CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

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Project Number

38530

Project Title

Seal That Mask: An Effective Solution to Improve Dust Masks

Abstract

Objectives/Goals

People use dust masks to reduce inhaling of air pollution in various parts of the world. Our objective was to measure the effectiveness of popular dust masks like N95, P95, and R95. Also our goal was to create an effective sealant for dust masks to reduce leaks.

Methods/Materials

For our test setup we put a mannequin head wearing different grade dust masks inside a closed enclosure. We used a hair dryer to blow baby powder inside the enclosure to simulate a human getting exposed to dust. Using GEARDON air quality monitor we measured the powder particle concentration that seeped through the masks. We did this by setting up a pipe behind the mask through the mouth of the mannequin#s head that carried the seeped powder particles to the monitoring device placed in a sealed bag at the other end of the pipe. We measured PM2.5, PM1.0 and PM10 particle concentration that seeped through the masks. We performed each test safely by wearing mask ourselves. We ensured every test run was performed with the same conditions, by using the same amount of powder, taking readings at every 15-second mark and cleaning all materials thoroughly. We also created a simple sealant for the dust masks using a sponge. We then performed the same experiment with every mask with the seal. We also did the same experiment using a fake beard.

Results

Our results show that P95 mask was the best in blocking dust particles. For PM2.5 particles it was better by 34% compared to N95 mask and 60% better compared to R95 mask. P95 was also better in blocking PM1.0 and PM10 particles. When we applied the seal to the masks N95 did the best. It reduced PM2.5 particle leaks by 72%. R95 mask with seal reduced leaks by 52% and P95 mask with the seal, reduced leaks by 22%. On an average sealing masks reduced leaks by 45%. Surprisingly having a beard actually helped to block leaks even without a sealant by an average of 67%.

Conclusions/Discussion

Based on our results we conclude that dust masks do reduce inhaling of air pollution particles. Our experiments did confirm that there are leaks when wearing dust masks. Our simple and inexpensive sponge sealant was able to effectively reduce dust particle leaks. Our solution will help people across the world by making dust masks more effective in fighting air pollution. We propose that dust mask manufacturers should create masks with different facial structure and features in mind to make them more effective.

Summary Statement

We reduced the leaks in the dust masks by creating a sealant there by reducing harmful pollutants from getting inhaled.

Help Received

Mrs. Christine Harada was our mentor. Our Science teacher Ms. Christina Haydt also helped us with this project. Our parents contributed to the cost of all the equipment and the masks.