Intelligent Dust Mask

This product is a dust mask. The mask uses inflatable materials, silicone, to set up a user interaction based on increased pressure. As the filter begins to fill up, the user experiences a slight increase in pressure to tell the user that the filter needs to be changed and gives them awareness.

Individual work
Industrial Design
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BACKGROUND

Pneumoconiosis is a very serious chronic disease that cannot be cured at present. Based on my research, there are nearly one million people suffer from pneumoconiosis in China and the government spends a large amount of money on them, which brings great pressure to the society. The death rate of the disease is high to 30 percent. Furthermore, patients suffer from serious breathe difficulties and they will lose working ability finally.

1 million

90 thousand

30 percent

Therefore, decreasing the number of pneumoconiosis patients is an extremely serious problem.

METHODS

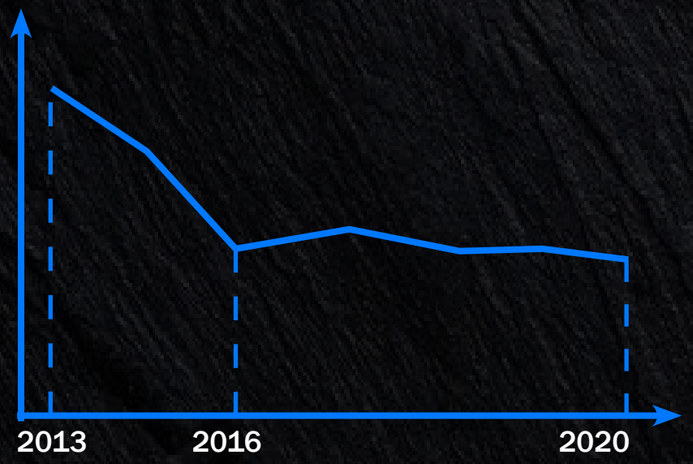
For pneumoconiosis, there are two main stages, prevention and treatment.

For prevention, the most effective way is using protection equipments, such as dust mask, ventilation equipments.

At present, pneumoconiosis cannot be cured, so the main treatment is still remission.

Based on above analysis, the most effective way to download the population of patient is wearing protection equipment.

RESEARCH



DATA ANALYSIS

The number of patients has dropped significantly since 2013, when the national governance policy was introduced. However, after 2016, the patients number holds in a high level.

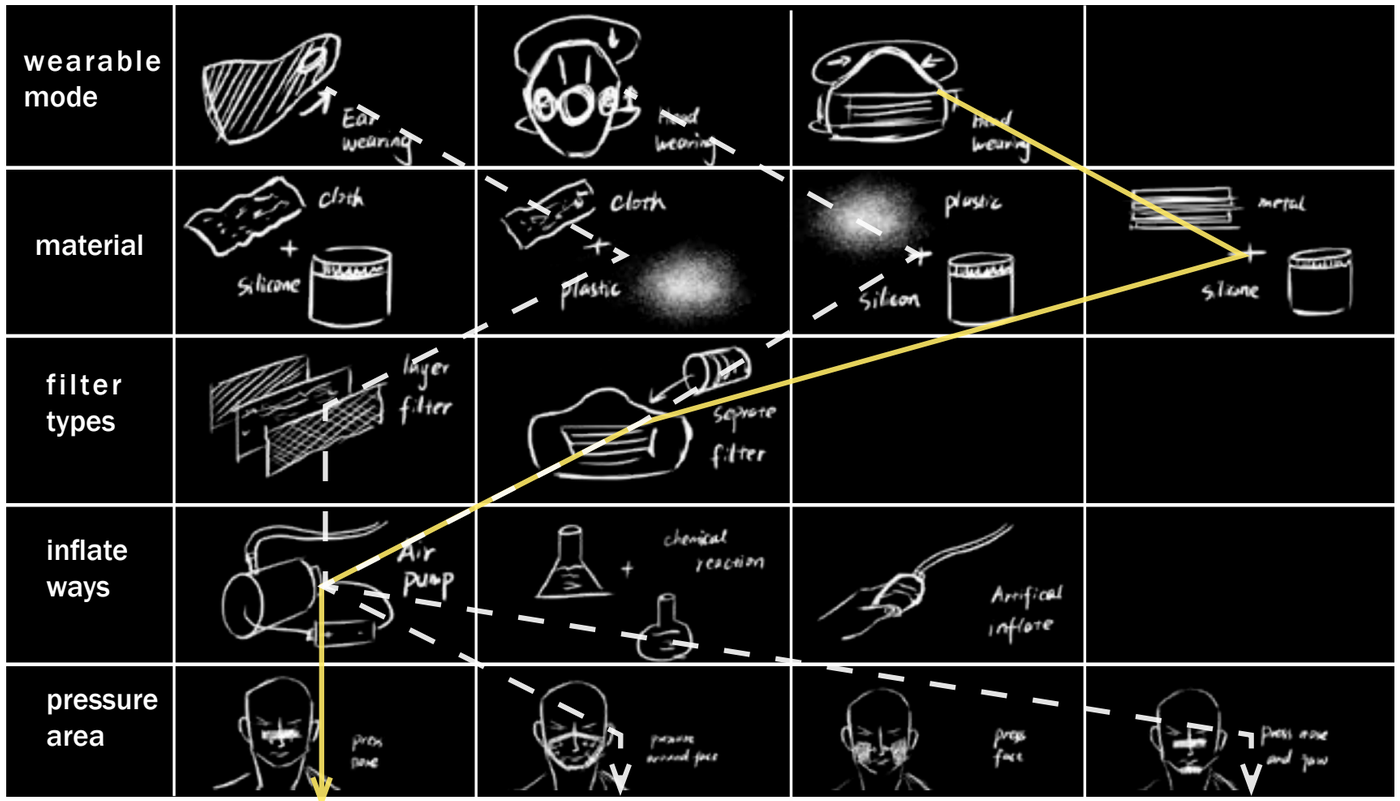
FILED RESEARCH AND INTERVIEW

According to my research, with the development of the technology and awareness, most workers know they need to wear masks. However, most of them don't know they need to change masks termly and when they need to change masks.

DESIGN DIRECTION

Different from other products, this mask builds up a soft alarming system which reminds people when they need to change their masks' filters.

BRAINSTORMING AND MIND MAP

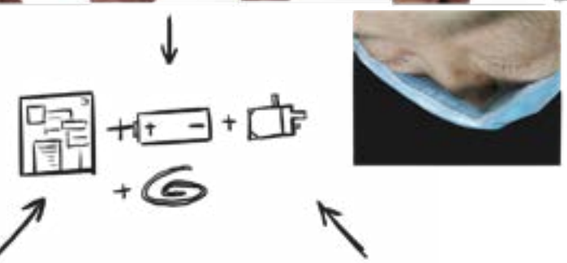


Solution 1 **Solution 2** **Solution3**

TECHNOLOGY TEST

1

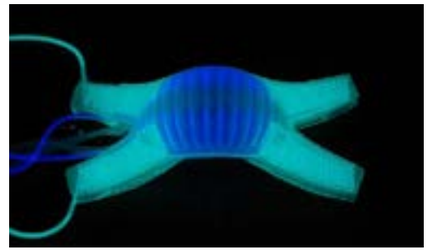
Based on the test, this technology can't be used as there are gaps between the mask and face.



2

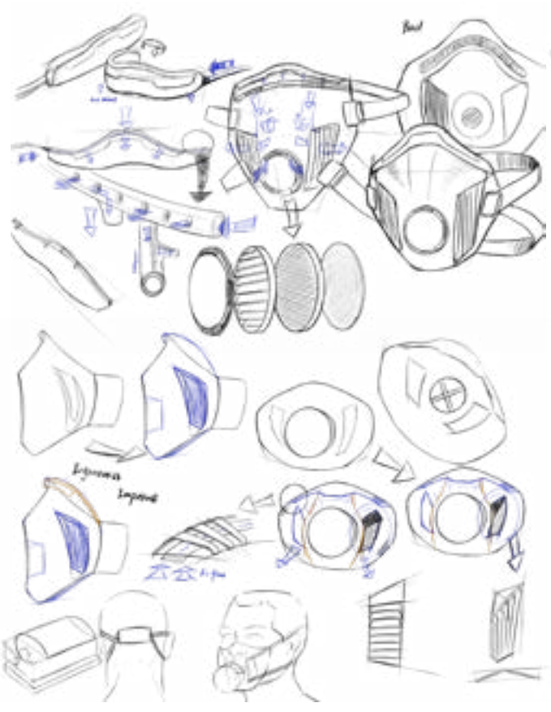
The shrinkage of paper-like materials also creates a gap between the face and the mask.

3



Silicone can adhere to the skin better and it is more soft and comfortable.

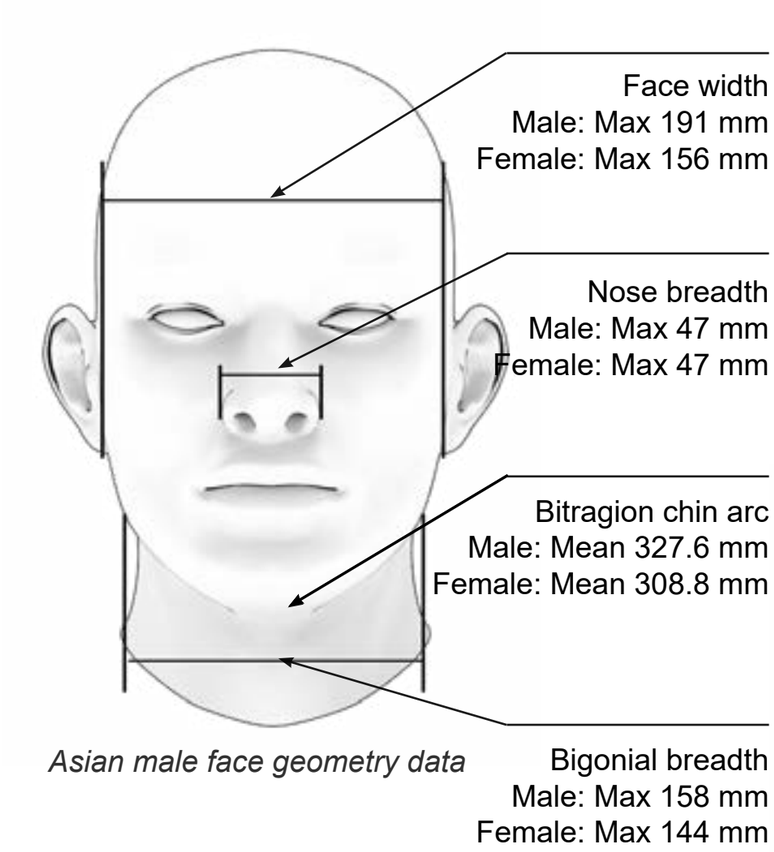
SKETCH



ERGONOMICS TEST

ANTHROPOMETRY

Based on the anthropometry data, some dimension can be defined.



Asian male face geometry data

The key data are highlight above. They can help me define some dimensions and also think where I need to add adjustor.

USER FEEDBACK TEST

As I mentioned before, the product will convey information through providing pressure. So, the volume of the gas and the range of pressure need to be defined.

For experiment results, there is no obvious different feeling between gas volume from 0 milliliter to 20 milliliters. Around 40 milliliters, users can feel the pressure. For 60 milliliters gas, people are uncomfortable, so the range of gas volume is from 40 to 50 milliliters.

SHAPE TEST

Based on the silicone prototype, some users feel pressure on the nose. So, I increase the angle of the surface.

Then I improve the design, and make a lot of prototype to define the most comfortable shape and dimension. Finally, the model of the mask is defined.

MATERIAL COMBINATION

Copper wires are used in 3-millimeter thickness and 1.5-millimeter thickness samples. The results of the test show that this idea can work well, however, one defect is that the wire is easy to move.

I use aluminum sheet and tin sheet in the experiment. Tin is softer and easier to model then aluminum.

PRODUCT DETAILS AND AIRFLOW

This page shows details of the mask and exploded views of main parts. It also shows the airflow when people wear the mask

FINAL DESIGN AND STORY BOARD

This page shows how people wear the mask and in what situation, the alarming system will work.