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SUPPLIERS' TIPS

When I speed up my blower, my conveying rate goes down. Why?

If you speed up a blower, you're increasing the airflow going through the conveying line. Increasing the airflow through the same-diameter line will increase the pressure drop in the overall system. This higher airflow contributes to a reduction in the blower capacity that's available to provide the work of conveying the material. The end result in most cases is an overall decrease in system capacity.

A direct side effect of the increased airflow would be an increase in material velocity, which contributes to higher frictional losses and potential material degradation (such as streamers for softer materials and dust generation for harder materials). Increased airflow can also increase your conveying equipment's required maintenance because it will increase filter demand and create the potential for line wear and leaks, especially in turns and elbows because of higher friction and an increase in impact potential at these points.

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With pneumatic conveying, a common misconception is that a dilute-phase conveying system's capacity can be increased by increasing the airflow rate. The total pressure drop in a system is the sum of the pressure drop incurred from the solids and the air (or other gas) moving through the conveying line and filter.

With a *pressure-limited* system, meaning the maximum pressure allowable is limited by a pressure-relief valve, a vent, or a pressure sensor and control system, increasing the airflow rate will increase the pressure drop from the air at the square of the line's air velocity, according to Darcy's Law. Since the maximum pressure is limited, this requires the pressure drop component from the bulk solids to be reduced. In other words, your solids conveying rate must go down with increased blower speed.

Simply speaking, the additional energy (pressure) needed to move the extra air through the line would take away from the pressure needed to convey the bulk solids. This assumes that total pressure can't be increased, as is generally the case with air movers such as fans or positive-displacement (PD) blowers. If you do have the ability to increase the pressure available to operate the conveying line, then increasing the solids throughput may be possible with an increased air velocity.

Remember to be careful with increasing pressure and air velocity because this can result in increased power consumption, which is a function of the cube of airflow, per a basic fan law.

As long as *saltation,* which is the settlement of particles in a horizontal line, doesn't occur or doesn't lead to conveying instabilities or line plugging, then lowering the blower speed and air velocity can often increase the solids handling capacity of the conveying line.

Also consider improving a poor line layout, which often has excessive elbows, lack of acceleration zones at the solids feedpoint and after sweeps, and messy transitions in diverter valves or line couplings. These can all contribute to increased pressure drop (energy loss) in a system and can limit the system's solids conveying throughput.

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There can be various reasons why your conveying rate is affected by blower speed. For example,

- Many blower performance charts are inaccurate, especially if your conditions aren't standard. As a result, the airflow may not be what you assume, and the whole conveying system could be unbalanced.
- In some conveying systems, increasing the airflow will push the system past its choke velocity at some point in the line, which raises the pressure and reduces the amount of material that can be conveyed.
- Increasing the flowrate may choke the feeder valve and make the feeder's fill rate less efficient, which will reduce the amount of material that can be fed into the conveying line.
- It isn't unusual to find that, because of the previous three reasons, slowing a blower down actually *increases* the material conveying rate.

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