Technical Paper

Determining Weight Calibration Intervals

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Determining Weight Calibration Intervals

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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 is yet to come when it needs to be maintained. Maintenance should be based on a set of measurements that identify changes in the equipment over time and not some arbitrary date set - with no thought as to why. Determining the calibration interval for a set of weight for a new balance requires control charts and a detailed history of the weight, which in turn will help predict a calibration interval for when the weights should be adjusted or replaced prior to failing process requirements.

What is a calibration interval? As easy as it may sound it is not the manufactures recommended interval. Even though most manufacturers can characterize their equipment and determine a calibration interval, the problem is the manufacturer can not determine how the user cares for the equipment. The safety net for most companies is the 1year calibration interval because it sounds good, it’s an even number and everyone seems to know that interval. Investing time now can save both time and money in the future.

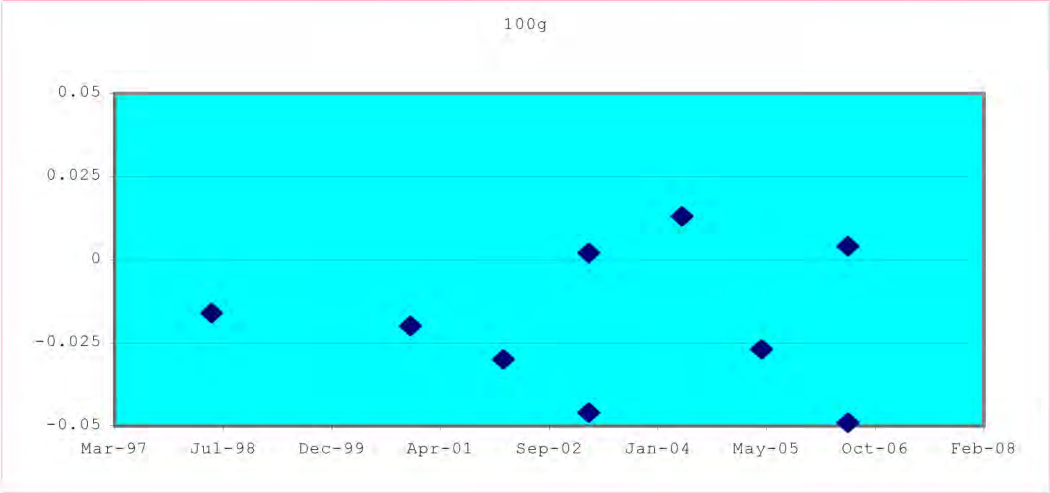
How do you get from new weights to a calibration interval that will support your internal process? It would be every laboratory quality managers dream if it was the shortest amount of effort to predict the longest amount of time between calibrations. Let’s examine the process for determining the interval for the control standard weight.

Determining the calibration interval requires examination of the weight over time and the process for using the weight. Every detail on 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 could be associated with excessive wear or abuse of the weight. 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 form air borne contaminates. Excessive scratching of the weight must be prevented, as weight can be 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 surfaces or dirty surface.

After documenting the process for using the weight, start 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.

Examination of the following example will explain the process for selecting a realistic calibration interval. Chart 1 is a 100g, one piece, E1 weight. The weight was put into service June 1998 and is spot cleaned with alcohol to remove any noticeable contaminates. The present calibration interval is between 12 - 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 months interval of 0.04mg.



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 can be noted in the next calibration. The 100g weight does show excessive scratching on the bottom of the weight. Handling of the weight is important to make sure that the surfaces the weight comes in contact with are clean and non-abrasive. 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 3 years, which will support the 18month interval. The problem that must be address 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 needed to halt any excessive wear. This can only be done if the weight is mapped on the surface prior to each calibration and the changes investigated.

Determination of the calibration interval involves all history of the weight. The more information that is available for the weight the more solid the evidence to extend the calibration interval. This will involve time in collecting the date but will save on the expense of calibrating the weight over time. The calibration interval of 18 months over the 8 year period will save on two calibrations in the future of the weight. Spend time initially will create a predictable process that will save time and money in the future.

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