

POF015: General platform presentation

It is justifiable to use a sinusoidal flow pattern when measuring work of breathing

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Abstract:

In 1960, Cooper proposed using a sinusoidal flow pattern for measuring work of breathing (WOB) in an RPD (Quarterly J. of Experimental Physiology, 45:179-191). Using a closed circuit device, the results from a breathing machine didn't differ from results from human breathing. While writing the new ISO standards for RPD it was desirable to extend this type of testing to more kinds of RPD. Results could justify standardization with just one flow pattern: the sinewave.

A flow profile derived from human testing was programmed into a breathing machine. Compared to a sinewave, peak flow was lower but acceleration needed to reach it was higher. The flow had a fairly large peak early in the expiration and then it tapered off. The inspiration time was 45% of the time of a breath, a typical value for humans.

WOB was measured in several types of RPD using both flow profiles. Several RPD manufacturers provided products for testing free of charge. Testing was done free of charge. Manufacturers received the test results from their own products and they agreed that their results could be used anonymously.

Measurements were obtained at all eight minute ventilations (10 to 135 l min⁻¹) used by ISO. Tests were run on APRs (10 combinations of masks and filters), one SCBA, 2 PAPRs and 2 CCRs. A total of 240 measurements were obtained. The WOB values two waveforms were compared: at 35 l min⁻¹ and below, the average difference in pressures was 0,002 kPa (0.02 cm H₂O); above 35 l min⁻¹, the average difference was 1.9%.

Given the small differences between the two waveforms it is justifiable to use sinusoidal flow patterns when measuring WOB. Thus, it is possible to use only one waveform for all minute ventilations.