SUPPLIERS' TIPS

What are some rules of thumb for selecting bends for my pneumatic conveying line?

The most common bends or elbows for pneumatic conveying are formed by bending a piece of straight pipe over a cold form mandrel. A common rule of thumb is that the bend's center line radius (CLR) should be twelve times the conveying line diameter. For example, a 4-inch conveying line should have bends with a 48-inch CLR. This allows the material to easily change direction and reduces impacts with the bend walls, which is especially important when conveying friable and abrasive materials. This rule doesn't apply if you're using specially formed elbows with back vortexes. These cast elbows have much tighter radiuses, but the vortex design reduces impacts by keeping material away from impact points.

Larry Eagan, regional sales manager,
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A good rule of thumb is that the number of bends you use in your pneumatic conveying line has a direct impact on the amount of air required to move the conveyed material. As the number of bends increases, the material velocity decreases. Minimizing the number of bends reduces the amount of air and energy required to convey. Additionally, a minimal number of bends also affords a smaller filter-receiver and decreases material degradation.

Steve Grant,
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The best rule of thumb when selecting bends for your pneumatic conveying line is to use 4-inch pipe with 4-foot bend radii.

Dinesh Mali, vice president of engineering, Caltex BMH Systems, 972-871-8400

A rule of thumb when designing a pneumatic conveying system is to reduce the number of bends used. This will decrease pressure drop, wear points, and material degradation and buildup. Make sure there's adequate distance between the bends to prevent the conveying system from plugging — the preferred distance is 30 pipe diameters or more between bends.

Choosing the best bends for your application will depend on the material you're conveying. Abrasive materials require elbows that resist wear, such as a blind tee, a pocket elbow, or a ceramic-lined elbow. For materials prone to smearing or building up, a flexible hose on a 10D radius works well. A typical dilute-phase conveying system normally uses a sweep elbow with a radius between 5D and 10D. In general, shorter radius sweep elbows will lower pressure drops.

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Most pneumatic conveying systems do need elbows. The first rule of thumb is to minimize the number of elbows (particularly back-to-back) and route the conveying line via the straightest path. This could mean routing across a building rather than following a perimeter. In general, the long-sweep elbow has traditionally given the best overall value of material cost to resultant pressure drop for most dilute-phase applications. The long-sweep elbow's radius is usually about eight to ten times the pipe diameter. A ventilation system uses elbows that have a radius approximately two to three times the pipe diameter. If you're considering using a smaller-radius elbow, keep in mind that as the material-to-air ratio increases, pressure drop effects become more pronounced.

You should also consider the material you're conveying. If the material is abrasive, specially designed elbows with wear chambers, hardened impact surfaces, or designs that incorporate material abrasion will provide a longer life and less maintenance. Materials that form angel hair or stringers work best with elbows that have interior treatments, such as shoot peen, spiral grooves, or specific geometry to reduce overall drag and friction. Material that builds up can be countered with hose elbows that flex and cause the material to flake off. In most cases, these special designs have higher pressure drops and higher initial capital costs and should be evaluated against your operating costs.

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Equipment suppliers are a valuable source of information about equipment and processes. In light of this, each month we ask suppliers a question of concern to our readers. Answers reflect the suppliers' general expertise and don't promote the suppliers' equipment. If you have a question you'd like suppliers to answer, send it to Alicia Tyznik, Associate Editor, Powder and Bulk Engineering, 1155 Northland Drive, St. Paul, MN 55120; fax 651-287-5650 (atyznik@cscpub.com).