



Respiratory protection's

Generation Next: *21st century challenges demand safety and comfort*

By ROBERT COLEMAN and
ROBERT BRUNELL

As recently as the year 2000, very little preparation and planning had been done for public response to events like pandemics, natural disasters and terrorist attacks within the U.S. A short ten years later, governments at all levels (city, state and federal) have plans of action and stockpiles of supplies ready to respond. Furthermore, the public is well aware of dangers such as:

- 🦠 Pandemics including SARS, Avian Flu, N1H1, etc.,
- 🌪️ Natural disasters such as hurricanes, floods, tornados and, recently, a volcano where the after-effects of contamination and pollution have become a major public health concern,

🦱 Terrorist attacks including September 11 and subsequent anthrax attacks where exposure to the after-effects were dangerous, not only for first responders but also for whole communities.

Public awareness

These major events have led to an increase in public safety awareness, particularly in the area of respiratory hygiene. While the general public typically associates respirators with medical, industrial and first responder safety, when asked about types of respirators and key features, their answer is likely to be less informed.

The World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC) and the National

Institute for Occupational Safety and Health (NIOSH) have made great inroads in public awareness and education over the past ten years. NIOSH provides a listing of approved respirators that filter out harmful particles. The NIOSH protocol for approval is ninety-five percent with further differentiation based on levels of resistance to aerosolized oil.

The following table outlines the key NIOSH designations with additional information available on the CDC's website (www.cdc.gov/niosh):

Keeping up with public concern

For many years the respirator industry has offered a wide range of products suited for various applications, but all based on the traditional cup "form and function" masks.

While there is a benefit to tried and proven technology, 21st century exposure threats are evolving, and respirator technology must also evolve as risks become more defined.

There are several traditional types of respirators which add protection, albeit sometimes at the expense of comfort. A few of the more common types are:

1. Cupped – This is the traditional design recognized by most users. It has a firm shape and stays away from the mouth for some comfort but also has a distinctive peripheral weld that is not flexible and makes face fitting difficult for a wide range of users. Because the cupped mask becomes somewhat heated and difficult to use for extended periods, many companies now offer cupped masks with exhalation valves.

2. Vertical flat-fold mask – Because it does not have the firm peripheral weld around the edges, the fold flat may offer a better fit for a wider variation of facial sizes. It offers convenience of storage and carrying, but is often closer to the mouth, subject to collapsing when worn and can become heated.

3. “Duck bill” or “beak” mask – Similar to the flat-fold masks but with a horizontal fold, this design attempts to keep the mask away from the user’s mouth for additional comfort. Because it is often produced from thin materials, it is subject to collapse and is a poor fit in some cases.

4. Cartridge mask – This mask comes in half and full facepiece and is generally used in industrial safety situations where there are significant contaminants in the air.

5. Air supply hood – This is suitable for users with facial hair or other factors that make it difficult to achieve proper fit requirements with other masks.

6. Air supply facepiece – This design provides constant flow of controlled (clean) air to the user.

Class	Description
N95	Filters at least 95% of airborne particles. Not resistant to oil.
N99	Filters at least 99% of airborne particles. Not resistant to oil.
N100	Filters at least 99.97% of airborne particles. Not resistant to oil.
R95	Filters at least 95% of airborne particles. Somewhat resistant to oil.
P95	Filters at least 95% of airborne particles. Strongly resistant to oil.
P99	Filters at least 99% of airborne particles. Strongly resistant to oil.
P100	Filters at least 99.97% of airborne particles. Strongly resistant to oil.

7. Powered air purifying respirators – Air flows through a filter to the face piece to provide positive flow.

Many of the traditional respirators used in medical and industrial environments with lower concentration levels of contaminants (items 1-3 above) provide a baseline of protection but often do not fit properly, do not hold their shape or are uncomfortable enough that people are reluctant to wear them very long, if at all. To help ensure a proper fit, regulations require fit testing and other means of ensuring that the respirator masks function properly (OSHA 1910.134). Even when fit testing has been done and a proper fit has been determined, if the mask is uncomfortable, the user still may not use the respirator properly or may not use it for extended periods of time, sacrificing safety for convenience and comfort. Air supply hoods can compensate for fit testing but are much more expensive.

What should the next generation of respirators do?

The next generation of respirators should provide safety, superior function and comfort while ensuring proper seal and breathability. Key characteristics of

the next generation of respirators for medical and lower level industrial use are:

- Ability to fit a wide range of face shapes and sizes,
- Lower breathing resistance that is noticeable to the user,
- Higher filtration efficiency without added weight,
- Lighter weight for increased comfort,
- Appropriate distance from the mouth to reduce the risk of collapse yet sufficient flexibility to provide a

proper seal and fit,

- Soft material touching the face to enhance comfort and fit,
- Low tension head bands,
- Adjustable nose wire,
- Ability to speak clearly without being muffled.

Ten years into the new millennium, the next generation of respirators is finally emerging. Several major manufacturers will soon be releasing their next generation of products to a market that has been waiting — and is now demanding — both comfort and safety.

Robert Coleman is senior vice president of the Gerson Company and **Robert Brunell** is director of new product development at the Gerson Company. Together the authors have a substantial number of years experience in the safety industry. At the Gerson Company, both are responsible for the development of the next generation respirator product lines and the growth of the Gerson Company Safety Division. Robert Coleman can be reached at RColeman@Gersonco.com and Robert Brunell can be reached at BBrunell@Gersonco.com. They may also be reached at (508) 947-4000.