SKYDROL® LD-4

SOLUTIA™

Respirator facts

Respirator Facts Number: RF-95-02 | CAS Number: M00006727

Respirator Facts is a service of Solutia Inc. designed to assist customers in the selection of appropriate respiratory protection when needed due to the handling of Solutia products above the recommended occupational exposure limit. The data presented in this fact sheet were developed through actual testing in a laboratory setting. A common test protocol has not as yet been published, outside of the NIOSH/MSHA certification process, which establishes an agreed upon series of tests to be performed that can be used to predict the service life characteristics of air purifying elements (typically cartridges) for respirators. Applicability of these data should be evaluated by each customer based upon the intended use of the Solutia product. Where feasible, Solutia recommends the use of engineering controls to eliminate or minimize the reliance on respiratory protection to control employee exposures below recommended occupational exposure guidelines.

Respirator Cartridge Testing

In general, respirator cartridge testing involves exposing the cartridge to a particular chemical(s) of interest as a gas or vapor stream blended in clean air to a desired concentration and pulled through the cartridge at a specified flow rate until the desired fraction of the upstream concentration is achieved downstream of the cartridge. This is considered the breakthrough time. The breakthrough time may be expressed in minutes at a given flow rate, challenge concentration and percent breakthrough. The air temperature and percent relative humidity are also referenced as they can also influence the results.

Table 1 summarizes the test results for tributyl phosphate, a component of Skydrol® LD-4, when tested against a specific manufacturer's respirator cartridge. Testing was performed by the manufacturer on a representative sample of their organic vapor cartridges.

Factors Affecting Cartridge Selection

Cartridge breakthrough data provide a means for estimating the likely service life of respirator cartridges under some conditions of use. There are many factors that can influence the actual service life experienced by an individual user. They should be considered before establishing an estimated service life for your specific application from available data.

1. Cartridge Type

Respirator cartridges are available in various general classes such as organic vapor, acid gas, ammonia/methyl amine, etc. The adsorption media used in the cartridge will vary based upon the type. Even within the same type of cartridge, different manufacturers may use media treated differently to adsorb the chemical of interest. Characteristics of the respirator cartridge adsorption media such as packing density, particle size, and bed depth will vary between manufacturers and can influence the cartridge's capacity to adsorb the chemical of interest. It is important to confirm with the manufacturer that they recommend their type of cartridge to be used to protect against the chemical of interest.

2. Humidity

The level of humidity can influence the service life of the cartridge. Cartridges are typically tested at 50% relative humidity. Higher levels of humidity (>65%) may cause a significant reduction in the service life of some cartridges, such as organic vapor cartridges, while it may improve the service life of others, like an acid gas cartridge. Therefore, it is important to consider the level of humidity expected to be experienced.

3. Temperature

Temperature can influence the service life of a cartridge. Cartridges are typically tested at ambient room temperature. Increases to 35°C may decrease the service life for some chemicals by 10%.

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4. Other Chemicals

The presence in air of other chemicals at a significant concentration can cause the service life of the cartridge to change for the chemical of concern. It may either extend or reduce the service life due to the physical properties of the mixture.

5. Breathing Rate

The service life testing of cartridges is performed at a variety of flow rates with 32 liters per minute representing breathing rates at medium work loads and 64 liters per minute representing heavy work loads. With the flow rate being inversely proportional to the service life, any increase in the air flow rate to adjust for heavier breathing rates due to greater work loads while wearing a respirator will reduce the service life.

6. Concentration

The capacity of the adsorbent bed in the cartridge/canister to adsorb the chemical of interest will vary based upon the concentration. Its capacity, measured in grams of chemical adsorbed per gram of adsorbent, reduces as the concentration is reduced.

Table 1: Summary of Respirator Cartridge Test Results for Tributyl Phosphate (TBP) vs 3M Model 6001 Organic Vapor Cartridge

Challenge Concentration (ppm)	Relative Humidity (%)	Air Flow Rate (LPM)[A]	Temperature Rate (°C)[B]	Breakthrough Time [C] (based upon 10% challenge concentration)
0.41	10	32	10	>25 days

[A] Flow rate in liters per minute through a single cartridge.

[B] Temperature used to separate TBP mist from vapor in generation system up stream of the cartridge.

[C] No breakthrough occurred as measured using an air monitoring method down stream of the cartridge sensitive to 10 ppb over a 12 hour sample. It was confirmed through analysis of the front, middle, and back portions of the cartridge after completion of the test. A significant amount of TBP was found in the front portion, a smaller amount was found in the middle portion and none was detected in the back portion of the cartridge.

The data set forth in the table above are based on samples tested and are not guaranteed for all samples or applications.