Mr Ritch Metzler
NIOSH

Dear Ritch,

I understand that things are pushed due to the 09-11-01. Incident, I am very happy that you are going to get a SCBA standard ready to test against by November 1.
By using the NFPA performance requirements plus added War Gas durability, it is a huge step towards what we today understand is the real requirements of First Responder/Domestic Preparedness personell, doing a typical incident response.

According to the data we have collected, the NFPA 100 lit/min volume (=314 PIAF) is not enough to always maintain Positive Pressure in the Face Mask. On the other hand there is a very large span in the requirement. According to a verbal communication I had with Andrew Capon some time ago he claimed that DERA in UK have recently measured PIAF in typical military exercises of up to 700 lit/min. This is much more than we have ever measured. On the other hand it is in line with the literature (Textbook of Work Physiology Physiological base of Exercise by Per-Olof Astrand and Kaare Rodahl).
"The individual differences in MVV are large. In the case of healthy twenty-five-year-old men, the mean value is about 140 litres/min, with a range from 100 to 180 litres/min. For women, the normal value range from about 70 to 120 litres/min. The pulmonary ventilation during maximal work is somewhat lower than that obtained during the determination of MVV (Minute Volume Ventilation)." (Figure 5-9)
If you then look in J.F. Nunn's "Textbook in Physiology" he claims the PIAF is between 3.5:1-5.0:1 times MVV. This is also in accordance with B. Dunn's thesis at Department of Safety Science, University of NSW. He measured PIAF to be 2.8:1- 4.9:1 times MVV.
All of this means it is possible that some people out there will require a PIAF of 180 Litre/min * 5 = 900 litre/min. Even if we decide to go to 145 litre/min, instead of 100 litre/min as used in the NFPA standard, we would still only achieve PIAF of 450 Litre/min. This is still only half way of the potential requirement according to the literature.
What would possibly be more valuable is to require all so called Positive Pressure Respirators to have an active pressure measuring devise, measuring the pressure in the orinasal area of the respirator all the time and alarming when a predetermined number of consecutive negative breaths occur. This would alert the user to his level of protection, and he/she could adjust the work rate (requirement of breathing gas) to stay below the limit of what the respirator is capable of providing.
This step would be easier to implement, as there would not be an argument of what is the right number.

It will of course not solve the concern with velocity dependent filters. Here we need to find some kind of accepted numbers. To do that we might need to define a test protocol for particular filters witch is work rate related instead of how we now are doing it. For example a P95 filter is filtering 95% up to a workload requiring PIAF of 120 Lit/min, 90% up to 250 Lit/min and 80% up to 500 Lit/min etc. To get the numbers right we need to get more tests done.
This could be one way of dealing with this problem for negative pressure Respirators.
For PAPR's and Positive Pressure PAPR's (FPBR) we need to test the filters at maximum capacity divided by number of filters, very much the same thing we are doing today.

When it comes to Gas adsorbers/chemisorbers there are reasons to believe we need to verify the performance against Acids and Alkaline (Ammonia etc) at higher airspeeds, including pulsating airflow on a breathing pump.

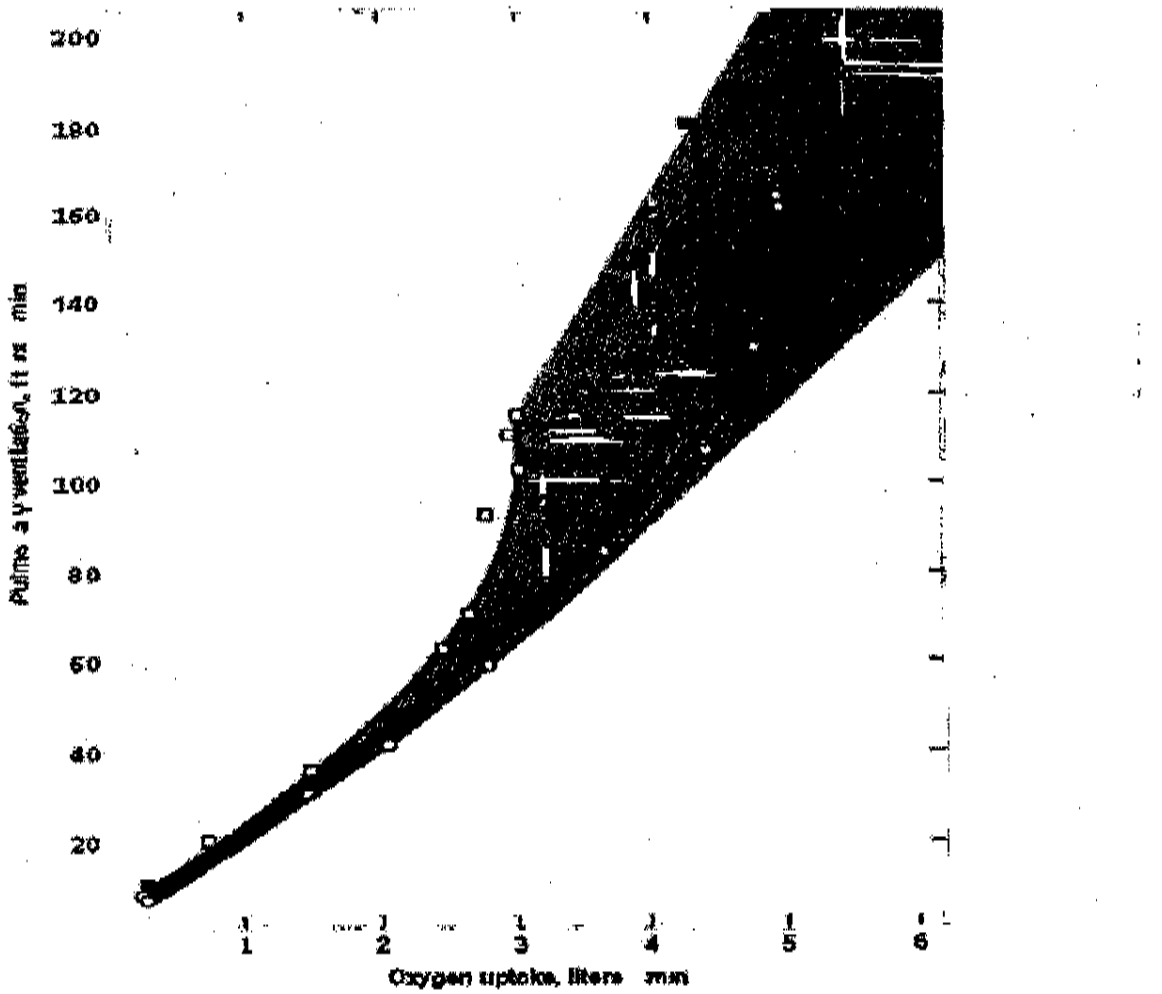

Figure 6-6
Pulmonary ventilation at rest and during exercise (running or cycling). Four individual curves are presented. Several rates of exercise gave the same maximal oxygen uptake. Exercise time from 2 to 6 min. Stars denote individual values for top athletes measured when maximal oxygen uptake was attained. (Data from Saltin and P.-O. Åstrand, 1967.) Individuals with maximal oxygen uptake of 3 liters · min^{-1} or higher usually fall within the shadowed area. Note the wide scattering at high oxygen uptakes.

I hope this information will help. It is very important to ME and SEA that we make a meaningfull standard which people out in the industry can trust will protect them when they are working in contaminated working environment.

I trust you will take this in consideration.

Regards Goran Berndtsson Connecticut October 25 2001