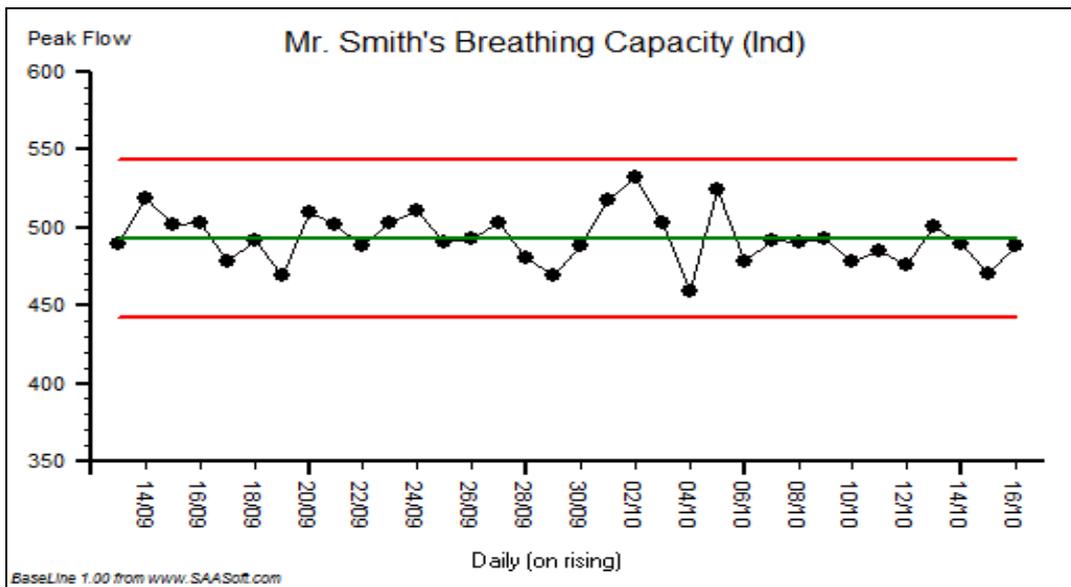


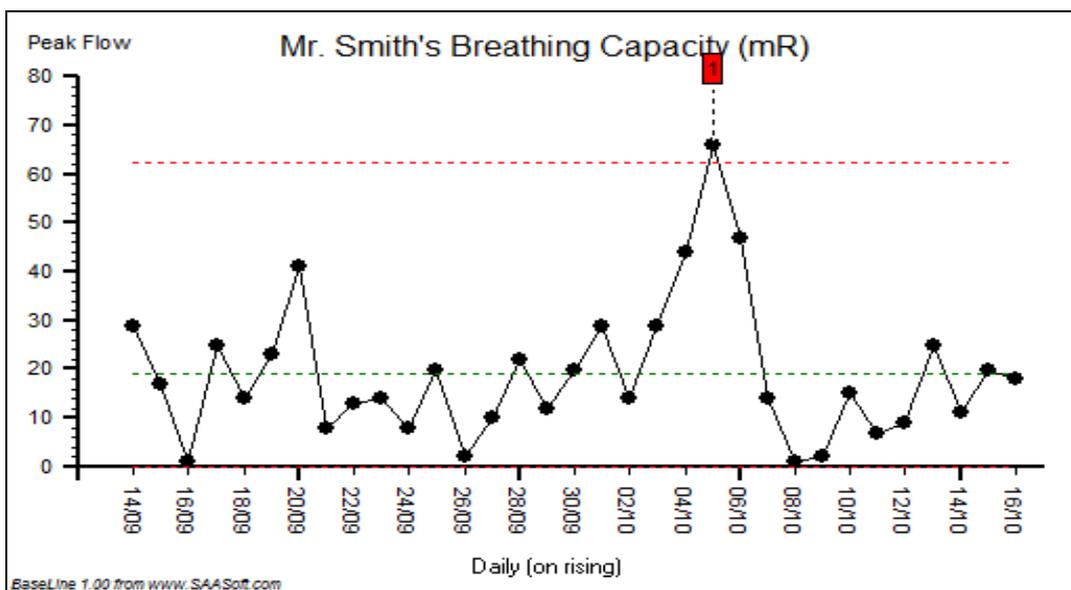
BaseLine© Examples

D. Detect systemic change by removing special causes FLAGS and eye-balling other changes in both the centre-line and the level of variation

1. The **Ind**ividual chart in this example has been taken from BaseLine© Example C. Judging by just this one view (below) the system in question is apparently stable – in that no Special Cause Flags are being signaled:



2. By clicking on the **mR** Moving Range Chart however, a different story may be told:

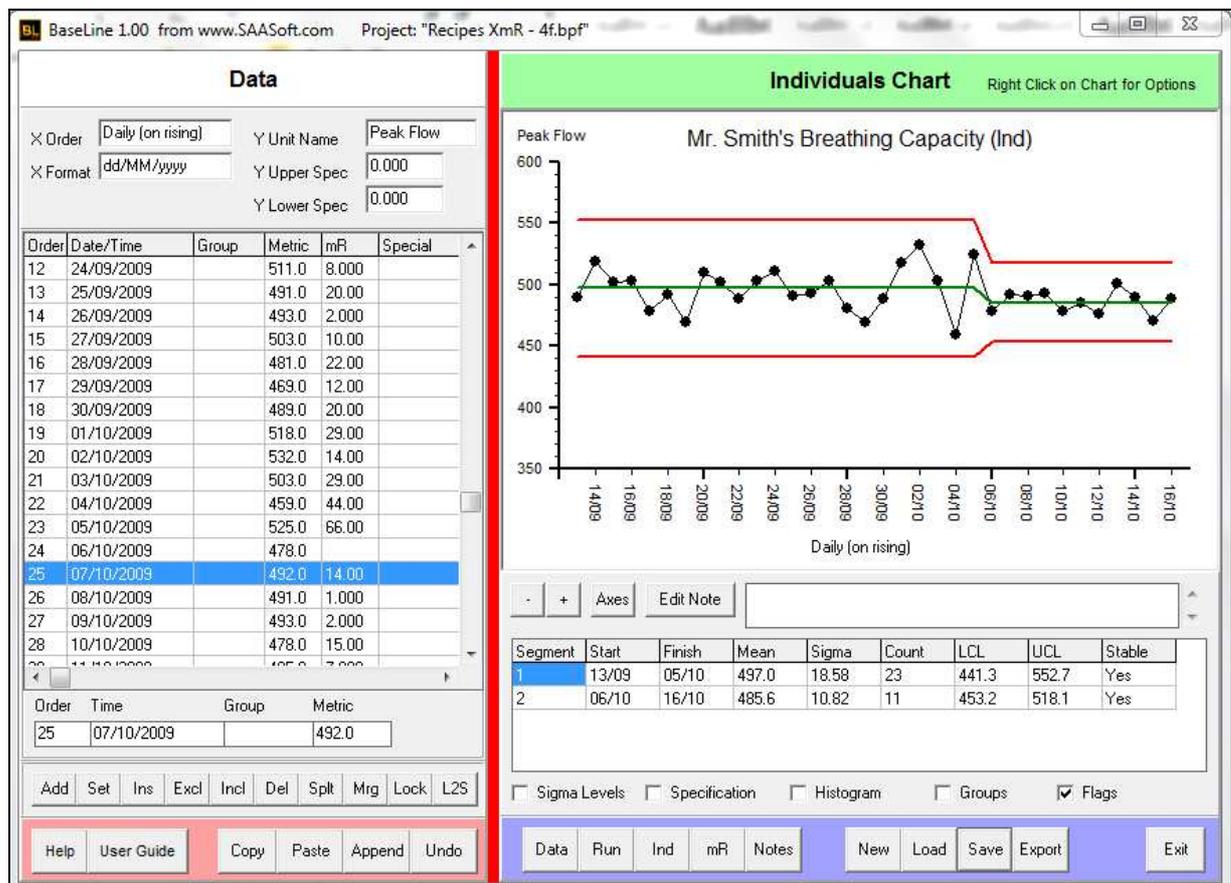


Note: The charts are based upon a sigma calculation for which the individual point-to-point sub range average (\bar{R}) is pivotal. BaseLine© automatically sums the data and calculates \bar{R} and displays the limits of variation.

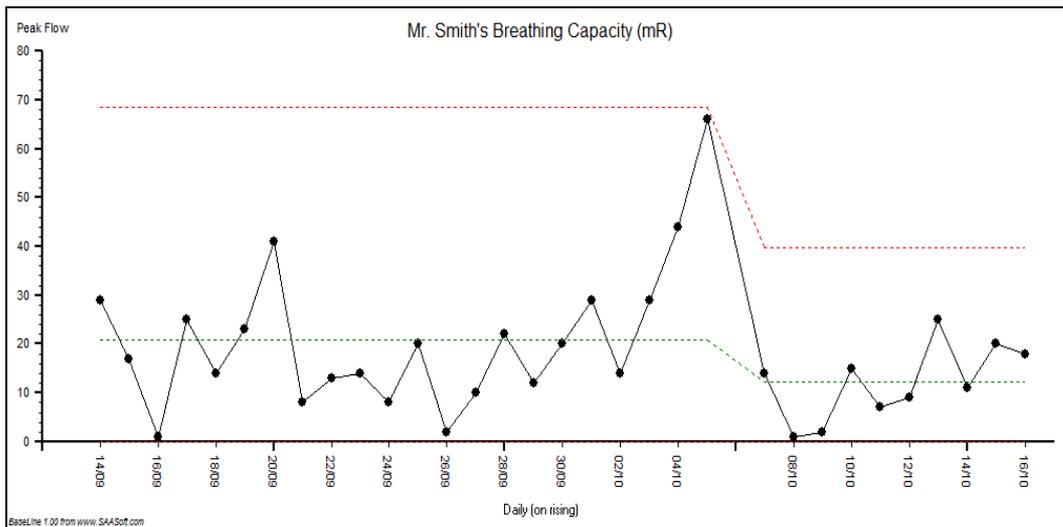
Occasionally, as in this case, a special cause flag appears indicating that something systemic is probably occurring between the events represented by the relevant two data points.

3. Returning to the **Ind** chart it does now appear that the level of variation may indeed have changed after **point 23** (05/10/2009) – so let's try splitting the data at this moment in time to see what effect this would have.

4. Hold your cursor over the very next **point 24**, right click on it and opt for "split". Here is the result.



5. It now does appear that the flag on the Moving Range Chart has helpfully revealed a shift in both the centre-line (green) and the variation (as indicated by the narrowed 3 sigma limits). The same split is also shown of course on the **mR** chart:



6. You may go on to spot other possible systemic shifts – even in the absence of any flags – but great care is needed because it's all too easy to imagine changes and to over-interpret the ups and downs of the data.

This is why the rules underpinning the flags must be carefully defined. BaseLine© defaults to probably the most commonly used rules: the so called "**Western Electric Rules**" named after the company that first published them in 1956 – incidentally the same company with whom Walter Shewhart was working when pioneering Statistical Process Control in the 1920s.

To view the precise definitions of these rules, click on **Help** at the bottom left-hand corner of your BaseLine© screen.

The Four Western Electric Rules for Special Cause Variation are used in the mR and Ind Charts

- Rule#1 - One point more than 3 sigma from the mean.
- Rule#2 - Two out of three points more than 2 sigma on the same side of the mean.
- Rule#3 - Four out of five points more than 1 sigma on the same side of the mean.
- Rule#4 - Nine points on the same side of the mean.

7. Should you feel that there may have been other significant changes in either the centerline or the level of variation – or both – feel free to experiment by choosing a point immediately after the presumed change, and right clicking on it to choose the "**split**" option.

If the split seems valid to you, leave it as it is and start looking for the next possible shift, for it is of course possible that the split you've just made has thrown up a new Flag to guide you in this.