SIZE MATTERS

We are reviewing pneumatic conveying systems for delivering raw materials to extruders, mixer/coolers, and other points of manufacturing. The engine of any pneumatic conveying system is the blower unit. Whether pushing with pressure or pulling with vacuum, your blower is the device that paces your system. It's also the easiest device to tinker with when the extruder demand of 2000 lb/hr that your system was designed for that will never, ever increase goes up to 3000 lb/hr six months after installation. Change the belts, modify the sheaves, install a turbo-charger—tisk, tisk. You can get some short term gain here, but at what cost?

Blower Challenges

Blowers cost good money. So do vacuum receivers. When faced with a capital budget dilemma, one of the first things a cost-conscious project manager will elect to do is down-size and up-tempo. Buy them smaller, run them harder.

> *Translation:*
> *harder = higher pressure = hotter = frequent breakdowns .*

Let's take a look at some typical problems with conveying material that can be traced to system and blower package design.

Trouble Brewing	Usual Root Cause	
	Pressure Systems	***Vacuum Systems***
Product degradation, angel hair, etc.	Velocity too high, elevated temps, undersized line	**Velocity too high, elevated temps, undersized line**
Slugging and plugging	Velocity too low, not enough air for line size, pressure too high	**Velocity too low, not enough air for line size, pressure too high**
Belts, sequencing valves wearing out prematurely	Undersized unit, running too fast	**Undersized vacuum receiver, frequent fill cycles**
Degrading capacity delivery	**Improper venting of receiving vessel, clogged filters**	**Insufficient air volume, clogged filters**

Ultimately any pneumatic system is all about balance—the balance between pressure and velocity, between the volume of material being moved and the volume of air to move it—and maintaining that balance over time. When blowers, convey lines, and receivers are undersized, your options for performance enhancements are limited (without buying new ones of course). Pressures increase to force more material through a fixed diameter line, creating velocity challenges and material damage while simultaneously placing equipment in the critical operation zone. Receivers have to discharge more often to meet demand, meaning more cycles and start/stops at the blowers. The interesting thing is that in many cases, increasing the blower velocity and pressure does NOT move more material through the convey line, often compressing powders and passing right over the lump of stuff in the bottom of the line.

Hidden Costs

"But wait just a minute, my smaller blowers cost me less—take a look at my receipt!" Really? Let's compare *cost* versus *price*. People often mix these up. Undersized blowers are priced less, and if you're in charge of capital procurement and not operations, that helps you and might be all you really care about. If you're the GM, tasked with running the whole operation, more details come into play for you, and you're more likely concerned with overall cost. Let's talk about a few elements of cost that are hard to quantify, but could be using your operating cash:

Heat

Heat is generally a bad thing for mechanical components, be they cars or blowers. Run blowers at higher velocities, you'll generate more heat, it's as much a physical law as gravity. Add that destructive element to the start/stop wear and tear mentioned earlier and you can start thinking about replacing these sooner than you anticipated (or budgeted!).

Here's a quick definition of maintenance common sense and lean thinking: we keep an extra of every size blower in inventory just in case the one on the line breaks. Now that's a classic two-bagger. We get that a lot. M A Y B E I T ' S B E C A U S E Y O U ' R E R U N N I N G T H E M T O O H O T !

Energy

But wait, it gets better! Blowers operating at or near their maximum output rate (I know *you* would never push them beyond the recommended rate, would you?) draw more current than those not taxed as heavy, and that means more electric consumption during what are generally peak hours (1st shift). Procurement guy doesn't usually think about that little nugget, yet budgetary accounting somewhere in your organization is laying into Operations about kVA.

Noise

Quiet little things, these blower packages, aren't they? More sound means more dB, more operator complaints, bad site tours for customers and that division president from Switzerland, and more Excedrin. We've actually had to install soundproof curtains and rooms around existing blowers in-plant left behind by others. Pretty economical, huh? Depending on your local codes, some smart design, and personal tolerance, it needn't be that way.

Right-Sizing

So how does size help? Upsizing blower capacities just one tick provides a larger volume flow band at lower pressures. Larger end receivers mean longer fill times and less frequent cycles, saving on equipment maintenance costs and downtime in production. Combined with larger blowers, increased line sizes allow for more air to convey product at lower pressures and velocities to prevent plugging, material damage and minimize poor performance.

Do we really need to get into a full-blown cost analysis of power consumption and the other hidden costs from the previous section? Sounds simple enough, but the facts are that many systems we assess and ultimately repair or replace have insufficient blower capacity as the source of the problem. This pneumatic conveying stuff is not splitting the atom. Find a good specialist who knows this stuff cold, get him or her to size your system right, and sleep easy knowing you've got the best, most cost-effective system for your operation.

By the way, if you want to lay hands on the top Technical Tips for Optimal Blower Design and Operation, email us at solutions@oanewton.com and mention BLOWER TIPS in the subject line. Never forget than when it comes to pneumatic conveying blowers, size really does matter!

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