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Exposure of Underground Miners to Diesel Exhaust

Comment On: MSHA-2014-0031-0047
Exposure of Underground Miners to Diesel Exhaust , Extension of Comment Period

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Comment from Brooke Henderson, NA

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General Comment

See attached file(s)

Attachments

Env Reg Essay

AB86-COMM-7

Dear,

Miner Safety and Health Administration

My name is Brooke Henderson, I am writing you this call for comment as a class project for my environmental regulations class here at West Chester University. I picked the Diesel exhaust topic because I have found it to be very interesting that the exhaust is put out into our air every day. Although it does affect us it does not hurt us as bad as it hurts the miners. Diesel exhaust was found to a carcinogen but we have no good way of protecting our miners hwo are stuck in this low air quality area for hours upon hours a day. There are new technologies that are being developed to help the miner's breathing conditions but for now they are still stuck with the old methods. The miners in the metal mines are being attacked worse because of how the interactions between the metal and the chemicals from the partial combustion are forming together and getting trapped in their lungs.

I think it is only fair that the miners get better air quality in their work places and that they should receiver great medical benefits since they are working in areas where not only lung cancers is becoming more and more dominant but also here bladder cancer is becoming common. Exhaust and dust particles need to be cleaned out of the air it is only a matter of time before these conditions leave the mines and enter into the local environment in such strong groups that the air will no longer be breathable.

This call for comment is talking about the health risk of diesel exhaust exposure for the miners. Mine safety and Health Administration (MSHA) is in the process of asking for new ways and information on controlling the diesel particulate matter (DPM) and the diesel exhaust. These measures need to be set in place because diesel exhaust has now been classified as a carcinogen. Diesel exhaust has been found to cause both major and minor health effects the worst of those being death from lung cancer. Limits have been set in the occupational field for how long miners can be exposed to the exhaust fumes and come out with minimal health effects. There are many different options on how to keep the DPM under control they all just need time and money to accomplish but fortunately when one of the mechanisms are chosen the health effects will be much less giving the miners a much better outcome.

First thing that needs to be discussed is what Diesel exhaust actually is. There are many organic compounds that make up diesel exhaust and by understanding how they work and how they are formed there will be a greater understanding in how to stop them from spreading in the human body and what problems they cause. Common symptoms that let show someone has been exposed to the exhaust are: eye irritation, headaches, nausea, dizziness, coughing, excess phlegm, and trouble breathing (Rudell et al., 1996) To no surprise the exhaust itself contains carcinogens, these particles attach to the living tissue in a person's lungs and causes cancer to start growing. The final products of diesel exhaust reaction are water and carbon dioxide. Even carbon dioxide can cause some pretty severe health effects all on its own. Now we know for sure that diesel exhaust leads to lung cancer but new studies are showing that there is a possibility of it also causing bladder cancer.

The chemicals found in the diesel fumes are capable of binding DNA to form adducts, they are the addition of a few particular molecules that can cause cancer and they bind to DNA.

With the incomplete combustion of diesel fuel three things are made solid, liquid, and gas particles. The gas portion of this break down contains carbon monoxide and nitrogen monoxide (nitric oxide) both of which are colorless gases that affect the respiratory tract causing many breathing problems for all of those that inhale these gasses. There are several hundred more gasses than just the ones previously mentioned and all of them can attack the respiratory tract and have other harmful effects on human health.

The Particulate matter (PM) plays a very large role in the effects on human health. Ristovski suggest that the diesel engine is actually one of the major air pollutants. Although studies have been done none were able to identify the major particulate matter that attacks the respiratory tract (Ristovski et al., 2012). Elemental carbon (EC) is a particulate matter that can be found naturally in many different urban locations. The carbon is used in many studies to further understand the health effects of the combustion of diesel exhaust. Studies have found that the individual elemental carbon molecules can be used as a tracer to estimate the contribution to the particulate matter in the air (Schauer, 2003).Unfortunately the analytical studies needed for these operations are too expensive and simple to be able to run all the different test technics that are needed to be able to find the particular PM that contributes to the specific health effects.

Utah valley had a steel mill factory that was suspected of causing health effects to the local residents, some test where done on the particulate matter to see if they were actually the cause of the poor health. Samples were taken from PM filters from 1986 (before the closure), 1987 (while the factory was closed), and in 1988 (when the factory was reopened); the test were done on rats. The rats that were exposed to the samples from before the closure and after the reopening had noticeable lung damage after 24 hours, 50% of these rats had a problem with their neurotransmitters. By the time 96 hours had passed the lungs of the rats started to clear up and

they could start to breath normally again. Seventy percent of the masses that had developed in the rats lungs were sodium-based. The 1986 and 1988 rats had increased levels of catatonic salts and certain types of metals. The metals that were commonly found in the masses were copper, nickel, manganese, iron, zinc, lead, and strontium; even though the metals only made up one percent they were a major part in determining the toxicity in the lungs (Dye et al., 2001). This means that places where metal dust is commonly found has a higher chance of getting lung tumors than places where metals are not commonly found. The miners in the metal mines also have the disadvantage of being in a closed in space where the exhaust and metal dust is not well ventilated.

There are a few tools that can be used to identify when there is particulate matter present in the area. There is a National Institute for Occupational Safety and Health (NIOSH) has Method 5040 which provides acceptable ways of sampling and analyzing the diesel exhaust in the area. The different monitors used detect the elemental carbon through thermal optical refractory and the Black carbon through light absorbing characteristics. The problem with these methods is that these tests are not able to measure the diesel particulate matter in short term analysis; because of this the real time monitors are gaining more and more attention form NIOSH. The real time monitors are more accurate at detecting the diesel exhaust than the previously mentioned methods. The problem with the real time monitors is that the environmental changes affect the sensors in these systems. Changes in the humidity and temperature of the area cause for false readings. Studies have shown that real time monitors give good accurate reading within the first two hours but after that they start to falter (Ho Yu et al., 2015). The monitors are improving but there are still many bugs to fix and work through to make the spaces safe for the workers in the mines.

The carbon can also be used to identify major gas releases based off of the particulate matter mass. Carbon has a more dense structure than many of the other substance found in diesel exhaust. Because of this weight it can easily be picked up by different monitors. Unfortunately they cannot tell us how many particles are being put out in the air but they can tell us the quantity. The more carbon that is detected the worse the breathing quality the miners will have and the higher the chance of lung cancer (Arhami et al., 2005). The weight of the carbon is a very common but imperfect way of measuring the release of diesel exhaust.

Diesel exhaust is used in everyday life and out in the open air it is easier to deal with than in the mines. The mines do not have good ventilation systems so the workers keep breathing in the same contaminated air every day. There was a occupation limit set for how much of the contaminated air the workers should be able to work in without getting too contaminated all in one day. The problem here is that it only takes a few short hours for the miners to start feeling the effects of the exhaust and particulate matter. Even with periodical breaks the works are still forced to work in the mines.

In conclusion the diesel exhaust can be very harmful to the human respiratory tract and therefore it needs to monitored in our mines very closely. The monitors that we do have are on the right tack but they are not quite acceptable. New methods are proving to have good ways of detecting the exhaust but unfortunately we have no good ways of keeping them under control. The current statues in place are not currently working to keep our workers free of cancer and therefore they need to be changed and more closely monitored.

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