Personal Protective Equipment

Q & A: N95 Filters and Cartridges

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Maintaining respirator efficiency requires changing its cartridges and filters, so you can breathe easily and safely. This guide will help you get a better understanding of why, when, and how these components need to be replaced.

1. How do filters work?

Filters are respirator components that remove solid or liquid particles from the air around you. When you inhale, air flows in through an inlet on the respirator. Air passes through the filter which blocks dangerous substances from reaching your lungs. Straightforward, right?

Filters are removable and exchangeable and connect to half masks and full face respirators. Particulate respirators, such as filtering face-piece or elastomeric respirators, filter out dusts, fumes and mists. They usually include disposable filters which should be replaced when they become dirty, damaged or clogged. By the way, this is how particulate filters are ***NIOSH-tested.***

The type of contaminant determines the type of filter and the way it will be removed – through filtration, chemical absorption, adsorption or neutralization.

2. How do gas and vapor cartridges work?

Cartridges are containers with filters, sorbents or catalysts, or a combination of the three (combination cartridges).

Gas and vapor cartridges utilize sorbent material – typically activated carbon – to filter gas or vapor molecules. Active carbon micropores, combined with other materials, help absorb organic vapors such as acid gases, ammonia, or formaldehyde. These condense and move through pores.

3. Why do I need to replace filters?

As particulate filters load up with contaminant, they start to restrict the passage of air, making breathing harder. The increased breathing resistance can put a strain on the wearer.

4. What is the difference between service life and shelf life?

The shelf life is the period before the cartridge/filter is put into service. There is no shelf life for the respirator cartridge if it is kept in its original wrapping and stored in a nice cool dry area, away from heat, away from sunlight, away from UV exposure.

Service life is the period after use. To calculate the change-out schedule and cartridge life, the following information needs to been considered:

- Chemicals being used
- Worksite concentration level
- Worksite temperature
- Worksite humidity
- The breathing rate of the worker

Each chemical must be calculated individually.

5. When should I change my filters and cartridges?

OSHA requires employers to maintain a respirator cartridge change-out schedule as part of their written respirator program.

For particulate filters, the filter service life depends on the filter series type used, the user's breathing rate, the characteristics of the contaminant, and environmental conditions such as humidity.

All N and R series filters should be replaced whenever they are damaged, soiled, contaminated with water, or cause increased breathing resistance such that the respirator becomes uncomfortable to wear.

In addition, when an R-series filter is used in an oil-containing atmosphere, the filter must be replaced after each 8-hour work shift.

All P series filters must be replaced whenever they are damaged, soiled, contaminated with water, or as soon as they are too difficult to breathe through.

Due to considerations of hygiene, all filters should be replaced at least daily, and more often if necessary, whether used in oil-containing or non-oil containing atmospheres. The user may be unable to detect small defects in the filter resulting in a loss of filter efficiency, and the determination of when breathing resistance becomes too uncomfortable is subjective.

Filters should also be replaced in accordance with schedules established by regulatory agencies.

For gas and vapor cartridges, the effective service life is the time until vapors begin to exit the cartridge.

Gas and vapor cartridge filters let a contaminant through once their sorbents become saturated. This is known as 'breakthrough'. Saturated cartridges will leak trace amounts of contaminants to the wearer, which may be detected by odor, taste, and/or irritation.

Changing gas and vapor cartridges before there is breakthrough to prevent contaminants from entering the user's breathing zone is critical – and it is required by –***OSHA*** and CSA . But there are many factors that affect how long a cartridge will last in any particular environment.

Unlike particulate filters, this is not indicated by a change in breathing resistance. Cartridges should be replaced when the end-of-service-life indicator (if so equipped) has changed color or in accordance with an OSHA-compliant cartridge change-out schedule.

Replace the cartridges earlier if you detect the contaminant by smell, taste, or irritation, or if either cartridge shows any signs of damage. Always replace cartridges in pairs.

The criteria to replace a combo cartridge with a P100 filter on it is whenever the breathing resistance gets harder for the P100, or the cartridge comes to the end of the Service Life Estimation.

6. How do I replace cartridges and filters?

Cartridges must be changed per local regulations; end-of-service-life indicators.

Replace cartridges as follows:

1. Return to fresh air.

2. Remove cartridges by turning counterclockwise.

3. Dispose of used cartridges in accordance with federal, state and local guidelines.

4. If using filter pads, remove the filter retainers from the cartridges or filter holders. Remove the used

filter pads and dispose of them in accordance with federal, state and local guidelines.

5. Clean the filter retainer and cartridge or holder if necessary.

6. Install new cartridges, taken only from sealed packages.

7. Perform a facepiece fit check.

7. How about mercury vapor cartridges?

Mercury vapor cartridges incorporate passive end-of-service-life indicators (ESLIs). Each ESLI, yellow in color when new, turns gray when exposed to mercury vapor. The indicators must be visible when wearing the respirator without having to manipulate either the facepiece or the indicator. If the indicator cannot be seen, do not wear the respirator.

The cartridges must be replaced when the ESLIs change color from yellow to gray, when the ESLIs become dirty or damaged, after 30 days of use, or if removed from their original packaging and not used within 30 days.

Never enter or remain in a hazardous atmosphere if one or more of the ESLIs is gray.

8. How should I store my reusable respirator and filters?

Make sure to store away from dust, sunlight, heat, extreme cold, moisture, chemicals or exhaust fumes. When not using the respirator, make sure you remove the cartridge and store in a sealed bag. They should not be stored casually in a toolbox or the cab of a truck. They should always be kept clean and dry. Extend the life of the cartridge by keeping it away from any contaminated areas.

Honeywell offers a wide range of cartridges and filters for APRs and PAPRs.

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