

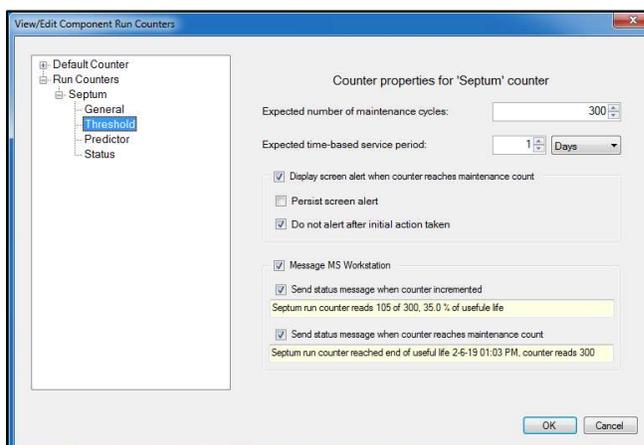
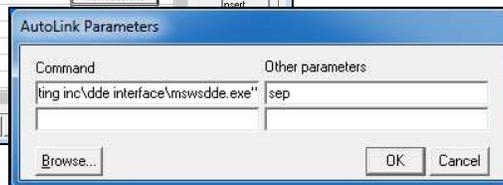
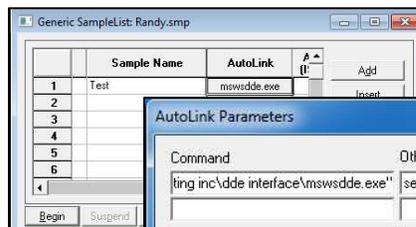
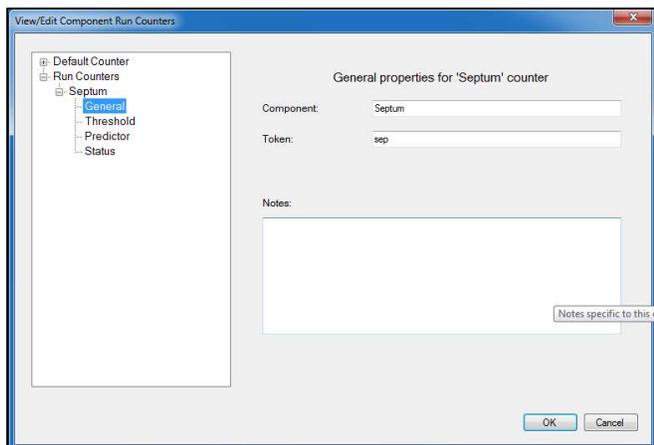
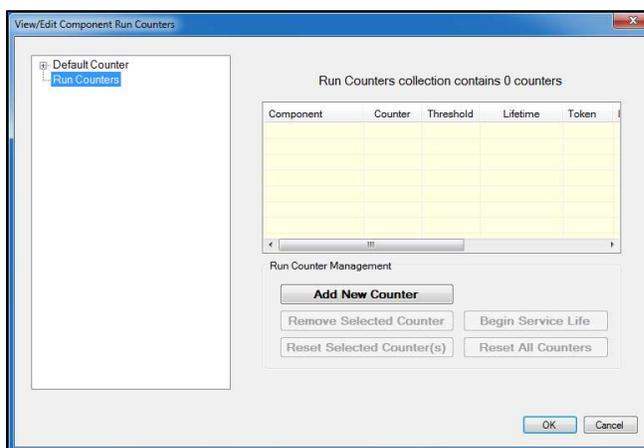
Run Counters for Scion MS Workstations

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Gas chromatographs have many parts to make it fully functional for specific applications. Some of these parts are consumed by operations, such as septa, guard columns, injector liners/inserts, oxidation and reduction catalysts. Others have specific lifetimes before they need to be replaced, including instrument supply gases, carrier gas filters, capillary columns, flame tips and syringes. If these items are replaced preemptively, based on usage, unplanned disruptions from their overuse can be avoided.

Run Counters by Lotus Consulting is designed to complement Scion MS Workstation,¹ adding the ability to track the maintenance lifetime of one or more components. Run Counters increments a cycle counter for designated components in each sample run, tracks a time-based service life, or both, and provides a message log entry and on-screen alert when the configured lifetime has been reached. Additionally, counter details can be reviewed including percentage of useful lifetime and predicted end-of-life. Based on historical data, values can be entered into this application to allow a prediction when preventative maintenance is needed to be performed.

Any item on the gas chromatograph can be added to the run counter monitoring. Then an assigned token can be listed in the Workstation SampleList for the item to be counted and its usage displayed.

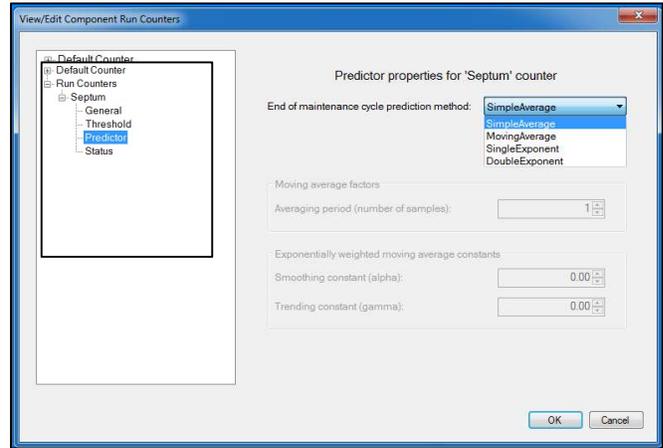


The expected number of cycles is set as the threshold to trigger an alert message on the System Control screen. This screen also allows the displayed message to be set by the user. If the Expected Number of Maintenance Cycles is set to 0, then the Expected Time-Based Service Period becomes active and is monitored.

¹ This application is also functional with Varian and Bruker MS Workstations.

Component end-of-useful-life maintenance cycle is predicted by applying an algorithm to sample increment timestamps.

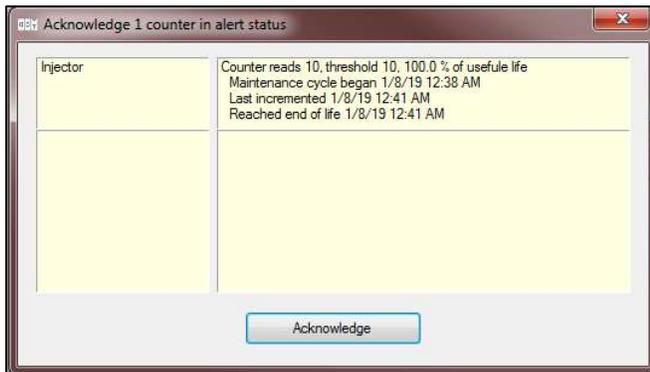
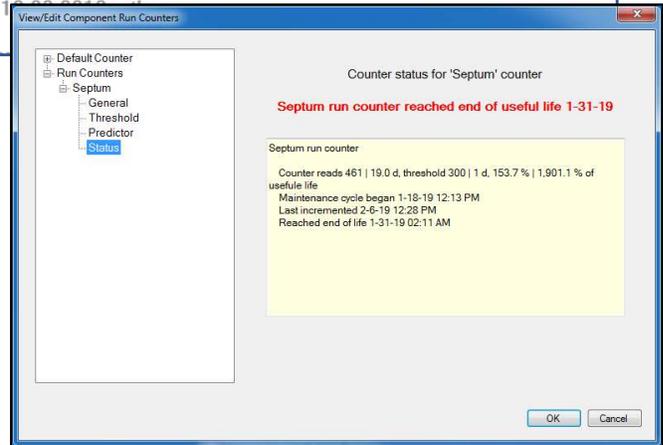
- Simple Average – mean time between each sample and ratio to threshold are used to predict the maintenance cycle
- Moving Average – maintenance cycle is predicted based on mean time between the most recent N samples
- Exponentially weighted moving average – single and double exponents can be configured for an Exponentially Weighted Moving Average algorithm (www.EWMA@Wikipedia.org).



An Excel® spreadsheet is included to aid with choosing predictor methods

Each injection increments targeted counters. This action is documented in the Message Log of the MS Workstation. Current status of counters is also viewable in “Status”.

```
Feb 03 10:02:49 Scion MS Workstation DDE Interface terminated DDE conversation
Feb 03 10:17:20 Data File 2019-02-03 10-02-19 467833 soak inj 1 - hip46 12-23-2018.run created for '467833 Soak', Inje
Feb 03 10:17:23 Ran AutoLink Command: "c:\program files\lotus consulting inc\kittyhawk hip cycle gas analysis\mswsdde.
Feb 03 10:17:25 No counter tokens recovered, incrementing 1 counter
Feb 03 10:17:25 Septum run counter reached end of useful life 1-31-19 02:11 AM, counter reads 3
Feb 03 10:17:25 Recalc list and Datafile information successfully processed
Feb 03 10:17:25 Scion MS Workstation DDE Interface terminated DDE conversation
Feb 03 10:32:51 DDE conversation established with HIP Cycle Gas Analysis
Feb 03 10:32:51 Activating Method C:\BrukerWS\methods\hip40 10-02-19 12-23-2018.run
Feb 03 10:32:53 Automation Resumed
```



When a counter reaches a value set by its preset “end of useful life”, an alert is displayed in System Control, and the message must be acknowledged by the user.

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