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Special Feature

Determining Weight Calibration Intervals

Observation, Damage Protection and Data Collection Are Key

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Charles Dickens wrote in *The Tale of Two Cities*, "It was the best of times, it was the worst of times". In the laboratory it is always the best of times when management purchases new equipment, and the worst of times when it comes to maintaining it.

Maintenance should be based on measurements that identify changes in the equipment over time and not an arbitrary schedule. Determining the calibration interval for a set of weights for a new balance requires control charts and a detailed history of the weight, which will predict an optimum calibration interval for when the weights should be adjusted or replaced prior to failing process requirements.

Determining the calibration interval requires examining the weight over time.

Every detail of how the weight is handled and stored should be documented. The first step is to document the surface of the weight. Changes in the weight value might be associated with excessive wear. Examination of the weight should be done periodically or, at a minimum, before each calibration. The weight should be stored in the original case and protected from airborne contaminants. Excessive scratching of the weight should be avoided, as this might lead to weight being lost or gained. Excessive scratches can be caused by dragging the weight along the balance pan or by placing the unprotected weight on a hard or dirty surface.

After documenting how the weight is used, begin plotting calibration data to identify trends in the calibration results. Analysis of the trends and data from the process will complete



the analysis for determining the calibration interval.

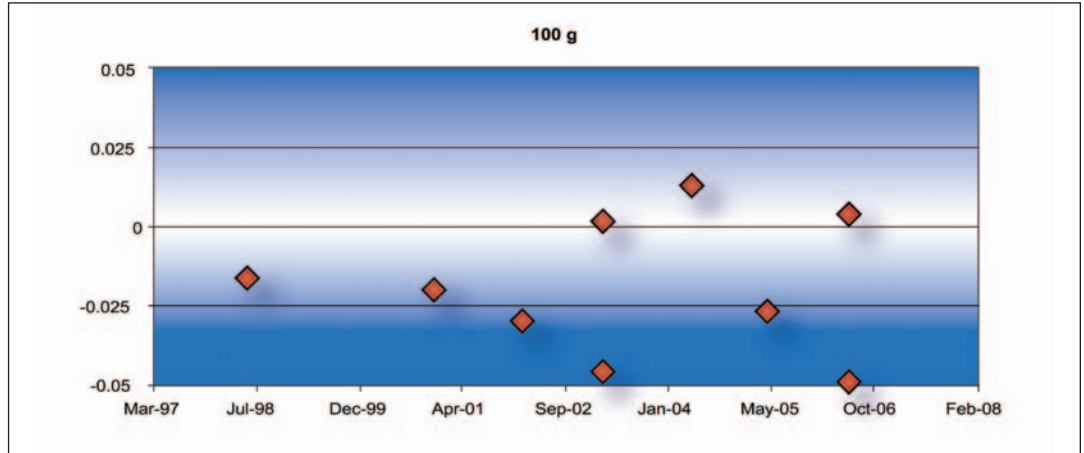
The chart below shows how to select a realistic calibration interval. The chart represents a 100-g, one-piece, E1 weight. The weight was put into service June 1998 and is spot cleaned with alcohol to remove any noticeable contaminants. The present calibration interval is between 12 to 18 months, and the limits on the chart

are the tolerance limits for the weight. The weight was replaced in 2003 after being in service for 45 months. It was also replaced in 2006 after 39 months of service. Each time the weight was replaced it was at the tolerance limit. The largest loss in mass was in a 12-month interval of 0.04 mg.

Enough data has been collected on the weight to determine the calibration

interval as long as the process has been reviewed for cause and effect. If there are changes due to handling of the weight, the procedure for handling should be changed and the effects of the change should be noted in the next calibration. The 100-g weight does show excessive scratching on the bottom. Protecting the weight is important in establishing a realistic calibration interval.

Can the calibration interval be set for 18 months and maintain the weight in-control? The history of the data indicates that the weight needs to be replaced every three years, which will support the 18-month interval. The problem that must be addressed to avoid replacing the weight is the excessive loss of mass from May 04 to



May 05. This is not consistent with all the other data points, and the procedure for using the weight must be examined to determine the cause of the loss and corrective action required to halt excessive wear. This can only be done if the weight is mapped on the surface prior to each calibration and the changes inves-

tigated.

Determining the calibration interval involves all history of the weight. The more information available on the weight, the stronger the case can be made for extending the calibration interval. This will involve time to collect the data but will save on the expense of calibrating the weight over time. The cali-

bration interval of 18 months over the 8-year period will eliminate the need for two calibrations in the future. Spending time early in the process will save time and money later on. ●

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