

**Prediction of Filter Performances against Organic Vapours:  
Statistical Analysis of Breakthrough Times  
as a Basis for a Simple Prediction Model**

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**ABSTRACT**

Over 75 breakthrough times of organic vapours on a typical respirator filter have been measured under EN 141 similar conditions. The paper describes the analysis of the results in an attempt to develop a simple, but reliable, prediction model for breakthrough times. The 46 organic compounds involved, including alkanes, cyclo-alkanes, alkenes, alcohols, ketones and carbonic acids have been clustered based on their structure and functional groups, leading to a matrix like structured dataset. Afterwards, this structural information has been coded and complemented with two physical properties; the saturation pressure and the affinity coefficient. This final dataset has been analysed by means of a general linear regression model. We found out, that a simple linear model with only five regressors yields to satisfactory breakthrough times. Furthermore, the calculated breakthrough times of five control substances which were initially retrieved from the data set lie within a ten percent deviation of the experimental values. Therefore, this study shows that for a given filter type and well defined testing conditions, satisfactory predictions of breakthrough times of organic vapours are feasible.