

# DEVELOPING COST EFFECTIVE AND COMFORTABLE PPE SUITS

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**ABSTRACT:** Ever since the break out of the global pandemic took place, many equipment and devices came into action for keeping the people safe from the virus. Since then, a personal protective kit is considered as one of the most important tools as it helps a person to stay safe around an infected person. Various health workers and doctors are using it to treat the infected patients. Apart from this it's also being used as an equipment to travel safely across the world.

PPE kits gained so much importance but also faced criticism as it is claimed to be really uncomfortable throughout its use. This is mainly because the user is unable to have access to meals, feel terribly hot and also have to experience long gruelling shifts. This makes it really hectic for them to use it for long continuous hours.

Keeping the problems in mind, GoCovid has come up with ideas to solve few problems experienced such as suffocation and dehydration. These problems are addressed by introducing the idea of cooling gel and an inlet system respectively. GoCovid has also tried to be cost efficient to make the product more affordable for the customers.

**Keywords-** Covid19; PPE kits; Pandemic; Virus; Dehydration; Suffocation; Masks.

## I. INTRODUCTION

Personal protective equipment (PPE) were designed for the protection of the wearer's body from the various biohazards and airborne particulate matter. Currently, it is majorly used by only the frontline workers like the doctors and some special nurses to treat the COVID-19 patients. But these kits are causing a number of problems for the doctors while treating the patients like suffocation, dehydration and its high cost. Doctors and nurses have reported that there is zero breathability and so health workers find it impossible to wear it for long. So, we have come up with the idea of a relatively comfortable PPE suit solving as many of the reported complaints as possible. GoCovid has the mission to provide the best possible services by providing an enhanced version of the PPE kit. Today, the world is fighting against COVID 19 and we plan to join this fight by manufacturing skin friendly kits which will offer support to the frontline workers in ways like keeping them hydrated and cool throughout their working hours at the lowest cost possible. GoCovid endeavours to deliver an eco-friendly kit which addresses the problem of disposing and also become an international supplier. GoCovid strives to provides its customers "the safety and comfort they deserve."

## II. OBJECTIVE

GoCovid has the mission to provide the best possible services by manufacturing skin friendly kits which will offer support to the frontline workers in ways like **keeping them cool throughout their working hours** at the lowest cost possible. **We have incorporated a cooling gel at some places of the body (the parts which get heated up quickly and cause a lot of sweating) within the layers of the PPE suit.**

## III. PRODUCT DESIGN

The product design was finalized keeping in mind the customer preferences and after analysing the results we got from the survey questionnaire.

GoCovid PPE KIT like any conventional kit will consist of the following-

1. Face shield.
2. Disposable Gloves.
3. Safety goggles.
4. Disposable shoe cover.
5. Disposable N95 mask.
6. Full body gown.

But there are some additional features added to it. The figures below show a 3-dimensional representation of these additional features.

### A. Layerings

Figure 1 shows a full body gown, disposable gloves and shoe covers. The white projection coming out from the right hand side is to give an insight of the inner layers of the kit.

As seen in figure 2, extreme left shows the outermost layer. It is the **protective plastic covering** in blue. This layer is the most important and will keep the users body protected and also prohibit their body's contact with the outer environment.

Next layer seen (middle layer) is the cooling gel memory foam. **Cooling gel memory foam is a specially formulated memory foam that contains gel beads designed to help absorb heat and draw it away.** It is found in many sleeping pillows and sleeping masks. Additionally, the cellular structure of the memory foam itself is optimized for **increased airflow**

over traditional formulation. By increasing airflow, and helping reduce temperatures by actively pulling heat away from the body, cooling gel memory foam helps deliver the ideal environment.

The innermost layer will be made of comfortable clothing. This layer is to avoid the direct contact of the cooling gel with the user's body and increase the comfort level of the PPE kit.

It's been taken care of that all the materials used are recyclable or at least semi-recyclable. Thus, our product will be environmentally friendly as well.

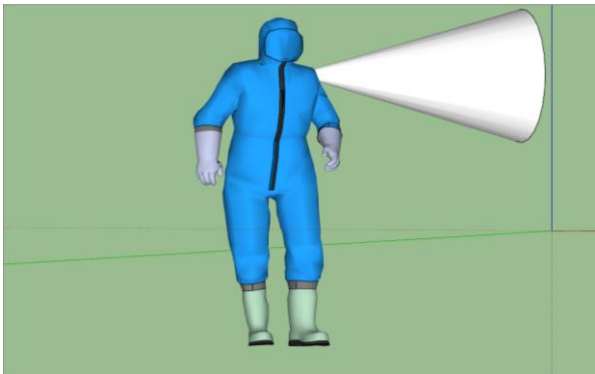


Fig. 1. Front view of the PPE suit.

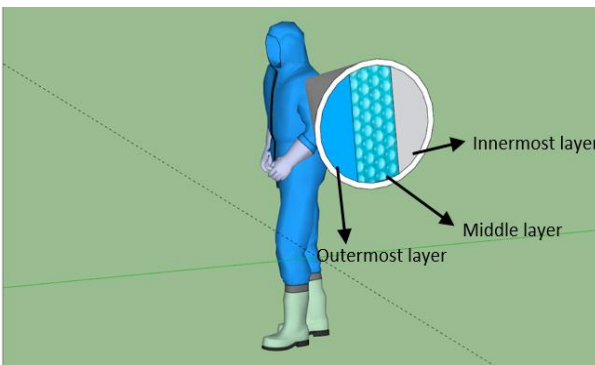


Fig. 2. Side view PPE suit showing the layerings.

#### IV. BUSINESS MODEL CANVAS

The key features of the proposed application system are highlighted below in fig. 4

##### A. Key Partners

Our main suppliers would be various companies manufacturing the basic raw materials required for manufacturing disposable N95 masks, face shields, goggles, protective gowns, and disposable shoe covers. This will hence include online retailers and wholesale markets. Our main partners would include various investment companies, hospitals, private companies, health sectors and NGOs.

##### B. Key Activities

Our company helps doctors, health workers and other customers by providing them the comfort unavailable in the conventional PPE kits. To make our customers aware of our facilities we will build efficient distribution channels in order to reach out to maximum numbers of audience and also improve the sales and marketing policy. We will also provide the facilities of online purchase from our company on different online shopping sites as well as from our own website. Our company will also engage in conducting workshops at various places in order to explain the working of our product.

##### C. Key Resources

1. Polypropylene fabric for good breathability.
2. Seam sealing machines to achieve waterproofness.
3. Plastic and rubber (for the production of goggles and mask and gloves, rubber boots).
4. Cooling gel for establishing the cooling effect.
5. Presence of a sterile ambience to carry out the manufacture of the product.

##### D. Value Propositions

The first thing that doctors, health workers and other customers are concerned with when it comes to PPE kits is 'safety'. Keeping that in mind and other problems faced by the users, GoCovid brings a specialized PPE kit with new additional features. The PPE kit provided by our company will have an innovative feature of providing a cooling sensation to our customers making them feel comfortable through their long work schedules thus increasing the quality of their service. Also the material used will be more skin friendly and not like the conventional PPE kits that doctors have termed as 'plastic bags'.

##### E. Customer Relationships

After sale services will be provided (warranty and guarantee). Moreover, regular market testing and customer feedback will be updated with the public demands. After use, proper disposal of the PPE kits would be done and assured by the company. We will try to conduct fundraising operations to generate funds and minimize the cost. Places in India with a desperate need would be supplied with a certain amount of free PPE kits. For a better understanding on the usage of our PPE kits, videos with detailed instruction would be shared with our customers.

### F. Channels

We would like to sell our product through direct sales. We would also like to have channels with many other websites such as NGOs so that people around the entire country can make use of it from anywhere. We would also reach out to our customers through online platforms like instagram, whatsapp and LinkedIn.

### G. Customer Segments

We target to help various Health care managers, Health workers providing patient care, Various workers working on the airport, Public traveling for emergency, Airport staff (flight attendants), Politicians and NGO workers. Apart from this, people in desperate need in rural areas for PPE kits would be given PPE kits at subsidised cost depending on their situation.

### H. Cost Structure

-Initially the company is going to manufacture 20 PPE kits. Each PPE kit will cost rupees 650

-Total cost= 20\*650= Rupees 13000

-8 free samples will be given to various hospitals for testing the comfort level.

Expenditure= Rupees 3250

-1 PPE kit will be used in the Workshop that will be conducted to explain the usage

-Expenditure=Rupees 650

### R&D

-Cost of commodities = Rupees 5000

-Research and lab work=lump sum

### I. Revenue streams

There are several revenue streams for our company. Our product sale being the major one, we also have online advertisements on apps and websites. Fundings from various NGOs, private companies and friends also include.

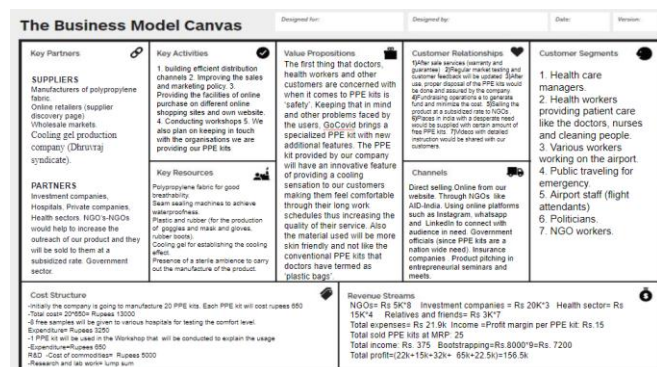


Fig. 4. Business Model Canvas of GoCovid.

### V. Results

A survey was conducted among selected people and we got responses from some doctors and other health workers who are experiencing the situation staying on the frontline. These are some of the questions and the results that we got.

1. The first question was what are the major problems faced while using the present PPE kit. According to the pie chart below, we had to find a solution for both the two problems of 'feeling hot and exhausted' and 'getting dehydrated'. (Fig. 5.)

What are the major problems faced while using the kit ?

39 responses

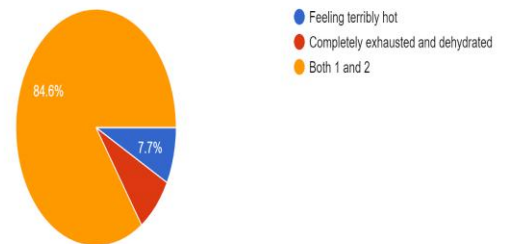


Fig. 5.

2. We had two solutions for the heating problem: (a) to have a comparatively heavier(by 0.5kg) but permanent cooling system in different parts of the body, or, (b) to have a detachable belt with a cooling system in it to be worn around the waist. A majority went with the permanent cooling mechanism. So we incorporated a cooling gel within the layers of the PPE suits at specific positions to provide an overall cooling sensation. (Fig. 6)

Would you prefer a) PPE suit comparatively heavy (by 0.5 kg) but with a permanent cooling system all over the body, or, b) PPE suit with det...g system but only confined to one part of the body?

39 responses

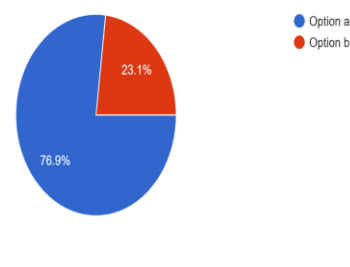


Fig. 6.

3. We asked for a preferred cost range and the cost structure of the PPE kits have been framed accordingly keeping in mind the facilities that our product has over the existing conventional ones. (Fig. 7)

What do you think should be the cost of our PPE kit?  
 39 responses

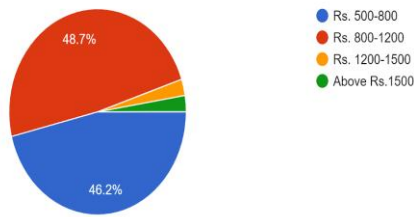


Fig. 7.

4. According to the following pie charts, it was seen that most of them thought that disposing of the PPE kit is a serious problem and they wanted the company to take the responsibility of disposing of the kit. So GoCovid will take care of this. After collecting the PPE kits from the hospitals, airports and other customers, our company will be handing it over to other private enterprises which are involved in recycling and reusing medical wastes.

According to you, is disposing the PPE kit a serious problem?  
 37 responses

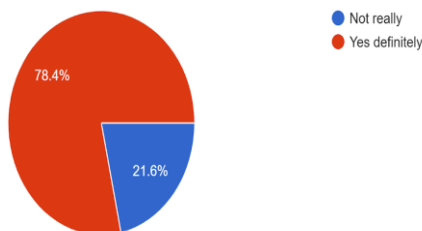


Fig. 8.

Should the company take responsibility for disposing the kits once used?  
 39 responses

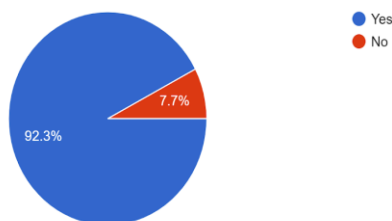


Fig. 9.

## VI. WEBSITE SCREENSHOTS



Fig. 10. First page of the GoCovid website for better customer services and customer feedback.

## VII. CONCLUSION

PPE kits were a savior for people as it protected them from the infectious covid-19. But with its growing importance and use, problems regarding its comfort level increased. Therefore, our main aim was to bring improvement ideas in the current PPE kits being used to help contribute in the fight of covid-19. After reviewing many articles and research papers, we couldn't find the idea of using cooling gel foam or an inlet system in the suits. Therefore, GoCovid hopes to bring relief in the sufferings of our covid-19 fighters.

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