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**From:** Christopher Papile [mailto:papile@nextechmaterials.com]

**Sent:** Monday, March 27, 2006 3:53 PM

**To:** zzMSHA-Standards - Comments to Fed Reg Group

**Subject:** RIN 1219-AB44, New Portable Breathing Stations, Best Version

This is the best and second version of these comments, thank you, Christopher Papile.

To: Department of Labor, **Mine Safety and Health Administration**

Subject: **RIN 1219-AB44**, Underground Mine Rescue Equipment and Technology

From: **NexTech**

**Preamble:**

NexTech has proprietary electrochemical technology capable of making immediate, humidified breathing oxygen, bringing no ignition source and no oxidant---such as pressurized oxygen into the situation. We have electrochemical membranes capable of making oxygen by 4 ways, and our analysis of the coal mine rescue situation has led us to design and patent a device that makes the breathing oxygen from water, which increases the safety aspects. The NexTech device is a portable, two-man lift-able device that is reusable that will allow miners to don once and wear a comfortable mask or supply oxygen to a portable refuge chamber. We believe the best way to do this is to serve a team of miners for 72 to 96 hours of emergency breathing, if there is no electrical power, and longer if there is power. The product contains mostly mature NexTech technology, with one aspect in development. Ultimately the NexTech product will be lower cost and more compact than comparable amounts of SCSRs. Our oxygen device, unlike boreholes from the surface, is a mobile source of emergency oxygen. We could supply oxygen for more than 12 miners that would simply be a larger device. There are other proprietary features of the device that we can not mention in this open forum. We are seeking partners and investors to bring this safety product to the underground coal industry.

**B. Breathing Apparatus**

3. We believe NexTech's approach for making breathing oxygen is a worthy technology to be explored further by MSHA and the mining community.

4. NexTech has patented a group 72-Hour breathing apparatus. We are working on prototype demonstration. We are seeking funding to expedite development work leading to a manufacturable product. The cost of the breathing oxygen from NexTech's device will be a fraction of the cost of a comparable number of 8-hour

SCSR devices and at least 1/10 the cost of comparable amounts of KO<sub>2</sub> based SCSRs.

### **C. Self-Contained Self-Rescuers (SCSR)**

1. Yes. NexTech patented technology makes breathing oxygen from proprietary electrochemical membranes, in a self-contained system. Although we have several electrochemical membranes available to us, we have analyzed for coal mines to derive the oxygen from water. Since the oxygen is derived from water, we are not dependant on there being oxygen in the post-accident air.

Although we could make a device in the size of an SCSR, we rather make a larger source of oxygen, such as the 12-Miner-72-Hour device. Such group devices would be able to follow the working zone of the coal miners, bringing no oxidant into the situation---only safe water. The ability to follow the working zone of the miners, makes our product potentially more effective than surface boreholes, since boreholes are fixed; and perhaps fixed in a location that is not accessible, such as near fire or smoke. The zone-of-working is moving rapidly in coal mining, so rescue chambers getting oxygen from boreholes would be fixed in a location that is every day farther away from the working zone, and can not be moved away if there is fire or other problem.

Our device would deliver immediate, humidified oxygen, in a controlled and metered manner, un-like some chemical sources of oxygen that are difficult to meter. The surface temperature of the device would be room temperature and offer no ignition source. The device would contain almost no internal oxygen and therefore bring no oxidant into the situation as pressurized oxygen tanks do. The duration of the delivered oxygen would be equivalent to 108 to 864 SCSRs. This would be good if miners could not escape; thus compelled to wait to be rescued. The device would take up less space than the equivalent in KO<sub>2</sub> SCSRs, and be all-together in one spot, movable, and reusable. The membranes in our device are well proven. For example, NexTech has also made breathing apparatuses for the military, NASA and medical device companies; in these devices we extract oxygen from low concentration in the air, or from humidity in air, or from the carbon dioxide in the air. We are not dependant on there being 21 % oxygen in the air for any of these designs. For coal mines, after considering all the methods available to us, our analysis indicates it would be good to make the oxygen from water, which our membranes do very well. Of course we would like to discuss this with underground coal companies and MSHA.

2. Smaller, belt worn SCSRs would be good in combination with our Miner-Team 72 to 96 hour device.

3. One small, belt worn SCSR and NexTech's 12-Miner-72 to 96 Hour device in the working area of the mine seems like a good combination. Several SCSRs stashed underground would take considerably more space underground than our

system. Several SCSRs underground could be crushed by heavy equipment or be ruptured in the case of an explosion and then increase the explosion by releasing pressurized oxygen. If a trapped miner must don as many as 10 SCSR (of the type that last 4 to 8 hours) devices to be underground for 72 hours, he or she will need to expose their face 10 times to potential smoke, carbon monoxide, dust, methane and potentially sulfur in the post-accident coal mine air—that creates secondary difficulties. Our device will require only one donning.

4. Yes.

5. Reduction to 5 years is better.

#### **D. Rescue Chambers**

1. Solid rescue chambers are not mobile, therefore not good for coal mines since the working zone moves.

Portable rescue chambers may have usefulness, but the question is, where do they derive their oxygen from? Stagnant oxygen is not good, since the miners entering the chamber will pollute it with post-accident coal mine air. Oxygen provided by air or pressurized oxygen tanks is not good, since those tanks themselves bring an oxidant into the environment which is surrounded by fuel---coal dust, methane, carbon monoxide---and ignition sources---since there was potentially a recent explosion or fire.

2. It must be mobile, but the question is more, what is the source of oxygen in the chamber? We can make oxygen from a stash of water. Water will not feed a fire therefore it is the safest source of oxygen.

3. 72 hours for 12 miners, without bringing oxidant into the environment. One can make a best estimate by checking the fatal grams over the years and seeing the maximum times workers are waiting for rescue and the maximum number of workers, but 12-Workers for 96 or 72 hours seems to fit that estimate.

4. 12 people minimum, but there are some places where 30 or 50 people should be protected.

5. One for every working zone (near the Continuous Miner) and a couple in the main shaft.

#### **H. Developing New Mine Rescue Equipment**

1. Economically, we hope the mine owners are open to purchasing new technology, otherwise there is no market. Without a market, no one will invest in new technology. Furthermore there is a long history of how things are done in coal mining; there may be a resistance to change.

2. I understand that NIOSH is helpful in making equipment permissible for use.
3. One can not cut corners on safety, but having more staff and more test equipment at NIOSH might help.
4. Flexibility is required, because for example, NexTech is bringing a new concept for breathing underground. We want to supply a team of miners 72 or 96 hours of breathing oxygen. This is separate from the SCSR concept. Without flexibility, this new technology will be denied to miners.

### **I Mine Rescue Teams**

2. The number of required breathing apparatuses should not be increased; rather, the NexTech's 12-Miner-72 to 96 Hour product should be deployed around the mine and miners can wear a small, light, belt-carried SCSR that enables immediate evacuation, if possible.
7. I am sure the rescue teams would like new breathing equipment; it is a matter of who is paying for it.
8. Yes, as I have mentioned above.

### **J. Government Role**

1. New technology that delivers oxygen in one device for a group of miners for extended periods of time (72 to 96 hours), with portability and bringing no oxidant into the coal mine should be promoted by the government.
2. Of course government funding to help develop the equipment to protect workers would help greatly.
5. If the government would fund new technology to make rescue and breathing equipment then the technology developers would not be so reliant on the Coal Industry and the coal companies' willingness to fund new product development. Products would become available with a minimum of risk taken by the Coal Industry or a shared risk between the Coal Industry, the government and the technology developer. That would facilitate the development of new products without regulation.
6. I recommend funding several projects for making new breathing apparatuses and communication tools, as well as more studies on why accidents happen in the first place. Projects would be best funded in a phased manner. First good proposals should receive enough funding in Phase I to demonstrate they have promise. If so, then additional funding should be awarded for Phase II, in an amount of money that depends on what needs to be accomplished and the costs to

get to the goal line. Each technology will require a different amount of money, but we need to be realistic about the cost of new product development. In this way, in less than two years, we will have many new technologies to save lives. It is unacceptable that people are loosing their lives on the job. Everything technologically should be done, that is the American way.

**Summary:**

NexTech is located near Columbus, Ohio with a main business in the field of fuel cells and electrochemical membranes. Within this business we have developed membranes and materials that can be applied to a variety of problems facing our society today. Before the recent tragedies in West Virginia we were already attending meetings with MSHA/NTTC/NIOSH in regards to the next generation of SCSRs. We already saw a good application of our technology to save lives.

As everyone, we were shocked by the number of deaths in coal mines in the beginning of this year in the US and Mexico, and committed ourselves to making a product that meets the needs of this market. We have some money to make our product, but it would be of great help if (1) the Coal Industry committed itself to placing breathing stations (not necessarily SCSRs) underground that delivered 72 to 96 hours of life support to a full mining team, and/or (2) state and local governments created development and manufacturing grants that facilitated new commercialization of mine rescue products, and/or (3) individual companies with a stake in coal miner safety who would like to team with us.

NexTech has over 56,000 square feet of R&D and manufacturing space. We welcome all those interested in helping in one way or another, including volunteers. We should not let the death of these workers, of these husbands, brothers, sons and friends pass without making every effort to improve the situation for underground coal workers.

We appreciate this opportunity to give our comments.

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Director

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