

*Making Buildings Smarter*



## CO2 Levels in Offices

‘Silently Damaging  
UK Productivity’,  
finds New Study



CO2 Levels

Study

- Workers were able to work up to 60% faster in lower CO2 concentrations
- High CO2 levels can cause offices to feel ‘stuffy’, which is mistakenly put down to high temperatures, but are rarely monitored
- An increased intake of CO2 can lead to poor decision making, slower reaction times and increased tiredness among employees
- Consortium behind the two-year project calls on businesses to test the quality of their indoor environments more regularly in order to boost employee productivity

Failure to regulate environmental conditions is negatively impacting workers’ cognitive functions

The results from the first-ever practical study into UK indoor office environments has revealed that worker performance declines when CO2 levels are high, and temperatures are too warm or cold. As the government and business community continues to examine new ways of boosting the UK's productivity levels, it's hoped that a greater understanding of the detrimental impact of CO2, as well as fluctuating temperatures, on employee outputs will lead to concerted action to improve air quality in offices.

Backed by a UK facilities management company, the two year research initiative was led by academics at Oxford Brookes University and LCMB Building Performance, and supported by Innovate UK - the UK government agency tasked with boosting innovation in the UK economy. This forms part of the Whole Life Performance Plus (WLP+) project, which brings together a consortium of leading experts in building performance, property development and facilities management.

## Putting CO2 to Work

Workplaces taking part in the study - including NATS and Kings College London - were tested over two years, with Internet of Things (IoT) enabled sensors installed to monitor fluctuating CO2 levels. During this time employees were sent numerical, proofreading and Stroop tests via email up to three times a day as part of the study. A methodology was then used to calculate the impact of CO2 and temperature on perceived productivity in those workplaces[1].

With lower CO2 levels, employees' test scores improved by up to 12%. And in one of the buildings tested, **people worked 60% faster with reduced CO2 concentrations**, completing tests in a mean time of 8.2 minutes, compared with 13.3 minutes with more CO2 in the atmosphere.

Too often due to energy efficiency concerns, the opening of windows in offices is highly controlled, meaning that the quality of the indoor atmosphere is heavily reliant on air conditioning. This means, for example, when new offices are built, they are 'sealed' and air conditioned as standard. Even if buildings meet ventilation standards, this doesn't mean that high CO2 levels are being effectively detected and reduced, and often lead to offices

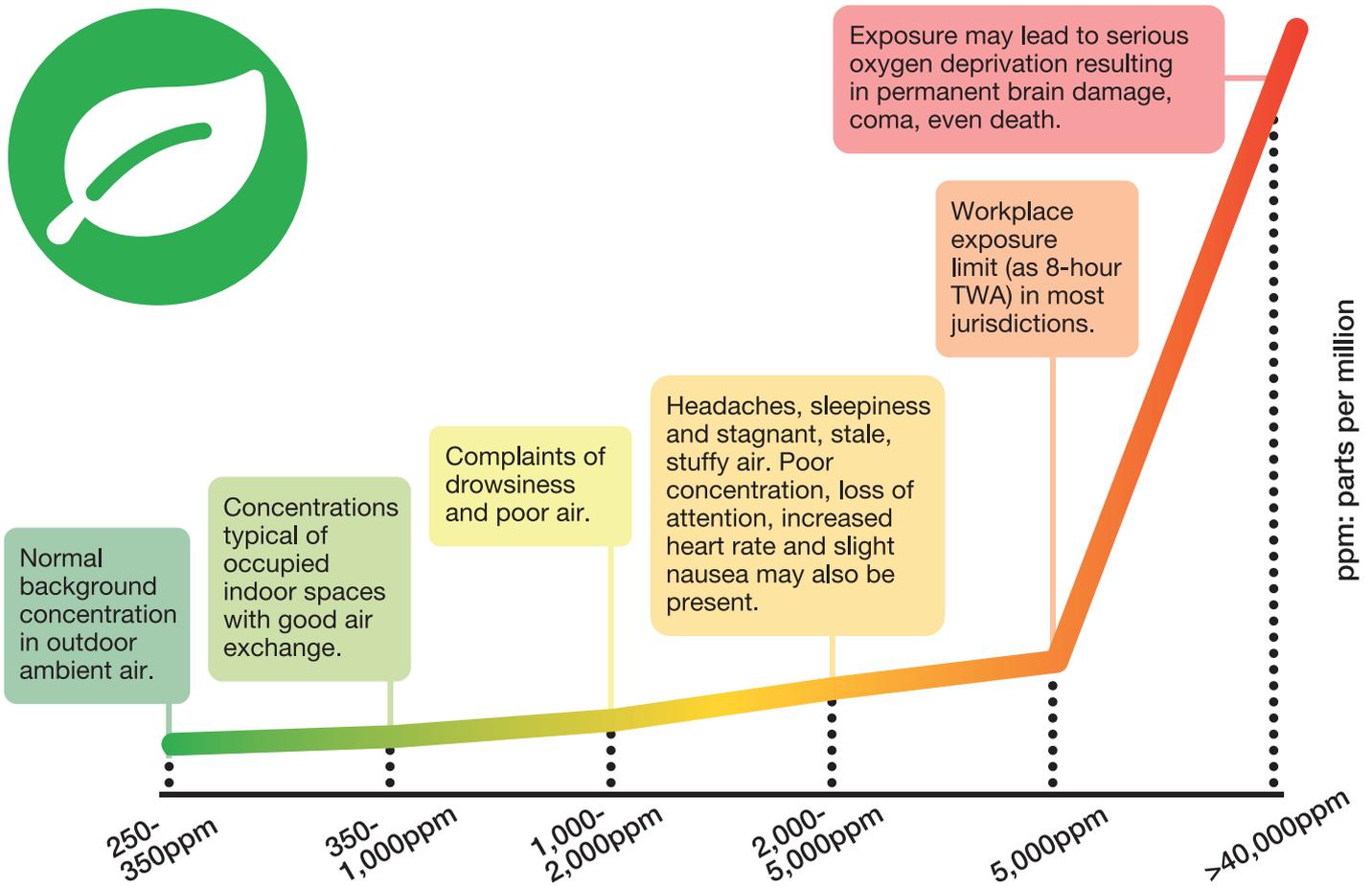
feeling stuffy - which can mistakenly be put down to high temperatures. In these instances increased energy usage is expended on cooling via air con systems and the unnecessary creation of additional greenhouse gas emissions in the atmosphere. For example, closer monitoring of the CO2 levels during the study revealed that fan speeds could be significantly decreased - by up to 50% - without adversely affecting the CO2 levels in the workspace.

Importantly this misconception also limits the amount of fresh air that is introduced into offices and other workspaces. This is especially pressing, when coupled with research showing that UK office workers only spend a maximum of fifteen minutes outside in addition to their commutes[2].

For example meeting rooms, which are often sealed and occupied for a prolonged period of time can reach up to 3000ppm CO2[3] - impacting concentration and productivity levels.

This becomes increasingly problematic as CO2 levels are not recorded with enough granularity by traditional building management systems to evaluate the effect on building occupants.





## Opening a Window to Productivity

Currently, UK productivity is 26.2% lower than Germany based on GDP per hour worked - and 22.8 % less than France[4]. Solving the 'productivity puzzle' is a strategic goal of both public and private sector organisations - with different variables across education and industry under consideration for creating improvements. Despite 10 years of tactics to help close the gap, this is the first time environmental factors have been considered.

NATS is the UK's leading air traffic control provider, it handles 2.5 million flights a year. They took part in the study with a UK facility management company to better understand how the environmental conditions within administrative areas of their corporate offices impacted employee performance.

This latest project undertaken by this facility management company and NATS is the culmination of a number of human performance and satisfaction studies over the past four years, resulting in an increase from a 44% to 58% aggregate score in perceived productivity among their staff[5].

### On the findings ZiggyTec's co-founder Kieran Murphy said:

*"The time is here now when corporate companies are looking at creating the most productive environment for their employees especially when it comes to CO2 levels in the workspace. These findings show us that the workplace is without doubt a place of Competitive Advantage. The solutions are not complicated and the rewards can be tremendous. Its amazing when you actually enter a workplace that monitors CO2 levels; employees are happier and we know their productivity is boosted. It's a total win-win".*

### Sean Allen, Head of Facilities Management at NATS said:

*"Taking part in this study to identify ways in which we can optimise our corporate offices has really opened our eyes to how even the smallest changes to indoor environmental quality can support productivity. I am keen to apply what we've learned by continuing to closely monitor the complex environment in which we work; making the interventions needed to support the wellbeing and performance of our people in their workplace".*

A copy of the full report - 'Improving Productivity in the Workplace: Lessons learnt and insights from the Whole Life Performance Plus project' - is available by

[CLICKING HERE](#)

[1] The WLP+ Project compiled task performance, self-assessment and business orientated metrics from the study locations and benchmarked them against interventions which adapted the environment to create a benchmark and improvement tool for offices

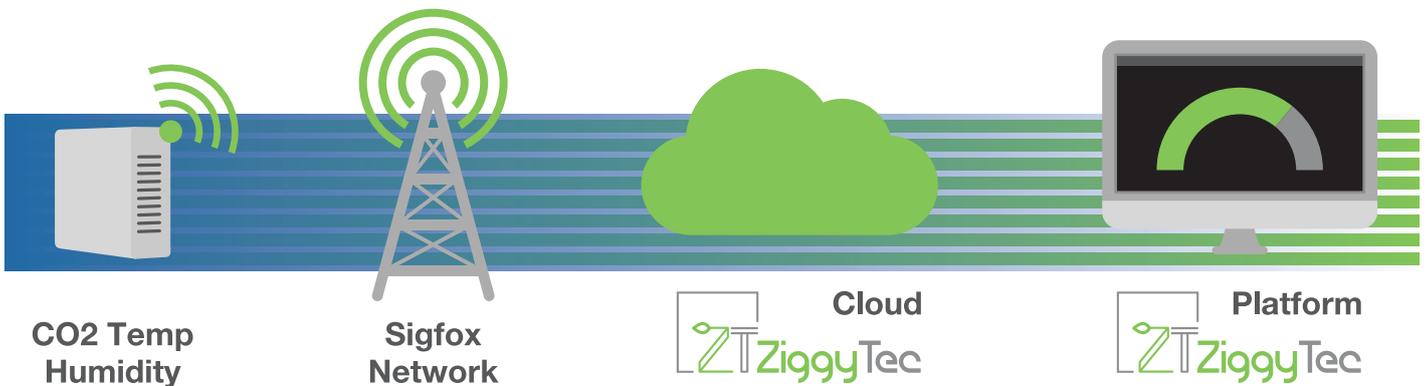
[2] Ambius Consumer Study

[3] Environmental Health Perspectives

[4] International comparisons of UK productivity (ICP), final estimates - ONS 2016

[5] Leesman Index Findings

## About ZiggyTec



**ZiggyTec Ltd** offer a highly cost-effective solution for monitoring temperature, humidity and CO2 levels in your workspace. Our Internet of Things (IoT) sensors are highly accurate and battery operated (battery life of 7 years) which means, they are very easy to install.

ZiggyTec charge a flat fee of £15/€15 per measuring point per month (temp, humidity and CO2 counts as 1 measuring point) and this includes all data gathering, communications and cloud platform licenses. There are no hidden fees, installation fees and no network operator costs.



**Ireland Office**  
Liffey Trust Building  
1 North Wall Ave  
Dublin D01 YX93  
Ireland

**UK Office**  
102 Keslake Road  
London NW6 6DG  
UK

Tel: +353 (0)1 4433147

Tel: +44 (0)20 3239 9301

[info@ziggytec.com](mailto:info@ziggytec.com)  
[www.ziggytec.com](http://www.ziggytec.com)

CO2 Levels

Study