Cartridge Changeout Schedules

Tutorial Guide for Bulllard PAPRs
Updated November 17, 2014
Respirator cartridges don't last forever!

- A change schedule is the part of the written respirator program which says how often cartridges should be replaced and what information was relied upon to make this judgment.
- A cartridge's useful service life is how long it provides adequate protection from harmful chemicals in the air.
- The service life of a cartridge depends upon many factors, including environmental conditions, breathing rate, cartridge filtering capacity, and the amount of contaminants in the air.
- It is suggested that employers apply a safety factor to the service life estimate to assure that the change schedule is a conservative estimate.

From OSHA's eTool on Respiratory Protection Change Schedules
https://www.osha.gov/SLTC/etools/respiratory/change_schedule.html
Accessed 11/17/2014

If there is no ESLI appropriate for conditions in the employer's workplace, the employer implements a change schedule for canisters and cartridges that is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. The employer shall describe in the respirator program the information and data relied upon and the basis for the canister and cartridge change schedule and the basis for reliance on the data.
Valid Ways to Estimate Service Life

• **Experimental Tests**
  – Can save money (accurate service life value vs conservative assumptions made by other methods)
  – Most reliable method, especially for multiple contaminants
  – Can be used to validate an existing change schedule
  – Will likely take time and money to perform the tests

• **Manufacturer Recommendation**
  – Can result in a more accurate estimate for your particular brand of respirator
  – Relies on the manufacturer's broad knowledge and expertise
  – May not be possible if the manufacturer is unable to provide a recommendation
  – May not account for all workplace and user factors adequately

• **Math Model**
  – Inexpensive and takes little time
  – Requires no math calculations if you use the Advisor Genius
  – Not as accurate as experimental testing. May result in a service life estimate that is shorter than it needs to be due to conservative assumptions
  – Generally limited to single contaminant situations
## Do’s and Don’ts

**Do**
- Make sure the cartridge is appropriate for the contaminant
- Account for environmental and use factors
- Apply a safety factor

**Don’t**
- Rely on odor threshold
- Rely solely on Rule of Thumb
- Use cartridges intermittently unless certain of migration possibilities
HEPA (Particulate) Filters

• These do not require a cartridge changeout schedules (they are filters, not cartridges or canisters)

• Generally, these can continue to be used so long as the Air Flow Indicator test is successful

• Usage should be for a maximum of 12 months after opening from package

• Storage life is 5 years if unopened in proper conditions
Organic Vapors

• For PA30 & PA30IS
  – PAPRFC2 is the part number for the filter cartridge

• For EVA & EVAHL
  – PAPRFC4 is the part number for the filter cartridge

• Use MaxxLife Software to calculate
Acid Gases

• Chlorine, Chlorine Dioxide, Sulfur Dioxide, Hydrogen Chloride, Hydrogen Fluoride

• For PA30 & PA30IS
  – PAPRFC2 is the part number for the filter cartridge

• For EVA & EVAHL
  – PAPRFC4 is the part number for the filter cartridge

• Contact Bullard for test data
Ammonia & Formaldehyde

• For PA30 & PA30IS
  – PA3NBC is the part number for the filter cartridge

• For EVA & EVAHL
  – PAPRFC5 is the part number for the filter cartridge

• Contact Bullard for test data
Rule of Thumb

• If the chemical's boiling point is > 70 °C and the concentration is less than 200 ppm you can expect a service life of 8 hours at a normal work rate.
• Service life is inversely proportional to work rate.
• Reducing concentration by a factor of 10 will increase service life by a factor of 5.
• Humidity above 85% will reduce service life by 50%.

• Found in chapter 36 of the American Industrial Hygiene Association (AIHA) publication "The Occupational Environment - Its Evaluation and Control."
Select the Correct Filter Cartridge

- Download guide at www.bullard.com
Example: Acetone

- PEL 1000 ppm, TLV 500 ppm
- PA30 or PA30IS Filter Cartridge is PAPRFC2
- EVA or EVAHL Filter Cartridge is PAPRFC4
Download MaxxLife from www.bullard.com

MAXXLife Calculator

The Ultimate Tool for Calculating Respiratory Cartridge Protection

Maximum Protection
Maximize the value of your respiratory system by using the Bullard MAXXLife calculator. MAXXLife is a user-friendly calculator that helps measure the service life of your Bullard air-purifying respirator cartridge.

Cartridge Life
MAXXLife lets you manage the life of your cartridge. It’s quick, easy and accurate. Just follow the step-by-step MAXXLife Calculator program to determine how long you can use your cartridge before it needs to be replaced. The MAXXLife calculator measures both environmental and usage factors when determining approximately how long the cartridge could be used before hazardous chemicals would begin to break through the cartridge’s protective filter. MAXXLife is the perfect tool for respiratory protection users.

MAXXLife Results
Be sure to save your MAXXLife report. Print it out for your records and quick reference.
Bullard MaxxLife Example

- Click on Continue Button to get started
Click on the question marks for additional help
Follow the numbered steps to guide you.
Click: Organic Vapor Cartridge Button
Click on drop down arrow to select Organic Vapor Cartridge.
• Click on Populate Fields button
• Then Click on Continue
Click Organic Vapor (A) Button
Select Chemical from drop down menu or by entering CAS #
• Click on Populate Fields
• Enter Average Vapor Concentration

• This is the concentration in the air (usually obtained from an air sample test)

• Click on Continue
• Repeat Steps for Additional Organic Vapor Entries
• Click on Use Conditions
• Enter Use Conditions
• Click Continue
• Click Continue
- Enter the concentration at which you’d like to be notified of breakthrough – must be >0 and < ½ Vapor Concentration
- Many customers use the TLV value here
- Click on Calculate Results

![Vapor Mixture Breakthrough Results](image)

<table>
<thead>
<tr>
<th>Organic Vapor Cartridge</th>
<th>Organic Vapors</th>
<th>Breakthrough Concentrations (ppm)</th>
<th>Vapor Concentrations (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAPRFC2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vapor #1 Acetone</td>
<td></td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Vapor #2 Methyl ethyl ketone</td>
<td></td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Vapor #3 Cyclohexane</td>
<td></td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Vapor #4 Isopropyl acetate</td>
<td></td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Vapor #5 Toluene</td>
<td></td>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>

- Temperature (°C): 23
- Average Air Flow (L/min): 227
- Use Relative Humidity (%): 50
- Equivalent Conc Vapor#1 (mg/m³): 23.9

[Calculate Results] [Return to Data Inputs] [Print this Window] [Exit Program]
Get Results

- When the concentration of Acetone is 10ppm and is used with the PAPRFC2 Filter Cartridge at 241 lpm, 1 atm, 50% rh, and 23 C, it will take 358.7 minutes before 5 ppm will breakthrough.
Finish

- Print the results
- Keep for your records
- Repeat as necessary
Notes:

• If your environmental concentration is less than the PEL then OSHA does not require a respirator.
• If you cannot find the chemical you are looking for in MaxxLife, please contact Bullard. We may be able to get your chemical added.
• Extremely low concentration values will take the software longer to calculate the results and in some cases may not be compatible.
Questions?

- info@bullard.com
- 877-BULLARD (285-5273)