

SOME FACTORS AFFECTING ADSORBENT BED DESIGN - 1

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Air flow through the vapour filters used for respiratory protection is such that residence time is minimal under normal breathing regimes. In a canister, such as that used on the S10, air is in contact with the adsorbent for well under 100 ms at normal breathing rates. Thinking that this went against the rules of kinetics we looked at the protection offered by a quantity of adsorbent dispersed in a large volume. Air was drawn into the volume with a sine-flow air pump and allowed to sit over the adsorbent during the exhale stroke so that residence times were much longer. Results were compared with the same amount of material in a closely packed bed used in the traditional manner. The traditional method gave the best protection. This supports work done by Rehrmann and Jonas (1978). Further work was done, with attritional filter and microbalance systems, to show that the beneficial effect of turbulence on the kinetics of vapour transport caused by forcing air through packed beds far outweighs the extra time allowed for diffusion in dispersed beds. Flow management is important, especially in short beds, to minimise critical bed depth and flow should be turbulent rather than laminar. With a layered medium, like a cloth, or a felt, flow needs to be through the layers rather than parallel to them to achieve this.