

IMPROVED WORKPLACE PRODUCTIVITY THROUGH IMPROVED INDOOR AIR QUALITY – WHO IS GOING TO BUY IT?

A J Geens BEng CEng MCIBSE O Griffiths *

School of the Built Environment, University of Glamorgan, Pontypridd, UK

**Count Strandman Ltd, London, UK*

This paper reports on the findings of a research exercise that has aimed to crystallise the current state of the Indoor Air Quality debate across a broad spectrum of the industry. The findings are discussed and conclusions drawn on whether there is evidence that the industry's efforts towards delivering good Indoor Air Quality is well received by building owners and operators in appreciable numbers.

1.0 Introduction

The recent attempts to improve Indoor Air Quality Standards^[1,2] have met with much resistance, and for the time being have been put on hold. The proposals in both cases were based largely on the Guidelines proposed in the European Concerted Action Report No 11^[3]. This report identified that the occupants in a space have two requirements of the air in that space. First, the health risk of breathing the air should be negligible. Secondly, the air should be perceived to be fresh and pleasant rather than stale and stuffy, in other words acceptable from an odour and irritation perspective, or comfortable to the nose. The report goes on to suggest that the ventilation rates that will satisfy these requirements can be identified separately, and that the higher value should be used in design. In a number of worked examples, it is shown that in non-industrial buildings, the ventilation rates to satisfy the second requirement, comfort, are significantly higher than for health. The figures derived suggest that whilst current standards, properly applied, will satisfy the health requirements of the occupants, it is unlikely that comfort requirements are being met.

The reasons behind the failure to adopt these Guidelines as a Standard may be numerous, but a CIBSE/BRE working group^[4] identified particular concerns over the availability of information on indoor sources of pollution, and the energy implications of the high ventilation rates required. A number of designers in the group felt that the approach was wrong. They felt, with good justification that the building should be designed to be low polluting, rather than designing for a ventilation system that will combat whatever pollution the building was producing.

Earlier work by the University of Glamorgan ^[5] has involved the development of innovative techniques to widen the application of Displacement Ventilation, which with its greater ventilation efficiency reduces the actual ventilation rates required for a particular situation, and would go some way towards countering the energy concerns voiced above. Problems have been experienced in finding commercial applications because the comfort objective remains simply a guideline, and as long as legal (health) requirements are met, most organisations will be satisfied. The commercial reality is that a decision to spend on better indoor air quality must be justified with a financial benefit, such as improved productivity, and in this respect, it is probably the Human Resources Director that needs to be won over as an ally.

2.0 The Link between Indoor Air Quality and Workplace Productivity

The link between indoor air quality and productivity in the workplace falls into the “known but not proven” category. It may seem logical that good indoor air quality is required for a satisfied and therefore productive workforce. Lorsch And Abdou^[6] report that there is general agreement that improved working (environmental) conditions tend to increase productivity, but that determining a quantitative relationship between environment and productivity has proved difficult. Some researchers claim to have reliably measured improvements of 10% or more, whilst others have presented data showing that no relationship exists. The reality is that it is difficult to define indoor air quality, as identified in the introduction above, and even harder to measure. The use of CO₂ sensors to control ventilation rates suggests that CO₂ levels are an indication of air quality, but they do not guarantee good air quality. Abdou and Lorsch^[7] have identified that in many case studies occupants have been dissatisfied with their environment even though physical measurements indicated that current standards are being met. The factors that influence workplace productivity are even more difficult to pin down. Clements-Croome^[8] categorises these factors as “Human Factors” and “System Factors”. Briefly, human factors of an individual are well being, ability to perform, motivation, job satisfaction and technical competence. System factors that influence these human factors are indoor environment, occupation, organisation, personal circumstances, facilities and services and outdoor environment. He argues that the significance of good air quality as part of the indoor environment factor is high. He reports on the conclusions of several researchers that the cost of providing good air quality is quickly paid back with very modest improvements in productivity.

The problem therefore would seem to be in demonstrating that improvements in productivity can be achieved. The problem is twofold. Firstly how is the productivity to be measured? The many possibilities for measuring workplace productivity have been summarised by an ASHRAE workshop on Indoor Air Quality^[6] and include such measures as:

- Absence from work, or workstation, unavailability on the telephone
- Health costs, including sick leave, accidents, injuries
- Observed downtime, interruptions

- Judgements of work quality
- Self assessment of productivity
- Task measures such as speed, slips, accuracy

Secondly it needs to be established that any measured improvement observed is due to the air quality improvements obtained rather than one or more of the many other factors influencing productivity. The need to use control groups to do this results in large scale, time consuming, and hence expensive research.

In the course of interviewing researchers and practitioners for this project, another factor was introduced that may have an influence on workplace productivity. In response to HSE advice on preventing worker exposure to passive smoking, in many offices smoking is completely banned, with no provision made for smokers^[9], such as well ventilated, segregated smoking rooms. This may be detrimental to productivity, as smokers are now leaving the building to smoke. They may be resentful of this, and non-smokers may resent the time they spend away smoking. Conversely, the health benefits, in terms of fewer sick leaves taken, from helping staff to stop smoking may outweigh this. Also, people may have been less productive whilst smoking at their workplace in the past anyway. Further work is proposed in this area.

3.0 Workplace Productivity Survey

The initial literature review for this project has shown that there is much research activity being directed at demonstrating the link between indoor air quality and workplace productivity. Much of this research has demonstrated that this linkage is positive. Before embarking on further research into innovative air supply techniques, it was decided to find out if the non-research community had any faith in what the researchers were telling them, or even if they were aware of the problem in the first place.

The objectives of the survey were:

- i) to support the case for investment in a substantial research project as identified in 2.0 above
- ii) to prompt an organisation to become involved in a research project either as a funder, a host site participant or both.

The vehicle for this survey was the journal of the Institute of Human Resource Management. The rationale for this was that it might be Human Resource Managers in companies who would have an interest in optimising the performance of their staff, and be in a position to influence expenditure to achieve this. A questionnaire titled 'Are you concerned about workplace productivity' was produced and enclosed with the November/December 1997 issue of the Human Resources Magazine, (circulation 33,000).

The questionnaire asked questions in 3 areas:

- 1 **The Workplace and Productivity**
 - do you measure productivity?
 - how much do various factors influence productivity if at all?

- 2 **Air Quality in the Working environment**
 - how good is your air quality?
 - would improved air quality improve productivity?
 - what ventilation system do you have?
 - does ventilation cause or cure workplace illnesses
 - what influences decisions on investing in air quality systems?

- 3 **Air Quality and Smoking Policy**
 - does your smoking policy allow smoking anywhere within the building?
 - has your smoking policy had any effect on workplace productivity?

The response rate for this survey was 0.1%. 34 completed questionnaires were returned.

3.1 Survey review

This response rate was very disappointing in view of the objectives outlined in 3.0 above, and illustrates the difficulty involved in obtaining information. The design of the questionnaire may have been poor. Although based on a successful formula for earlier surveys, it may not have been right for this target group. It may simply have arrived at the wrong time when something else was urgently attracting the attention of the target population.

Although the response rate was very low, the nature of the response group, primarily personnel managers, should be of some interest. For example, in response to the question, "By how much do you believe that improvements to your air quality could affect productivity", no one responded "not at all". The response was as follows:

Productivity improved by less than 10%	14
Productivity improved between 10 and 20%	10
Productivity improved by more than 20%	7

These responses indicate that there is a perceived a link between indoor air quality and productivity that needs to be developed into a demonstrable link.

4.0 Licensed Trade Management Survey Results

As part of an on-going exercise, in collaboration with the Association of Licensed Multiple Retailers, Count Strandman Ltd have been monitoring the response of the licensed retail trade to the Government's 1992 target of 80% of outlets having a smoking policy^[10]. Of 730 questionnaires mailed to organisations, 93 were returned from a wide range of retailers. As well as general questions relating to whether smoking policies had been implemented, a number of questions were directed at ventilation issues. The respondents were asked how many of their buildings had good ventilation, what action their companies had taken to improve indoor air quality in the last 2 years, and what action they planned to take in the near future. The responses are shown in figures 1-3 below.

Fig 1 How many of your outlets have good ventilation (> 30m³/hr/person)?

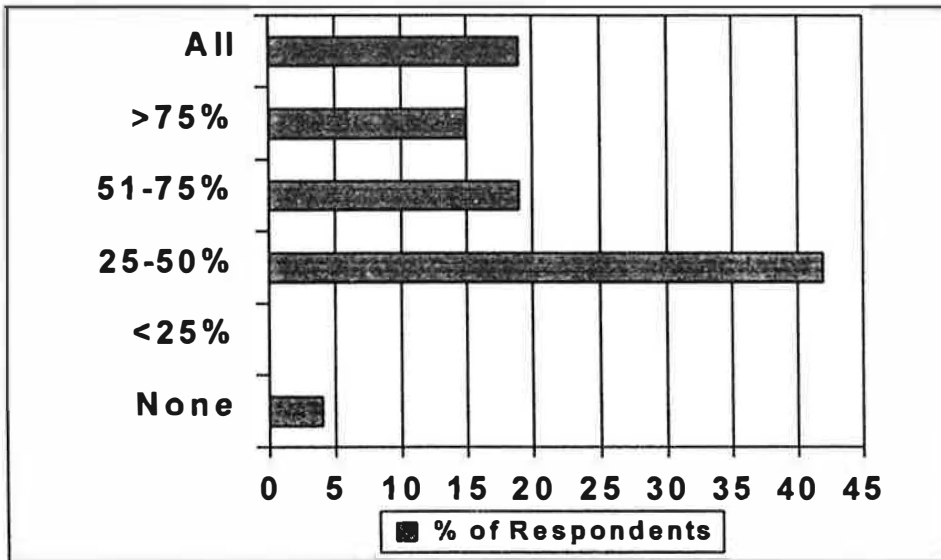


Fig 2 What action has your company taken to improve air quality in the last 2 years?

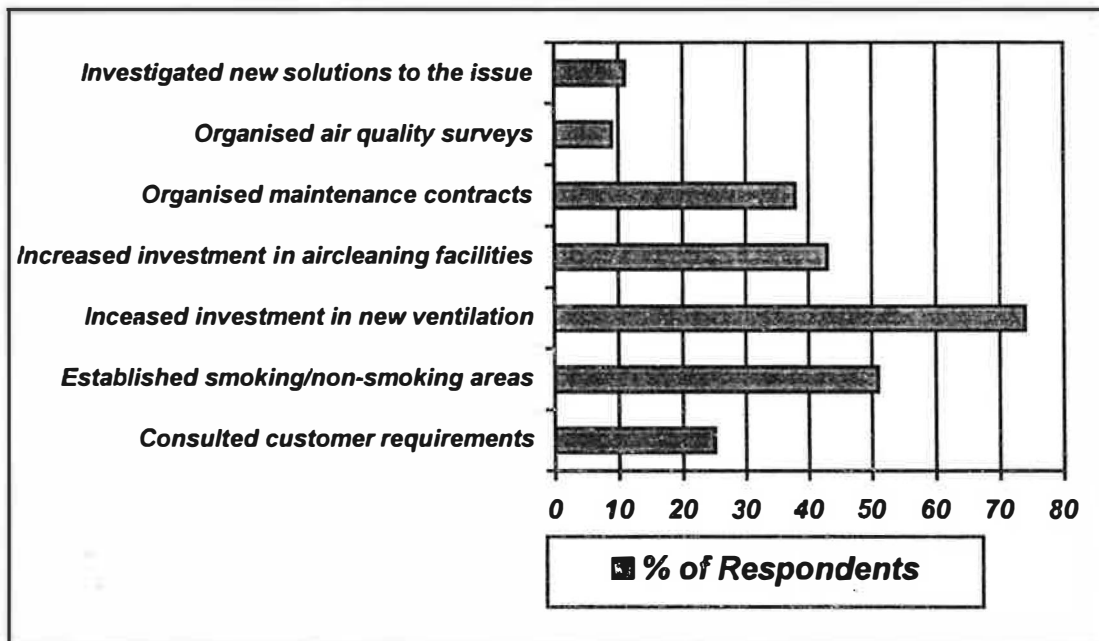
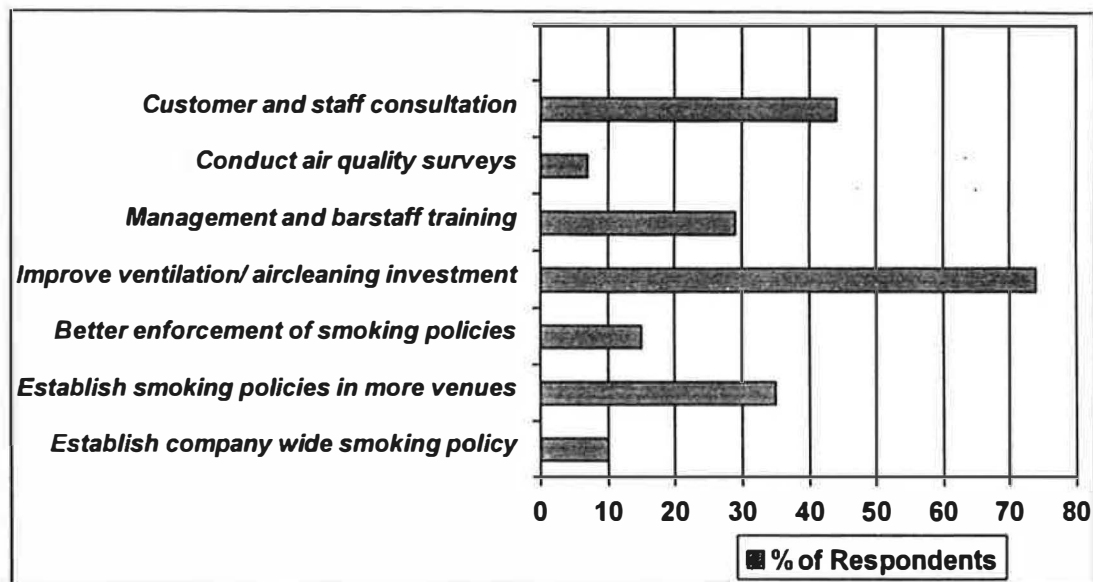


Fig 3 What action is your company planning in the next 12 months?



These findings demonstrate that there is an industry sector that is interested in indoor air quality and are actually taking advice and investing in ventilation systems. A small-scale study of four public houses has indicated an increase in sales, particularly food sales, following the installation of ventilation systems. For these four cases the average investment was £2,323. The average increased profit from increased food and drink sales was £218 giving an average payback of 10.7 weeks

5.0 Conclusions

Presented with the concerns over indoor air quality within the industry this study has noted that:

- * Engineers and researchers have been largely unsuccessful in persuading building operators that there are solutions to the problem, (or even that there is a problem).
- * Government has been largely unsuccessful in persuading the operators of licensed premises that if they are to be allowed to have smokers in their buildings, they must improve the air quality in the buildings.
- * By identifying a measurable financial benefit a lay person in engineering terms, with no statutory authority, has influenced operators of licensed premises to invest in ventilation systems.

If the efforts of researchers into indoor air quality measures are to be valued, they need to be linked to stronger issues, than at present. It may be that concerns over passive smoking in the workplace versus exiling smokers to the perils of the external environment can be used as the leverage to achieve better working environments for everyone. At some point in the future, this issue may have passed us by, either because smoking has been made illegal, or because everyone has given up anyway, and we will still be trying to persuade building operators of the merits of investing in better ventilation systems.

References

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