

Personal Protective Equipment in India:

A ₹7000 Cr

(around USD 1 Bn)

industry in the making



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Personal Protective Equipment (PPE) in India:

A ₹ 7000 crore industry in the making

The COVID-19 pandemic is the defining global health crisis that the world is currently facing. The virus has spread all over the world, and the number of cases is rising every single day as governments work to slow its spread. The global response to the unfolding COVID-19 crisis saw countries implementing countrywide or partial lockdowns, announcement of stimulus packages and relief measures to tackle the harsh economic impact of the pandemic. The virus also overwhelmed the global production capacity of PPE which is the most critical product to protect the front-line health workers and other responders. Surging demand for PPE kits along with disrupted global supply chain amid the Covid-19 pandemic was putting lives at risk.

India moved quickly, implementing a nationwide lockdown with the goal of flattening the curve and using the time to plan resource responses, adequately. The Prime Minister assured the country that there are ample reserves of medicines, PPE kits, food and other essential goods.

India realized the critical role of PPE in combating this pandemic as early as March, wherein Ministry of Textiles stepped to lead the assessment of availability of all protective wears for our frontline health workers.

“ We will make sure that enough protection equipments are provided so that doctors are safe while treating patients. The government will also ensure that training of paramedical staff and nurses is conducted. ”

said Prime Minister Narendra Modi



What followed this, is a remarkable journey of collaboration between governments at the central and state levels, industries and workers to revamp existing production lines to manufacture a completely unknown product, from scratch.

From 0, India now produces nearly **4.5 lakh** PPE kits every single day.

In 60 days, the PPE industry in India has witnessed **56 times growth**.

PPE PRODUCTION IN INDIA PER DAY



This is a testimony to the government of India's concerted efforts of improving domestic manufacturing capacity on the back of its industrious manufacturing sector at

such challenging times. Before we proceed further, we must understand what PPE exactly is.

WHAT IS PERSONAL PROTECTIVE EQUIPMENT (PPE)?

Personal Protective Equipment (PPEs) are protective gears designed to safeguard the health of workers by minimizing the exposure to a biological agent. PPEs include goggles,

face-shield, masks (Surgical/N-95), gloves (surgical/examination), coverall/gowns (with or without aprons), head cover and shoe cover.

TYPES OF PPE



Industrial PPE

As employers become more concerned about the safety of their workforce resuming work post lockdown, this segment of PPE will witness an upsurge



Healthcare PPE

Its demand has gone beyond installed capacities for most products, with order backlogs ranging from 6 to 12 months globally



Consumer PPE

This segment driven by changing consumer behaviour & will continue to grow as infection control becomes the focus till we develop a vaccine to combat the pandemic

The Ministry of Health and Family Welfare released a set of guidelines for the rational use of PPE for health care workers and for others who work at various point of entries, quarantine centres, hospitals, laboratories, primary healthcare and community settings.

The guidelines emphasize the need to select the right type of PPE based on the estimated risk of contamination, the reuse of PPEs when there is a shortage and, the procedures to be followed on how to wear them.

More details in Annexure 1.

Several stakeholders played a crucial role in ramping up the production of critical products



DEFENCE RESEARCH AND DEVELOPMENT ORGANISATION (DRDO)

DRDO best known for its self-developed line of nuclear capable missiles that has given India its strategic deterrence, reoriented itself to mobilize its existing skills and resources to create spin off technologies to help in the production of critical products. With the support of the science fraternity, several products to combat the pandemic including ventilators, PPE kits, large area sanitization solutions and Covid-19 sample collection

kiosks have been developed. PPE kits are sent to DRDO for testing by HLL Lifecare, which is the government's nodal agency for medical procurement. Pressure testing of these kits are done at six different levels and only after passing such stringent quality tests, they are sent for distribution. DRDO has approved several testing centres across the country.

For more details on the laboratories, refer to Annexure 2.



THE SOUTH INDIA TEXTILE RESEARCH ASSOCIATION (SITRA), COIMBATORE

SITRA is the centre of excellence for medical textiles at Coimbatore, Tamil Nadu. Established in the year 1956, SITRA is governed by a council of administration consisting of member representatives of the industry, government and scientists. SITRA is sponsored by the industry and is supported by the Ministry of Textiles.

SITRA spearheaded the testing for body coveralls as early as March by upgrading itself with PPE testing facility.

"We have two classifications – single use and reusable. Both are widely acceptable in today's scenario because disposal of single use is becoming very complicated. So, reusables are also slowly coming in."

Prakash Vasudevan, Director, South Indian Textile Research Association (SITRA) said in a webinar organised by Apparel Export Promotion Council (AEPC) on PPE manufacturing under Medical Textiles

INDIA IS THE 2ND LARGEST PPE MANUFACTURER IN THE WORLD IN JUST 60 DAYS



“After receiving WHO guidelines on PPE, in less than a month’s time, 14 manufacturers cleared rigorous technical testing and started manufacturing indigenous PPEs for our frontline health workers.”

said Minister of Textiles Smriti Zubin Irani in a tweet.

On March 1, two days before the World Health Organization (WHO) spoke of a global shortage of PPE, India had no PPE coveralls suitable for Covid-19. India was a complete import dependent as far as PPE kits are concerned. In January, there were only 2.75 lakh PPE kits available, owing to timely import.

Currently, India has about 15.96 lakh PPE kits in the centre-state buffer stock and orders for another 2.22 crore PPE kits have already been placed to domestic manufacturers.

Geographically, Bengaluru, Karnataka has become a major hub for PPE coverall production in the country accounting for nearly 50 per cent production. Besides Bengaluru, PPE coveralls are also being manufactured by approved production units in Tiruppur, Chennai and Coimbatore in Tamil Nadu, Ahmedabad and Vadodara in Gujarat, Phagwara and Ludhiana in Punjab, Kusumnagar and Bhiwandi in Maharashtra, Dungarpur in Rajasthan, Kolkata, Delhi, Noida,

Gurugram and few other places. The Indian textile manufacturing industry came to the fore in this exercise, where they initially began with manufacturing of masks followed by complete PPE sets, including body coveralls, gloves, shoe covers, etc. The textile sector is gearing up to start producing these goods, which comes under the medical textiles segment, with a view to making India a hub for sourcing of PPE kits over the next few years. Production of PPE is proving to be a commercially viable product category and a saviour in this time of crisis wherein economic uncertainties loom large owing to the effects of the nationwide lockdown.

Now, the domestic production of PPE in India is being currently pegged at about 4.5 lakh PPE kits per day. This mammoth growth has been achieved owing to domestic manufacturers who rose to the occasion and helped India attain a self-sufficient status in production of PPE.

INDIA NOW HAS OVER 600 COMPANIES WHO ARE CERTIFIED TO MANUFACTURE PPE

Below is a glimpse of a few indigenous manufacturers who spearheaded the initiative:



The Trident Group is manufacturing 10,000 disinfectant masks daily and 10,000 pieces of PPE for healthcare professionals, per day. The company is distributing comprehensive hygiene kits of essentials, including soaps, sanitisers, vegetable cleaner and hand towels to people residing in rural areas. The group is also launching an exclusive 'Anti-virus' range of home linen.

"Covid-19 has changed everything. I feel nature is pressing reset button for us. We cannot overlook massive drop in the economy, but we should take this as an opportunity to restructure our communities, lifestyles and priorities."

Rajinder Gupta,
chairman of Trident Group



The Aditya Birla Group commenced production of 1 million triple-layer surgical masks and 1 lakh coverall garments with the support of the Ministry of Textiles and has allocated Rs.50 crore towards supply of 1 million N95 masks, 2,80,000 PPEs, as well as ventilators.

"Given the severity of the disruption, there is a compelling need for a multi-pronged response that includes financial and material support, healthcare assistance and community responsibility."

Rajashree Birla,
chairperson of the Aditya Birla Centre for Community Initiatives and Rural Development



Shahi Exports is making 10,000 pieces of PPE per day and will continue to increase the capacity for the same.

"We have five factories in Bangalore where about 750 workers have started making coveralls with all the required permissions. We are experienced in making water-proof clothing and have started making 8,000-10,000 suits a day."

Harish Ahuja,
managing director of
Shahi Exports



Welspun is working with the government and local authorities to seek support in manufacturing a few lakh disinfectant hand-wipe packs per week.

"From the business point of view, we have been making smart non-woven products and medium for diverse applications around safety clothing. Hence, manufacturing face masks and disinfectant wipes for combating the crisis is a natural extension for us."

BK Goenka, chairman of Welspun



JCT Mills

with its associates is manufacturing 1,000,000 protective suits in a month.

"The suit is indigenously designed, and all the raw material will also be sourced from India only."

Priya Thapar, Strategic business development director, JCT Mills



Arvind Mills has a daily capacity of producing 2,000 PPE kits per day.

"We will be making protective coveralls - protective gowns that protect the body. We have to do whatever we can in this effort."

Punit Lalbhai, Executive director of Arvind Mills



Matrix Clothing

manufactures 4,000 units of PPE per day.

"These are our efforts to help support and keep the frontline healthcare warriors safe during this pandemic."

Gautam Nair, Managing director of Matrix Clothing in a discussion with Invest India



Sure Safety (India) Ltd. has developed a first-of-its-kind reusable PPE kit.

"All the required approvals for the kits are in place, while the company is waiting for an order from the agencies to start supplies for the PPE-starved hospitals and Covid-19 care centres, where a larger number of patients are under isolation."

Nishith Dand, Managing director of Sure Safety

A cluster based approach to manufacturing PPE: Tiruppur

South India's cotton knitwear capital, Tiruppur, has geared itself to step up production as demand for PPE has brought to the fore, a Rs. 15,000 crore worth business opportunity this fiscal year. The garment cluster manufactures textiles worth Rs 60,000 crore a year for exports and domestic markets. About 200 units currently make PPE, mostly to serve needs within India. The local industry body, Tiruppur Exporters Association, has been pushing these units to improvise on products to meet global standards to make PPE manufactured in India more export oriented, in conjunction with the rising global demand. The Association estimates this to be a Rs. 10,000-15,000 crore revenue opportunity, this year alone.

"Tiruppur has a huge capacity to make PPE and medical masks. This coordinated effort with the government and initial handholding support from research wings like DRDO, and other research organization would make Tiruppur good enough to supply the PPE kits for the nation in one month's time, if it leverages its entire capacity on an emergency."

Raja M. Shanmugam, President of Tiruppur Exporters' Association in an interview with Invest India.

"According to a study, there will be domestic demand of PPE worth Rs.10,000 crore for the next one year and internationally there will be a USD 60 billion business in 2025, whereas India has done only USD 260 million so far last year."

A. Sakthivel, Chairman of Apparel Export Promotion Council (AEPC) in a webinar organised by AEPC on PPE manufacturing under medical textiles.

Further, he added that though many of the PPE products needed for frontline health workers are banned for exports currently, but once the local manufacturers meet the Indian demand, they should be allowed to export. AEPC has already submitted a request for this to the government. Sakthivel further notified that AEPC will have a separate cell for PPE, as its immediate task is to provide sufficient kits domestically to prevent their further imports.

"We have a vibrant Indian and global market. Please reach out to doctors who are near you and understand these medical professionals who will wear these PPE. Connect with them and understand the practical aspects of breathability, wearability issues that they are having and create garments for that. If you are able to satisfy that customer then the world is at our feet."

K. S. Sundararaman, Chairman of Indian Technical Textiles Association (ITTA) in a webinar organised by AEPC on PPE manufacturing under medical textiles.

Efficient response and farsightedness of the Indian Railways & Indian Navy: An exemplary testimony of public commitment



THE WORLD'S 4TH LARGEST RAILWAY NETWORK, TO MANUFACTURE PPE

The pandemic also saw the Indian Railways, a treasured public utility system that came to a standstill due to the lockdown, quickly convert its resources to start in-house production of PPE kits as a mission. The entire production by Jagadhari workshop in Yamunanagar district of Haryana was cleared by DRDO and over 17 workshops are committed to this exercise.

With the specification for the PPE kits, the resources and the material suppliers in place, over 6 lakh masks were produced as of 9th April and the mission aims to continue producing minimum three sets per sewing

machine per hour to meet 50 per cent of the PPE requirements of the country.

"On the forefront to protect those on the frontline from measuring to cutting & stitching, railways staff works with precision to make PPE. Aiding medical fraternity with protective gear, railways is committed to support India's fight against COVID-19."

Piyush Goyal,
Minister of Railways and Commerce & Industry, Government of India.



THE WORLD'S 5TH LARGEST NAVY, DESIGNS PPE TO FIGHT COVID-19

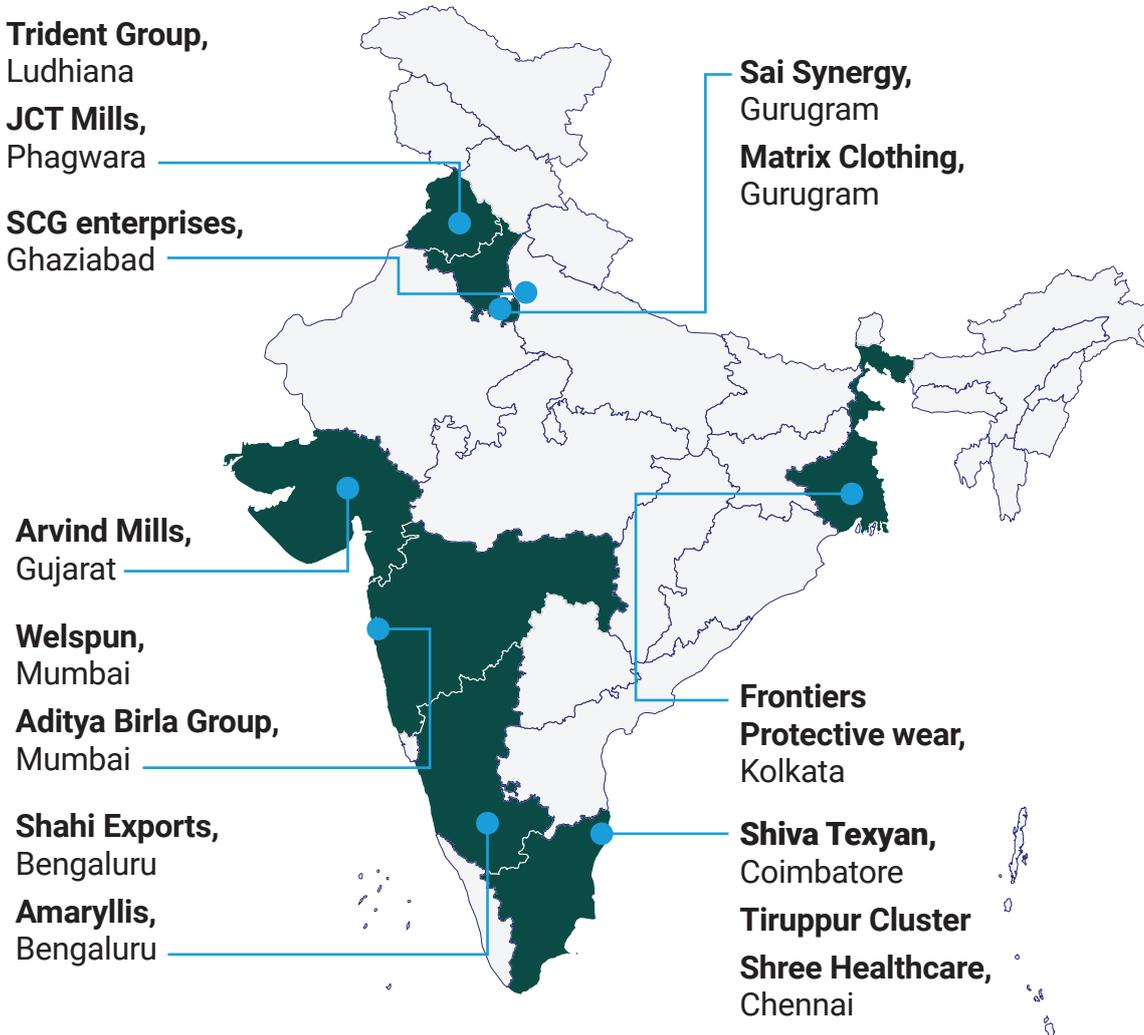
Duly contributing its bit in the fight against COVID-19, the Indian Navy is ready to help the industry to mass PPE kits. A team formed by the Innovation Cell, Institute of Naval Medicine, Mumbai along with the Naval Dockyard, Mumbai collaborated to design and produce PPEs.

Tested and approved by the Institute of Nuclear Medicine and Allied Sciences (INMAS), which is a laboratory of the DRDO, the PPE is noteworthy for the innovative choice of fabric used, which gives the PPE its 'breathability' and 'penetration resistance' rendering it both comfortable and safe for the user.

"Shortage of PPE during the ongoing Covid-19 pandemic is of serious concern as it imperils, the well-being and availability of the healthcare workforce, apart from adversely impacting their security and morale. The Indian Navy has risen to this challenge of making available this critical resource in the fight against Covid-19."

Commander Vivek Madhwal
Navy spokesperson in a press briefing

Major manufacturers/clusters of PPE in India



TAPPING INTO THE GLOBAL DEMAND

As industry insights suggest, most of them see PPE as a long-term product category going ahead, as these products will be more in demand across the globe in future.

The World Health Organization (WHO) has estimated the requirement for 89 million medical masks each month along with 76 million examination gloves and 1.6 million medical goggles.

“Healthcare workers rely on PPE to protect themselves and their patients from being infected and infecting others. Without secure supply chains, the risk to healthcare workers around the world is real. Industry and governments must act quickly to boost supply, ease export restrictions and put measures in place to stop speculation and hoarding. We can’t stop COVID-19 without protecting health workers first.”

Dr. Tedros Adhanom Ghebreyesus

WHO Director-General

To meet the rising global demand, WHO estimates that industry must increase manufacturing capacity by 40 per cent.

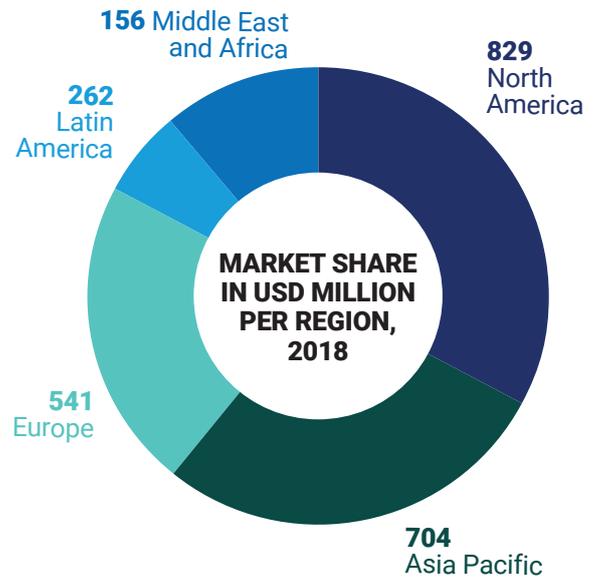
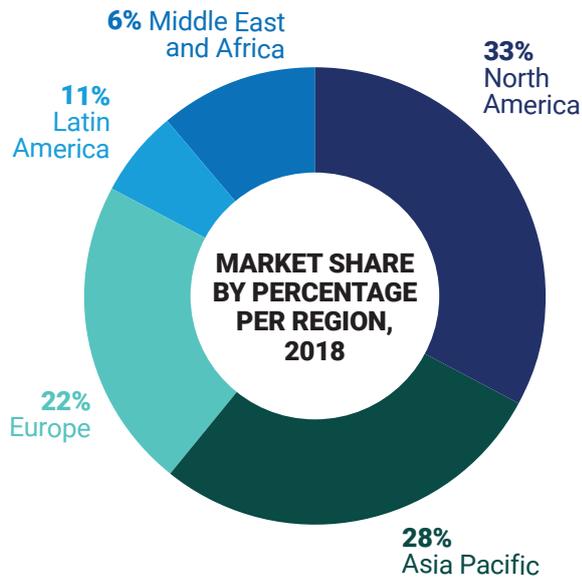
Governments should develop incentives for industry to ramp up production by easing restrictions on the export and distribution of personal protective equipment and other medical supplies.

The spread of Covid-19 has sky-rocketed the global demand for PPE and China, being the largest producer of PPE kits affected in the initial stages of the outbreak, has led to massive disruption of the global supply chain. Most countries in Europe and North America rely on Asia for 60 per cent to 70 per cent of their PPE supply. Besides China, Taiwan alone makes up for 20 per cent of the supply of face masks, while other countries with PPE production capacity, include India, Japan, Korea, Malaysia, Mexico, Thailand, United States (US), and several European countries.

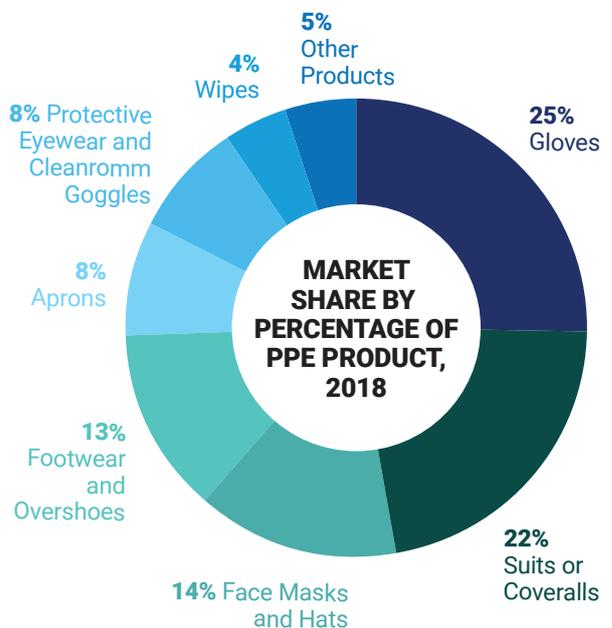
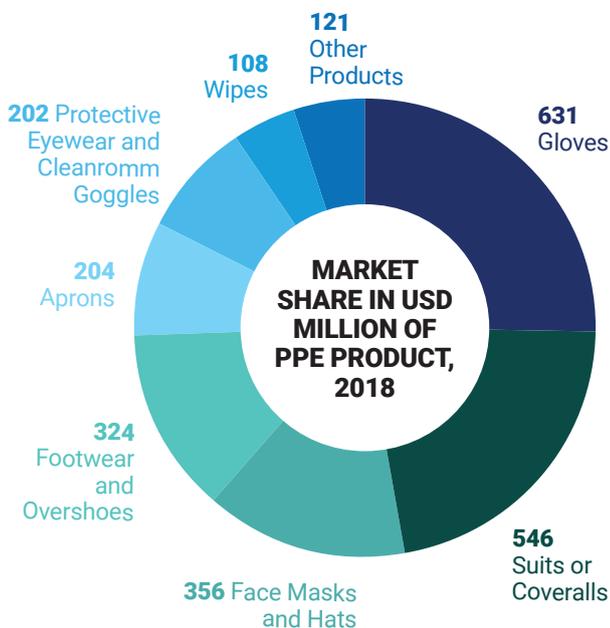
The industry is a mix of big and small players but largely dominated by established manufacturers like 3M, Ansell, DuPont. Honeywell Safety Products, Kimberly Clarke Corporation, Lakeland, Moldex-Metric and others, who are rising to the occasion to meet the global demand.

The global PPE market was valued at USD 52.7 billion in 2019 and is expected to reach USD 92.5 billion by 2025, growing at a CAGR of 8.7 per cent during 2020-2025.

By region, the US had the largest market share of 33 per cent, followed by Asia and the Pacific (28 per cent), and Europe (22 per cent) in 2018.



By product, gloves have the highest share of sales revenues at 25 per cent, followed by suits or coveralls at 22 per cent. Face masks and hats came in third with a share of 14 per cent.



THE ROAD AHEAD

As the virus ravaged even the most developed countries of the world, India has shown its superior leadership, solidarity and its mind for innovation and quick thinking. India, achieving an unrealistic goal of producing 4.5 lakh of PPE kits within three months of the virus outbreak, exemplifies its abilities, resources and commitment to its people. Over the years, India has exhibited strong links to the global community, assisting countries on several occasions in the past. India should rise to this moment and going forward, be even better primed to meet the expectations and demands of its global family.

Some key points to address some of the bottlenecks, and strengthen the supply distribution of PPE in both domestic and cross-border trade:

1. Strengthen local supply chains -

Given the potential for border closures or unanticipated delays in procuring raw materials from other states, governments both at the central as well as the state levels, must be proactive in planning to localize, regionalize and secure shorter supply lines. Government initiatives such as reducing the cost for licensing facilities and products, expediting development of high-speed manufacturing lines and other strategies to assist companies in overcoming barriers to new production, will encourage local companies to be able to shift production to making PPE equipment.

GLOBAL BEST PRACTICE:

After the SARS epidemic in 2002-2004, Singapore had stockpiled enough disposable PPE and has now benefitted as a result, during this COVID-19 crisis. All organisations/institutions/industries must look anew at stockpiling and maintaining buffer of critical supplies such as PPE in conjunction with the huge population of India.

2. Opening borders - Post Covid-19 crisis, the Indian government must re-evaluate current bilateral and multilateral trade agreements and envision new ones that enable supplies of critical components and materials. India is one among the top countries in Asia with maximum number of Free Trade Agreements (FTAs), either in operation or under negotiation or proposed. Overall, with the exception of a few agreements like South Asian Free Trade Area (SAFTA), India has been unable to fully leverage most of its FTAs. Hence, it is important that India implements the necessary measures to remove these obstacles such as high cost compliance and strict regulation that hinder the overall competitiveness of exports in the country.

3. Tie up with technology companies –

As one of the largest technology providers, India can leverage the technical know-how and build analytics to create efficient PPE supply chain management mechanisms to

monitor high demand of critical products. This will enable to predict surges in ordering, maintain optimum stock levels, limit wastage and avoid stock-outs. PPE forecasts, based on rational quantification models, can ensure the rationalization of requested supplies; assist in monitoring and controlling PPE requests from countries as well as large responders and promote a centralized request management approach.

4. Global standards to improvise indigenous PPE products – This will prove to be a benefit in the long-term to make PPE manufactured in India, more export-oriented in conjunction with the rising global demand. Gathering data by capturing ratings and reviews of PPEs and developing universal fit guidelines, will also help manufacturers focus on wearability while keeping in mind their safety and efficacy. Disposing and processing of PPE suits is damaging to the environment and with sustainability becoming increasingly important to companies, reusable PPE gears will be preferred and will see a spike in demand in the future.

5. Strengthen supply chain and optimally utilize trade finance programs for Micro, Small, and Medium-sized enterprises (MSMEs) – MSMEs are particularly vulnerable to the economic and trade impact of COVID-19. Many and most of the PPE supply manufacturers in India are also MSMEs, who may be experiencing supply chain disruptions,

and due to reduced sales and trade, facing liquidity and working capital constraints. Trade finance programs for MSMEs by multilateral organizations such as World Bank and the Asian Development Bank can help facilitate domestic and global trade by financing MSMEs in developing economies like India.

6. Leveraging India's vibrant research and development ecosystem – For greater growth and competitiveness through enhanced innovation to improve the efficacy of PPE, it is imperative that India seeks collaboration with countries who are lead innovators in this segment alongside bolstering up the research institutions. Knowledge transfer at an international level can be achieved through research partnerships, building strategic alliances with countries with whom India already has a track record of collaborative research and exploring such research in the form of virtual institutes.

GLOBAL BEST PRACTICE:

Scientists at Cornell University in the USA are working to improve the efficacy and efficiency of PPEs. The team aims to redesign the entire protective gear system to enhance protection, lower thermal burden and improve movement efficiency by merging fibre science with apparel design technologies.

ANNEXURE 1

Following are the steps taken by Government of India to procure, increase manufacturing and ensure safe distribution of PPE suits crucial in fight against COVID-19:

- 1. Additional guidelines on rational use of Personal Protective Equipment (setting approach for Health functionaries working in non-COVID areas)**
<https://www.mohfw.gov.in/pdf/AdditionalguidelinesonrationaluseofPersonalProtectiveEquipmentsettingapproachforHealthfunctionariesworkinginnonCOVIDareas.pdf>
Date: 1 May, 2020
- 2. Guidelines on rational use of Personal Protective Equipment**
<https://www.mohfw.gov.in/pdf/GuidelinesonrationaluseofPersonalProtectiveEquipment.pdf>
Date: 1 May, 2020
- 3. SITRA approved list of Fabric Manufacturers for Coveralls (2 releases)**
<http://www.ittaindia.org/?q=node/1676>
<http://www.ittaindia.org/?q=node/1677>
Date: 24 April, 2020
- 4. Quality Control Mechanism for PPE Body Coveralls Manufactured in India**
<http://www.ittaindia.org/?q=node/1671>
Date: 22 April, 2020
- 5. List of Fabric Manufacturers for making PPE body coveralls approved by SITRA**
<http://www.ittaindia.org/?q=node/1656>
Date: 15 April, 2020
- 6. Two laboratories under OFB equipped with Blood Penetration Resistance Test Facilities for Testing Body Coveralls for COVID-19**
<http://www.ittaindia.org/?q=node/1664>
Date: 11 April, 2020
- 7. Exemption from BCD and Health Cess on import-Ventilators, PPE, COVID Test Kits and Face, Surgical Masks**
<http://www.ittaindia.org/?q=node/1659>
Date: 9 April, 2020
- 8. A total of 2.94 lakh PPE coveralls have been arranged and supplied by Government of India. Negotiations are in final stages with a Chinese platform for placing an order of 60 lakh complete PPE kits**
<https://pib.gov.in/PressReleasePage.aspx?PRID=1611704>
Date: 6 April, 2020
- 9. Manufactures / Suppliers whose proto-type samples for Body Coveralls for COVID-19 have failed Laboratory Tests, are still supplying their PPE in Market**
<http://www.ittaindia.org/?q=node/1655>
Date: 6 April, 2020
- 10. PPEs are being procured from the central pool and distributed to all the States across the country**
<https://pib.gov.in/PressReleasePage.aspx?PRID=1611676>
Date: 6 April, 2020
- 11. Production capacity of coveralls required by medical personnel treating COVID-19 cases in the country has been ramped up to more than 1 lakh per day**
<https://pib.gov.in/PressReleasePage.aspx?PRID=1618389>
Date: 6 April, 2020
- 12. Minutes of the 12th meeting of Technical Textiles for Medtech Applications Sectional Committee**
<http://www.ittaindia.org/?q=node/1657>
Date: 3 April, 2020
- 13. Personal protection equipment (PPE) kits are used by medical personnel working in isolation areas and intensive care units to protect them from acquiring infections. They were not being manufactured in the country. With the prospect of huge requirement of PPEs arising in the near future, the Government of India made proactive efforts to promote their manufacturing in the country.**
<https://pib.gov.in/PressReleasePage.aspx?PRID=1609263>
Date: 30 March, 2020
- 14. The Ministry of Textiles has set up an Emergency Control Room to monitor production and supply of medical textiles (N-95 mask, Body Coveralls and meltblown fabric) which are required in connection with Covid-19.**
<https://pib.gov.in/PressReleasePage.aspx?PRID=1608188>
Date: 25 March 2020

15. **Emergency control Office in the Ministry of Textiles for monitoring and facilitating supply of PPE and other materials for Covid-19**
<http://www.ittaindia.org/?q=node/1649>
Date: 24 March 2020
16. **Minutes of meeting with MOT to assess the availability of protective wears for use of health professional in country in the wake of COVID-19**
<http://www.ittaindia.org/?q=node/1647>
Date: 18 March 2020

ANNEXURE 2

Contact details of laboratories for testing and certification of PPE coveralls for COVID-19

S. No.	Name	Contact Details	Address	Website Link
1	The South India Textile Research Association (SITRA), Coimbatore	Mr. Suresh Ram, 07530035499 Landline: 0422 - 4215349/ 4215333/ 4215334/ 2574367 Email: sitrameditech@sitra.org.in sitramailer@gmail.com coephy@sitra.org.in	Centre of Excellence for Medical Textile The South India Textile Research Association 13/37, Avinashi Road, Coimbatore Aerodrome Post Coimbatore Tamil Nadu 641014 India	http://www.sitra.org.in http://www.sitrameditech.org.in/
2	Institute of Nuclear Medicine and Allied Sciences (INMAS) DRDO, Delhi	Brig. S. K. Mazumdar 011-23905170/ 23905105/ 23905105 director@inmas.drdo.in	Rajaji Marg, Vijay Chowk Area, Central Secretariat, New Delhi, Delhi 110004	https://www.drdo.gov.in/testing-and-certification-samples-ppe-body-coverall-covid-19-inmas https://www.drdo.gov.in/labs-establishment/about-us/institute-nuclear-medicine-allied-sciences-inmas
3	Heavy Vehicles Factory, Avadi, TN	Mr. Sanjeev Kishore, Sr. General Manager; 044-26843000; hvf.ofb@nic.in	Heavy Vehicles Factory, Avadi, Chennai, Tamil Nadu 600054	https://ofb.gov.in/units/HVF
4	Small Arms Factory, Kanpur, UP	A. K. Maurya, General Manager; Landline No: 0512-2295042/46 saf.ofb@nic.in	Small Arms Factory Kalpi Road, Kanpur, Uttar Pradesh, 208009	https://ofb.gov.in/units/SAF
5	Ordnance Factory, Murdanagar, UP	Mr. D. K. Meena, Works Manager; 9462696751; 01232 228 910 ofm.ofb@nic.in	Ordnance Factory Muradnagar Ghaziabad Uttar Pradesh 201206	https://ofb.gov.in/units/OFM
6	Ordnance Factory, Kanpur, UP	Mr. A. N. Srivastava, General Manager; 0512-2295161-68/ 70; ofc.ofb@nic.in	Ordnance Factory, Kanpur, Kalpi Road, Kanpur, Uttar Pradesh 208009	https://ofb.gov.in/units/OFC
7	Ordnance Factory, Ambarnath, MH	Mr. Santosh Kumar Sinha, General Manager; 0251- 2610211, 2613132, 2613660, 2613750; ofa.ofb@nic.in	Ordnance Factory Ambarnath Ambarnath, Thane, Maharashtra 421502	https://ofb.gov.in/units/OFA
8	Metal and Steel Factory, Ishapore, WB	Mr. Sanjay Chawla, General Manager; 03325938400; msf.ofb@nic.in	Metal and Steel Factory, Ishapore PO-Nawabgunj-Ichhapur Dist - 24 Parganas (North), West Bengal 743144	https://ofb.gov.in/units/MSF

SOURCES

- https://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/india-produces-one-lakh-ppes-per-day-almost-50-production-in-bengaluru-govt/articleshow/75390610.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
- https://economictimes.indiatimes.com/news/politics-and-nation/domestic-manufacturers-soon-to-make-1-lakh-coveralls-a-day-for-frontline-workers/articleshow/75253165.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
- <https://www.tribuneindia.com/news/ludhiana/trident-to-make-10k-ppe-kits-daily-69908>
- https://economictimes.indiatimes.com/https://economictimes.indiatimes.com/industry/cons-products/garments/-textiles/welspun-to-start-making-disinfectant-wipes-masks/articleshow/75019409.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
- <https://indianexpress.com/article/coronavirus/in-indias-fight-against-covid-19-a-made-in-punjab-hazmat-armour-6336884/>
- <https://www.businesstoday.in/current/corporate/coronavirus-impact-apparels-manufacturer-arvind-mills-to-make-ppes-for-medical-workers-to-start-supply-soon/story/399509.html>
- <https://indianexpress.com/article/coronavirus/in-indias-fight-against-covid-19-a-made-in-punjab-hazmat-armour-6336884/>
- <https://www.businesstoday.in/current/corporate/coronavirus-impact-apparels-manufacturer-arvind-mills-to-make-ppes-for-medical-workers-to-start-supply-soon/story/399509.html>
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