

TO	H. Waltemate	FIELD POINT OR AKRON DEPARTMENT & BLDG. NO.	Cleveland	DATE YOUR LETTER
FROM	M. M. O'Mara	FIELD POINT OR AKRON DEPARTMENT & BLDG. NO.	Avon Lake Technical Center	DATE THIS LETTER
SUBJECT	June 6, 1974			

Sampling Rate and Testing of Welsh Cartridges; The Harvard Approach to Increased Efficiency

One of the anomalies in our testing program involving carbon cartridges has been the choice of rate of gas flow through the carbon bed. In one of my earlier reports I stated that we tested at 30 l/min. because this correlated so well to the Harvard studies which involved testing the entire mask at 32 l/min. (the OSHA standard). Since the entire mask contains two filters, the unidirectional gas velocity through each cartridge must be 16 l/min. The question that has remained unanswered is why we do correlate so well when the gas velocities are so different. This has finally been satisfactorily resolved since I have seen an actual copy of the Harvard data and the OSHA requirement. The OSHA requirement calls for rates of 64 and 32 l/min. when testing the full mask. Under the more severe condition, the unidirectional gas flow is 32 l/min. through each of the two cartridges. Harvard (like us) has been testing one cartridge at a time at 32 l/min. to simulate the upper OSHA requirement. Jim Matheson of Welsh misinterpreted the Harvard data and this has been the source of the error. No problem exists with our program since we are in rough compliance with the OSHA requirement.

Reversed Flow Engineering

One other point that needs to be cleared up is the supposed breakthrough made by Harvard in redesigning the Welsh mask so that expelled air travels back through the carbon bed. Matheson told me that in using this approach, Harvard was able to increase the life-time of the cartridge to about 40 hours (versus the 1-2 hour life-time which now exists). Jim Matheson has again misinterpreted the Harvard data. I believe Matheson meant 4 hours not 40 hours. A closer inspection of the Harvard data reveals that their claims of a "dramatic increase in life (of the cartridge)" are not justified. The Harvard data has been plotted for the 3" and 4" cartridges under continuous flow (unidirectional) and pulsating flow (reverse flow) in Figure 1. No data was available for unidirectional flow involving the 4" cartridge. In our meeting, Matheson implied that Harvard was comparing the 3" unidirectional curve with the 4" reverse flow curve in coming to their conclusion of dramatic performance changes. Viewed in this way, one must make the same conclusion. However, this is like comparing apples and oranges. In our unidirectional testing we have noted a 2.4X increase in efficiency in going from the 3" cartridge to the 4" cartridge. So in view of this factor, one might find the 4" unidirectional curve somewhere around the 2 hour point (for 5 ppm). Thus, there is a change for both the 3" cartridge and the 4" cartridge when the flow is "pulsed".

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I believe that in terms of the problem confronting us and the medical questions arising from this approach (i.e. high carbon dioxide concentrations in exhaled air) this is not a viable solution to the problem.

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LBC
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Figure 1: Harvard Data Involving VCM (100 ppm)
Penetration Through Welsh's 3" and
4" Carbon Cartridge

