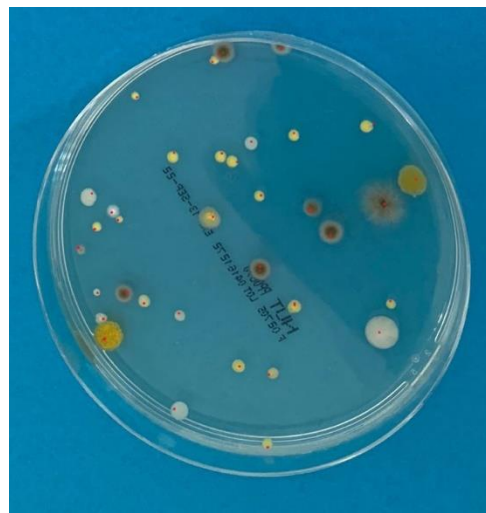
Office Position – 4 – BEFORE (102 TVC)



Office Position – 4 AFTER (70 TVC)



Office Position – 5 – BEFORE (117 TVC)



Office Position – 5 AFTER (35 TVC)

Summary & Conclusions:

From our audit of the area and samples taken, the following conclusions may be drawn:

1. Throughout the sampling period the levels of CO2 recorded in the office indicates poor ventilation in the space.
2. The levels of bacteria collected during the test does indicate that full air changes are not being delivered within an hour. CIBSE (Chartered Institution of Building Services Engineers) recommends between 5 and 15 air changes per hour in occupied spaces. Replacing the 13 existing panels with CleanLight would deliver the equivalent of 7 ACH.
3. Significant reduction in bacteria levels were recorded in the sampling completed after CleanLight was installed.
4. Significant reduction in CO2 levels were recorded in the sampling completed after CleanLight was installed.
5. **The introduction of CleanLight panels has made a significant improvement in air quality and is delivering equivalent air changes per hour in line with CIBSE recommendations.**

Recommended CleanLight Installation:

There are currently 13 600 x 600 LED panels in place in the office, which is 58m², replacing these with CleanLight panels would provide the following

1. Sufficient CleanLight coverage based on 7.5m² effective area from each panel
2. Minimum light levels of 655 lx which is well within CIBSE guidelines for the space and use type
3. The equivalent ACH (air changes per hour) of 7.32, again more than the minimum CIBSE guidance of 5 ACH.

