The Way You Calibrate May Be Losing You Money:

A Case Study on IR Calibration Frequency Consideration

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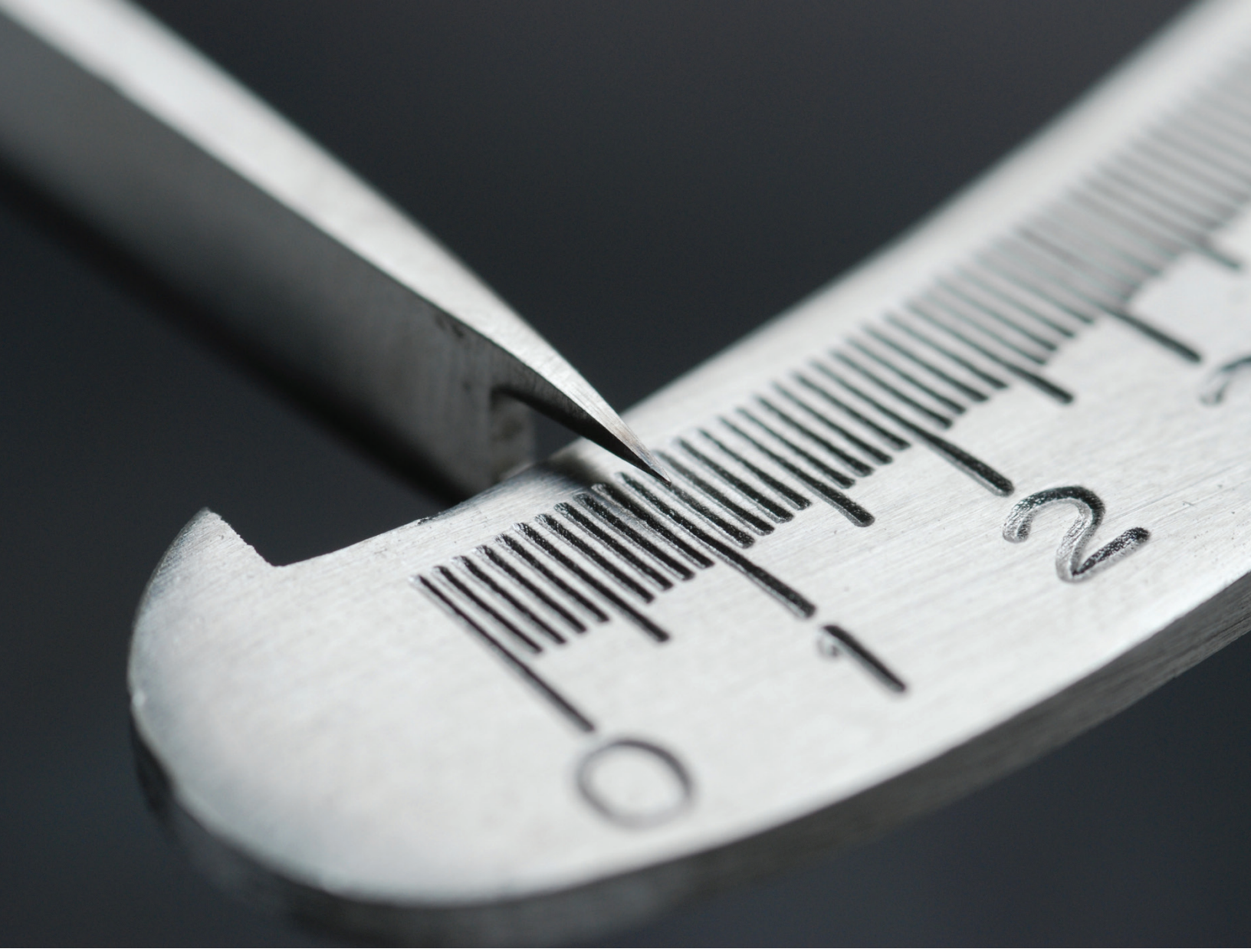

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Are You Leaving Money on the Table?

How do you determine the amount of money your company pays for each raw milk purchase or the value of the end product? Simply put, the fat and protein content are measured with an Infra-Red (IR) instrument to grade the milk. This then determines its price per pound and payment to your farmers accordingly as well as accuracy in the results of your end products.

In order to get accurate readings, your IR instrument has to be calibrated against standards with known percentages of fat and protein. The frequency of calibration directly determines how accurate your IR readings remain. As the length of time increases between calibrations, the more likely your IR readings will be off, this is known as drift.

Instrument drift may show readings that are lower than actual, which means you end up shorting your farmers. But what if your IR instrument shows artificially higher protein or fat values? You will end up over paying for your raw milk, directly cutting into your profit margins on the finished goods you produce.

This case study makes the financial case for why your company should calibrate its IR instrument more frequently.

Case for Drift Being Real

In this case study we examine data pulled over an 8-day period directly from an IR instrument from an operating dairy production laboratory. The instrument is calibrated daily before running any product samples to ensure accuracy and consistency.

As presented below in figure 1, even within a single day there can be fluctuations in readings up too ± 0.025. These readings fall well within the usual maximum of ± 0.04% as recommended by the ISO/IDF. However, imagine if the instrument was not calibrated daily. How quickly might these values begin to fall outside the acceptable range? In figure 2, we extrapolated the daily drift data using the total average drift by component over the full eight days of data. While a linear extrapolation comes with numerous caveats and we would not necessarily expect the drift to increase at this pace, it does illustrate how quickly it can escalate outside the usual accepted range of ±0.04%.

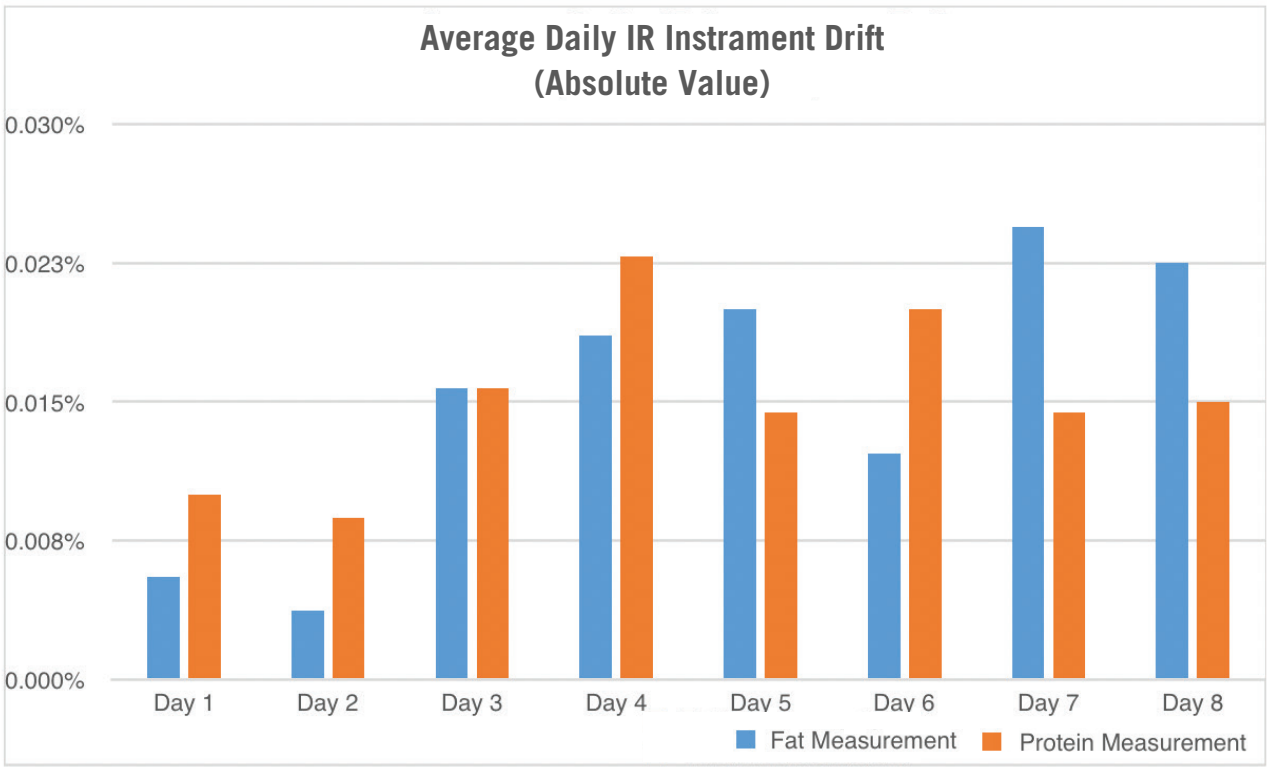

Figure 1

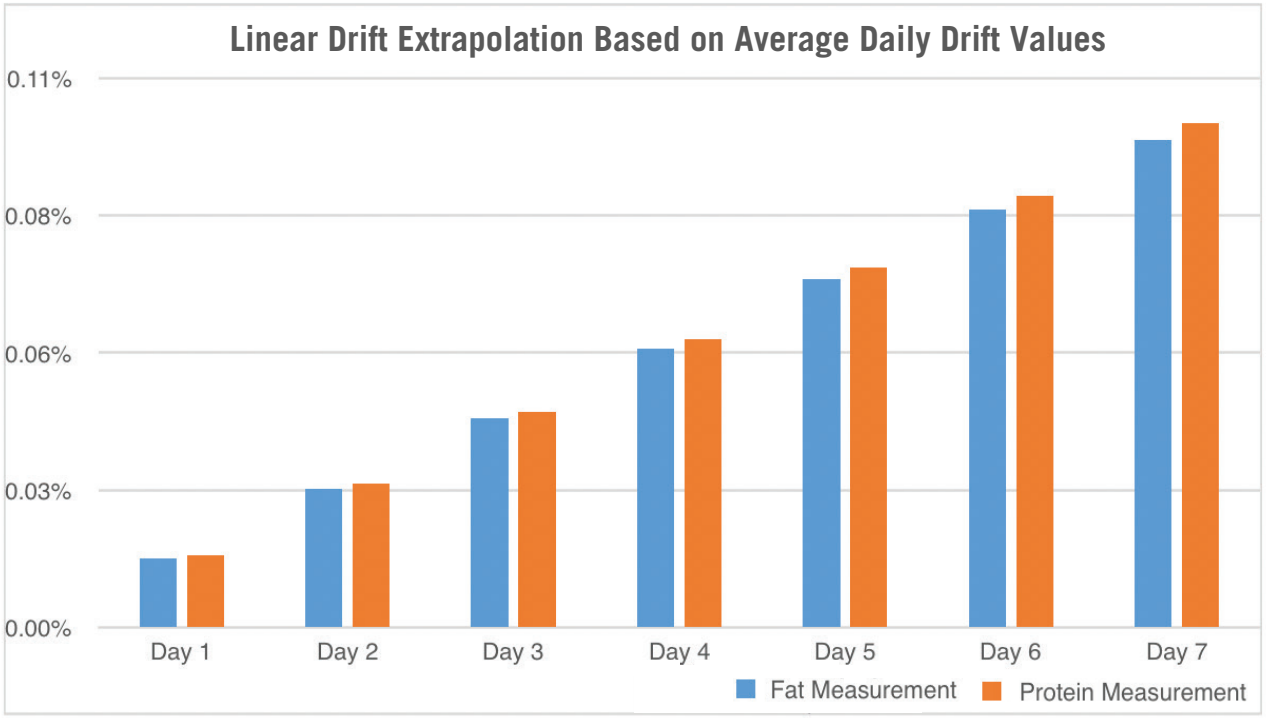

Figure 2

Financial Impact of Drift

As outlined above, IR instrument drift can have a real impact on the key measurements of your dairy products. The question then becomes, what is the specific financial impact that could result from your readings being off? Below is a simple scenario that illustrates the potential impact of IR instrument drift on your bottom line.

Milk Assumptions:

- Yearly intake of raw milk 300 million pounds.
- Average fat content 4.2% and average butterfat price of $1.8591 per pound
- Average protein content 3.4% and average protein price of $4.5349 per pound

Drift Assumption:

- Average yearly drift of readings is 0.02% above acceptable reading range of +0.04%

The assumption in this scenario is that your IR instrument readings are falsely inflating the fat and protein values at raw milk intake by 0.02%, meaning you would be paying for fat and protein content that wasn't there. Let's take a look at the specific financial impact from this drift.

Financial Impact at Raw Milk Intake

Raw Milk Intake	Drift	Resulting Variation	Financial Loss from Butterfat	Financial Loss from Protein	Total Financial Impact
300,000,000 lbs.	0.02%	60,000 lbs.	$111,546	$272,094	$383,640

In this scenario you would pay nearly $385,000 more for your raw milk than you should have based on its actual fat and protein content.

So, how could a financial discrepancy like this remain hidden from you? Your plant takes in raw milk and transforms it into finished products like fluid milk, heavy cream, ice cream, or yogurt. Before you fill the products into their final containers and release them for distribution, they are tested to ensure fat and protein content are at their expected levels. If your IR instrument is already experiencing drift and affecting the levels at intake, the fat and protein values in your final products will be off as well, effectively masking the issue.

Not only could you be losing money if the values on your final product are off, but imagine if the FDA were to test your product for compliance. If the values don't hit the expected levels and the FDA has to take action, this could cause lasting damage to your brand in the eyes of the public.

Recommendation

So, what is the best way to combat drift and minimize the financial risk it poses? The simple answer is frequent calibration and instrument maintenance as part of your good laboratory practice (GLP). The next logical question is, what is considered frequent calibration? The answer to that is, it depends. The key factor to consider when determining how frequently you should calibrate your IR instrument is the number of samples per day you analyze. As the number of samples run each day increases, the risk of drift increases. There are some additional factors that can influence drift such as cleaning frequency and procedure, zero setting, number of different products being tested, correct channel usage, and general components wear and tear.

We will work with you to analyze your throughput and product use cases and asses your maintenance and calibration techniques. Based on our assessment, we can put together a custom plan that tailors your calibration frequency directly to your business needs and budget. We can even help you monitor the results over time and make adjustments as needed.

If you are interested in discussing your IR calibration strategy you can send an email to Dino Holmquist: DinoDemirovicHolmquist@eurofinsUS.com.

Be on the lookout for our next article where we will discuss how to choose the right kind of instrument calibration standards, and discuss how they affect your readings.