

# Respirator

I chose a respirator as the subject for my senior project because I saw a great deal of opportunity for improvement on existing products. Current respirators are uncomfortable, bulky, and not very sexy.

As an industrial design student I spent many hours in a respirator during the modeling process, so I had a good starting point in my research. My goal was to create a respirator that more naturally echoes the contours of the human head, and make the filter cartridges less wasteful.

My respirator design was featured on many web sites, including Gizmodo and Yanko Design.

Spring 2009





I created a questionnaire based on my market research and distributed it to people I knew who wore a respirator at work across a broad cross section of work environments. I then used their answers to determine what factors are most important to respirator users. This included factors such as price, comfort, waste, ease of use, and style.



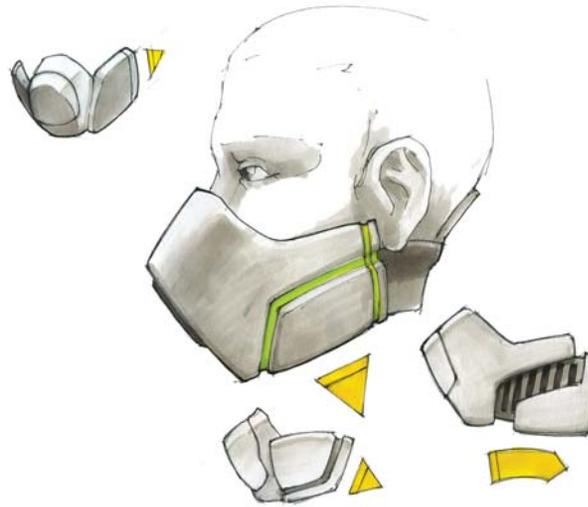
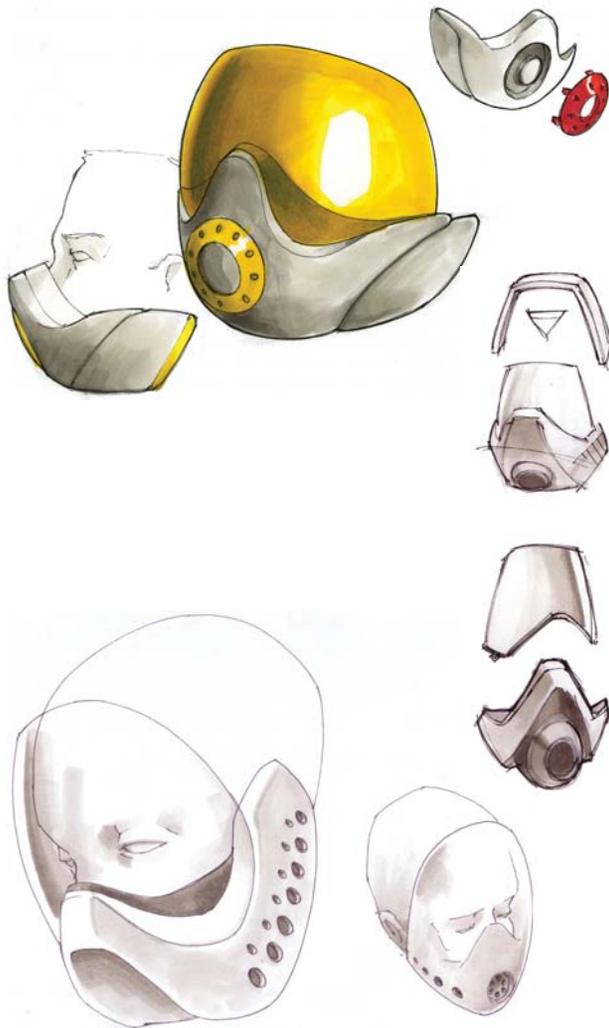
While there are many different brands of respirator on the market, 3M is the best selling. Existing models can block the bottom third of your vision, which can be very dangerous. They do not fit comfortably with safety glasses and tend to fog them up, compounding visibility issues. The filter descriptions are confusing making the correct purchase difficult, and the strap system is awkward to manage. Users wear respirators for widely varying periods, from a few minutes to all day, so it has to be comfortable and easy to wear. They are also frequently worn in conjunction with safety glasses and hearing protection, but many aren't compatible.



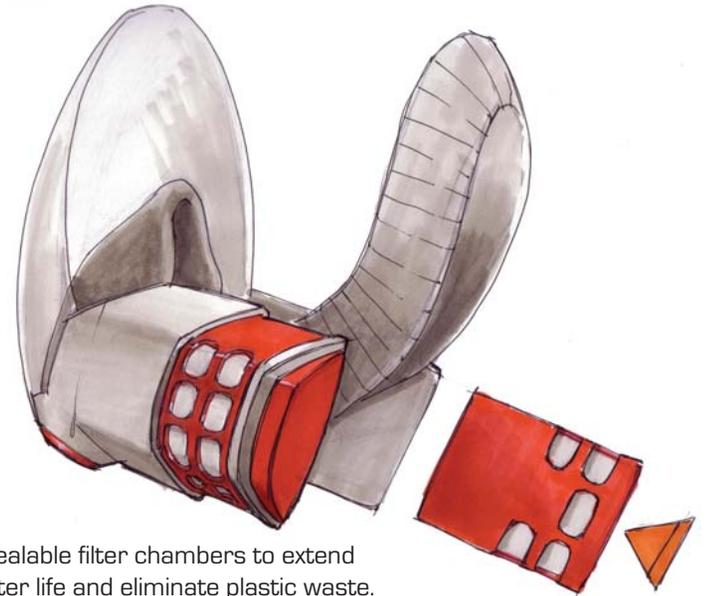
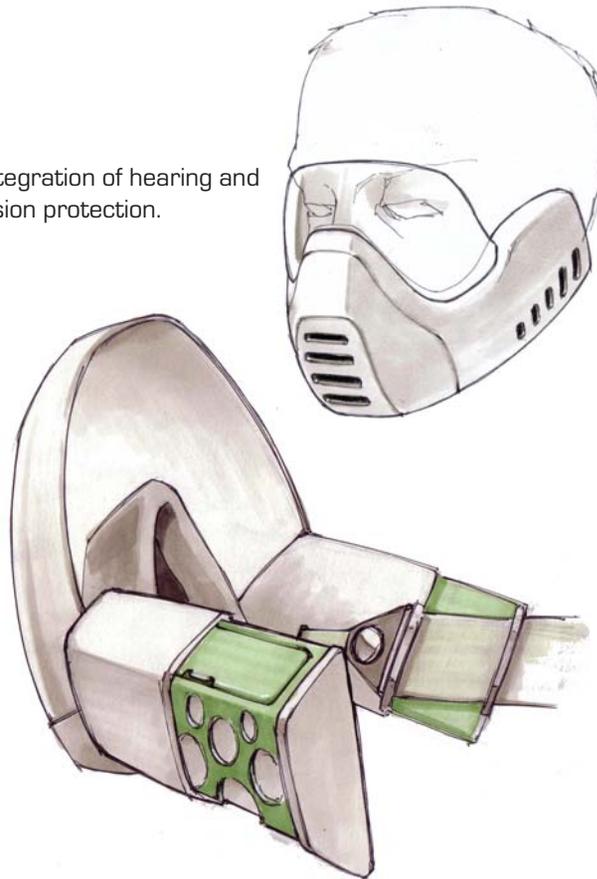
During interviews users brought up points and made suggestions that I hadn't included in the questionnaire. One concern was markings to distinguish your respirator from a coworkers, since no one wants to share such a personal item. Another was storage, one user was using the original packaging. Graffiti artists have a secondary use for their respirator; hiding their identity when out on a mission.

# Ideation

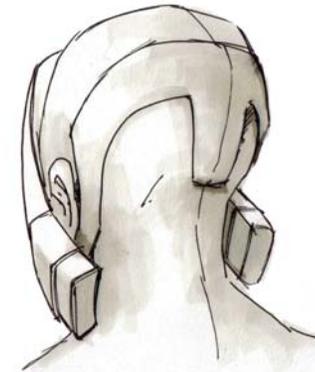
My design took cues from automotive engineering. The air intakes of sports cars are designed to optimise airflow while protecting sensitive engine components from dust. I was also influenced by nature. The placement and structure of the gills of fish provides an efficient model for a filtering solution.



Integration of hearing and vision protection.



Sealable filter chambers to extend filter life and eliminate plastic waste.



Filters are moved out of the wearer's field of vision, and the visor style eye shield won't fog.





To figure out how the respirator's filter chambers would open and close I built a proof of concept prototype (left). It was not very comfortable or pretty, but it did work, so I moved on to form studies in urethane foam. I built a more linear, sculptural form (lower left) and decide it wasn't the look I wanted. My second attempt hit closer to the mark with a more compact and tech look (below). Now that I had a sense for the volume I began CAD modeling.



# CAD Model



Integrated safety shield  
snaps into place

Filter chambers snap  
closed when not in use  
by internal elastic band



Comfortable, one-piece  
strap is easy to put on

Filter located out of the  
way of hearing and vision



## Final Model

The final model was different from the CAD model in a few minor ways. Most notably the exhale valve took on a form that echoed the filter vents. To ensure a good fit I made a mold from my head to build the model from, which changed the dimensions from the CAD model. For production I would average a range of measurements to adjust the fit for a wider percentile of users. I vacuum-molded the visor from a hand model.

