MEASURE TWICE, CUT…NONE

Remember when you were a kid and your Dad the carpenter was showing you how to do it the right way? This was way before guys in orange smocks ran demos at the *Home Depot*. Dad was the man back then. He taught you how to whittle safely; you graduated to some power tools; and, if you were really a star, you got to use the belt sander. No self-respecting male who had such a patriarch is unfamiliar with Dad's Boy Scout-like mantra of preparation,

> *"Measure twice, cut once!"*

Present day: You work in a place that produces stuff that requires a very specific recipe of ingredients, precisely mixed, or else the end product that the consumer sees gets complaints or, hopefully, gets trashed in your plant's QC inspection. It could be plastic compound, or wood-composite blend for decking, or dehydrated food for that matter. It's gotta be accurate or else your (or someone else's) goose is cooked.

But what do you mean by accurate? Let's try +/- ½% or thereabouts. If your product's manufacturing process is so robust that you can stray a few percent in any direction, this article isn't for you. For most companies, their formula, their recipe, is proprietary, unique and may provide a significant competitive advantage in the marketplace.

Plant Idealism vs. Reality

If you're mixing ingredients, let's call them minors, you've pretty much seen it all over the years and you know that, regardless of what you might want, high measurement accuracy comes at a price, usually an elevated one. Budgets being what they are, you opt for the combination minors system from volumetric feeders. It might look something like this:

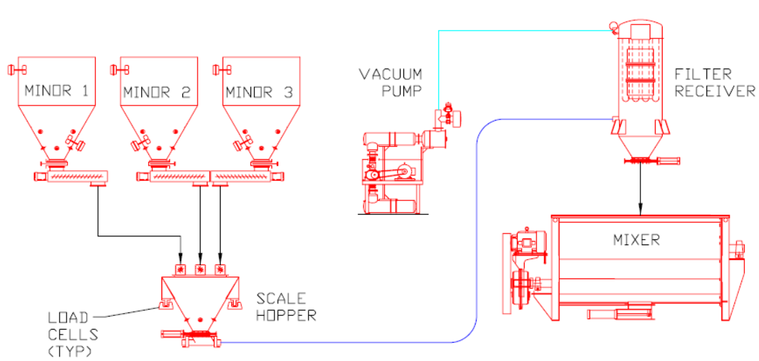

Figure 1 – Typical minor ingredient combination weighment.

In the figure, note how the 3 minor ingredients dump into a common hopper on load cells. That hopper is set to weigh the first ingredient, then systematically the next to a set point and so on.

Now here's a key question: if the first 2 ingredients are on the high side of their tolerance, what must happen to the third in order to satisfy that load cell reading? It *has* to be below tolerance. Does it matter? How accurate does your formula need to be? If you're blending powder compounds, some of the materials are a bit dicey to handle (like TiO_2). Suppose some of the material in the scale hopper gets stuck in the throat or the line when its time to send the mix to the receiver above the mixer. You can have an underweight batch, which isn't so bad, or a bad mix depending on what got hung up.

Inaccuracy Can Cost You

Let's take a look at the cost of bad measurements. Y don't know you have a bad batch yet, right? It gets processed because your controls told you everything was AOK. Into the mixer, perhaps stored (with other compound!), and then onto an extruder, molder or other recipient of the ingredients. What tells you when the material has gone south? Perhaps end of line quality inspection, or worse yet, your customer discovers it with a product that fails.

We had an experience with an irrigation installer that used some pipe from a major supplier that cracked underground—all of it—during routine use in its first summer. Clearly a manufacturers defect, the entire lot of pipe for multiple customers who had the issue had to be dug up, recalled and replaced at the manufacturer's expense.

If it's not that bad and you catch it at QC, here are some numbers. Say your compound costs about $0.45/lb, a pretty reasonable number. Now your mixer batch is 1200 lbs, and before you notice the problem coming off the line you have ripped out 5 batches of bad stuff.

1200 x 5 x 0.45 = $2700

Not so bad, only a mere $2700 in wasted material. Maybe you can reprocess the bad product as scrap and introduce it in small percentages back into manufacturing, and maybe you can't. Even so, you now have to collect 3 tons of scrap (3 1 ton Gaylord boxes for instance), grind it, move it, store it, handle the heck out of it.

A Different Approach

Lots of ways to get more accurate, and they usually involve load cells. Let's take a look at Figure 2.

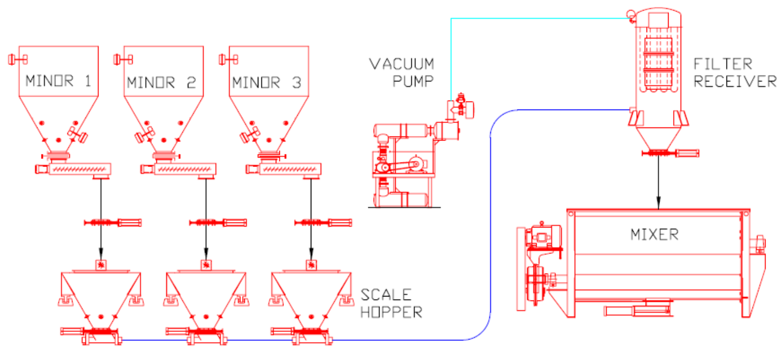

Figure 2 – Individual weigh, check-scale weighment.

Each of the minor ingredients is fed into a weigh basket decked out with load cells - each is weighed separately within its tolerance band to eliminate tolerance accumulation in the summation method shown earlier. Then they get drawn into a vacuum receiver and *weighed again—the check scale weighment.* If any residual got caught somewhere in the lines and the weight doesn't pass muster, an alarm sounds and you can disposition the bad batch immediately, first time through, before you process it and add good money after bad.

Time saver? Yes indeed! What about overall economics? We've been doing this for a few years with compounds that do require a high degree of accuracy. Data on bad batches and comments from our own customers tell us that the ROI on a more advanced system is less than 1 year. By measuring twice you ultimately end up cutting none, meaning no bad batches.

So it comes down to risk and the uniqueness and accuracy requirements of your formula heading to the mixer, and of course the most important issue, the consequences of failure reaching your customers' doorsteps. If that is no big deal, you don't need this approach. If you think there is trouble brewing, there probably is.

To get the top 5 tips for your material handling measurements to be at their best, email me at solutions@oanewton.com and mention MEASUREMENT in the subject line.

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