

TOP 5 TIPS FOR SCALING SYSTEM PERFORMANCE

When scrap or bad product hitting the field becomes an issue, when customers are complaining and leaving, it's well past time to get back to the basics of your scaling system. Yes, of course, there is basic maintenance. Take care of the following five things, and watch the percentage of good batches go up exponentially.

1. **Mechanics.**

- a. **Alignment:** Regardless of what the load cell manufacturers tell you, there is only so much electronic robustness you can introduce into a scaling system that has bad mechanics. Load cells are designed ideally to see axial loading in one direction—either compressive or tensile. As soon as you begin using them as structural components that see eccentric loads or moments, things get out of whack. Your system should be designed to minimize or eliminate eccentric loads on the load cells. If you cannot, things like ball joint or clevis mounts help to stabilize and more evenly distribute odd ball loadings.
- b. **Isolation:** This is mechanical and pneumatic isolation. All weigh vessels at some point should have flex connections that are near weightless in and out of the weigh vessel. This minimizes the effects of these transitions on what is actually getting weighed. If you're in a busy industrial environment, vibration isolation mounts on the scaling equipment is a good idea (granite base plates are probably excessive here, but do dampen factory vibration at the floor). Similarly, dust collectors for the minors should use minimal air flow; just enough to keep the environment clean without compromising materials in the weigh vessel or pulling on the scale.

2. **Resolution.** You will not get measurement accuracy in a scaling system that equals the load cell published accuracy. Whatever the measurement accuracy you want in your final mix, select your load cells with an order of magnitude higher resolution—minimum. Why? The mechanics of the system, delivery of ingredients to the final destination (say a mixer), and the addition of multiple ingredients will exaggerate error through tolerance accumulation. If you want final accuracies of +/- 2%, use load cells accurate to +/- 0.2%.

3. **Calibration.**

- a. **Linearity:** Due to the eccentricities that many systems have in loading (see Mechanics above) and compensating for the base weight of the components of an unloaded system, most scaling systems will not calibrate linearly. Your control software should be equipped with an algorithm to calibrate to multiple weigh points and do a best fit for measurements that fall along the grid.

- b. **Taring:** Most control systems for ingredient weigh systems have auto-tare features that reset zero point, or the empty vessel condition, every time you weigh. If your control system does not have this feature, establish a procedure to tare the system at least once per operating shift. The zero point can drift over time and affect your delivered accuracy adversely. Don't let it.
- 4. **Timing.** In any manufacturing environment, it is axiomatic to state that time equals money. Be careful that in the zeal for the most attractive process times you don't sacrifice accuracy. Focusing specifically on settle times in the weigh vessel for materials that have been dropped into the basket. The load cells need a few seconds for the mechanics to settle out and for vibration to go to steady state. This way, what you get is what you get.
- 5. **Discharge.** When you are weighing pellets, powders, or any solids to get an accurate measurement for the next process, it is critical that all the material that is supposed to evacuate the weigh vessel and convey to the next machine actually make it. If not, your scales can tare to zero with material in them that breaks loose and causes an overflow condition that is not predictable and will lead to a quality problem. Angles of discharge for gravity vessels should be determined by experienced professionals (like 70° for most powders). Discharge aids such as vibration or air purge can help get all the materials out of the scaling vessel as well. Of course, check weigh vessels periodically (at least every shift) to ensure all the product is moving along without hangup and to see if there is a chronic condition that needs to be addressed.

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