

SPORTS RESPIRATORY PROTECTION

INDUSTRIAL DESIGN RESEARCH SYNOPSIS

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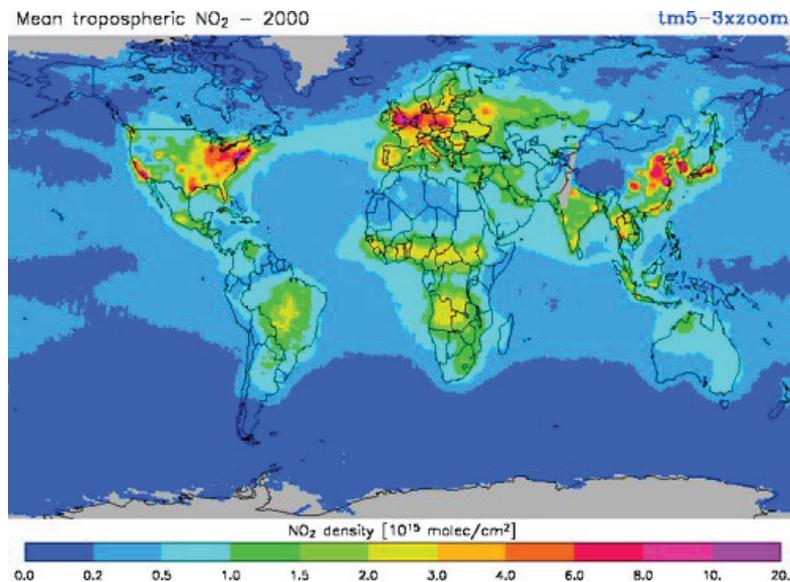
The project focus is personal protection equipment (PPE) products for respiratory protection from hazardous gases and particles while exercising in highly polluted urban environments.

Rapid increases in air pollution are a major global concern due to damage to the environment and to our health. The benefits of personal respiratory protection for both safety and performance purposes is a growing awareness, especially among athletes and the increasing numbers of bicycle commuters. The three driving issues are the environment, health and performance.

Environment

Few locations in the world are unaffected by air pollution, however pollution levels are greater in areas of condensed population. *Figure one* of tropospheric NO₂ levels shows that large urban cities of high population have the lowest air quality.

Figure 1.



Health

Air pollution causes approximately two million premature deaths globally per year (World Health Organisation, 2008). The two types of air pollution are particles and gases (Respro, date unknown). Carbon monoxide from vehicle emissions is the largest source of 'gas' pollution, causing approximately 400 premature deaths in New Zealand each year (Fisher et al 2002).

Performance

During strenuous activity people breathe up to 10 to 20 times more air, increasing the intake of toxins (Kaufman 2009 & Reynolds, date unknown) and most people breathe through the mouth, by passing the natural filtering system in the nose. Therefore the health risks are greater during physical activity.

Growing environmental awareness and rising fuel costs have rapidly increased the number of bicycle commuters worldwide. At the Beijing 2008 Olympics the United States Olympic committee provided athletes and cyclists with respiration masks for personal safety and performance due to low air quality (Macur 2008 & Leibenluft, 2008) (Figure 2 and 3). As a result the numbers of athletes and cyclists wearing masks is expected to increase (Macur 2008).

Common problems causing discomfort with many face masks currently on the market are pinching, pressure points, leaks at the bridge of the nose and full face mask claustrophobia (Holanda et al. 2009).

Figure 2 and 3.



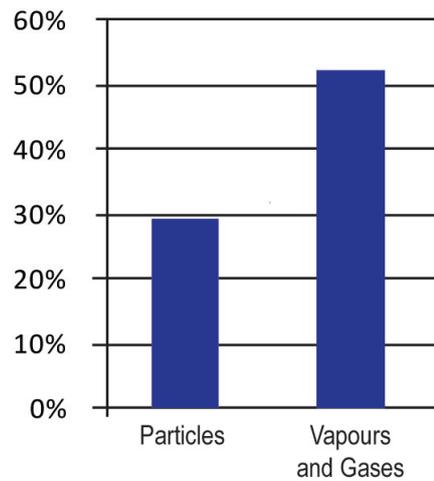
Personal Feedback

Personal survey feedback from approximately 50 frequent exercisers in different locations shows that approximately 78 % are concerned by increasing air pollution and 35% of responders felt physical health effects during or after exercising.

Participants were of a wide demographic from an age range of 14 to 50+ years from 14 different countries, as diverse as the UK, Egypt and Shanghai. The majority of casual runners have no concern for low air quality however 100% of participants concerned are frequent cyclists, mostly bicycle commuters. 39% of participants have worn or do wear a mask for respiratory protection.

Factors preventing the use of respiratory protection are self image (67%), discomfort and reduced performance.

Figure 4. Survey results show that users perceive vapours and gases to be a greater concern than particle dust.



Personal Exploration

To gain a greater understanding of the performance and experience aspects of exercising with respiratory protection I went for a run wearing my 3M organic vapour mask on a busy Saturday afternoon (Figure 5). I experienced discomfort due to pressure points and impaired vision due to the mask pushing upwards under the eyes but no breathing restrictions. The extra weight on the face is an unusual sensation, reducing the 'freedom' emotion usually felt while running, to a slight claustrophobic level. There were numerous 'odd' glances and similar to the majority of survey responses, I also felt more uncomfortable about my appearance than physical discomfort.

Figure 5.



Design Challenges

- Drinking and communicating with a mask on.
- A comfortable seal for a large demographic of users.
- Does not reduce performance.
- And the greatest challenge, creating a product that people want to wear!

References

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Illustration list

- Fig. 1 JRC CCU - Climate change unit (2000). Mean tropospheric NO₂ - 2000. *TM5 (Global Chemistry Transport Model)*. Retrieved 10 March 2010 from http://ccu.jrc.ec.europa.eu/tm5_sci.php
- Fig. 2 Bull, A. In 'Guardian UK' (2008). Olympics: US cyclists apologise for wearing face masks at airport. *Beijing countdown*. *Guardian*, 6th August 2008. Retrieved via web on 9 March 2010 from <http://www.guardian.co.uk/sport/2008/aug/06/olympics20084>
- Fig. 3 Leibenluft, J (2008). Will our respirators help our olympic athletes - only if they can put them on correctly. *Slate*. Retrieved 30 March 2010 from <http://www.slate.com/id/2196988/>.