

SUPPLIERS' TIPS

What are some tips for successfully handling my heat-sensitive material in a pneumatic conveyor?

Many heat-sensitive bulk materials, such as resins, food powders, and sugar, are routinely conveyed in pneumatic transport systems. The key to successfully transporting these materials is to use appropriate conveying gas conditions at the correct temperature and relative humidity.

The effects of elevated temperature on heat-sensitive materials can include gradual buildup in the conveying line and complete line plugging. For example, during plastic pellet conveying, deposits of plastic streamers and angel hair may form in the pipeline and cause buildup, especially in the elbows as pellets skid around the bends.

Before implementing a cooling system, determine if you have a positive-pressure or vacuum conveying system. If you have a positive-pressure conveying system, chances are the air entering the conveying line will be at an elevated temperature because of air or gas compression. Many temperature-sensitive solids will require air cooling to avoid this condition. With a vacuum system, ambient air at atmospheric pressure is typically drawn into the conveying line, avoiding significant temperature rise. If you're using a closed-loop conveying system, a heat exchanger can be installed before the solids infeed point to recirculate the elevated temperature air or gas.

Knowing a material's softening and melting points will help you choose the proper cooling equipment. Keep in mind that even if the melting point isn't achieved, particle softening can cause just as much trouble in the conveying line and in downstream handling equipment.

Various heat exchangers exist to reduce the conveying air or gas temperature. Many use chilled-water indirect cooling, which is a very simple but effective means of cooling. Besides cooling the air or gas with a heat exchanger, you may also have to reduce its humidity or moisture content. Knowing a material's hygroscopicity (ability to absorb moisture) will help you determine if you also need to dry the air or gas.

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Since the material is heat-sensitive, obviously you should avoid heat generation in the system. The simplest way to avoid heat generation is to use vacuum conveying instead of pressure conveying to avoid the heat of compression from the air supply. If the conveying line is located outdoors, shield the line from the direct sunlight in order to avoid heat buildup. Also, try using a closed-loop conveying system where the conveying air is economically cooled. If your process requires pressure conveying, install an air cooler before the material feedpoint. This will avoid the heat from the air supply, but watch out for moisture formation due to the compressed air cooling.

Paul E. Solt, consultant, Pneumatic Conveying Consultants, 610-437-3220

Although it depends on your material and application requirements, one way to handle heat-sensitive material is to reduce the temperature of the conveying air or gas in your dense-phase, dilute-phase, vacuum, or pressure conveying line. In addition, reducing the conveying velocity will result in less material contact with the pipeline, reducing frictional heat generation. Dense-phase conveying is the best bet for this type of velocity reduction. Many heat-sensitive materials also have a tendency to pack under pressure, so a dense-phase vacuum system would solve that problem. Be sure to find a pneumatic conveyor supplier that can conduct material testing for your specific material and let you witness the tests.

Mike Weyandt, corporate sales manager, Nol-Tec Systems, 651-780-8600

To successfully handle heat-sensitive material, the pneumatic conveying system must be designed with the lowest possible velocity within the required flow regime to reduce frictional heat. Using polished interior-diameter tubing also helps mitigate frictional heat by lowering the drag coefficient. You should also use vacuum instead of pressure conveying wherever practical to eliminate material exposure to any compression heat. However, if vacuum conveying isn't practical (such as with long runs or high tonnage rates), you can use heat exchangers to condition the conveying air source in a pressure conveying system. No matter what, use clean, dry conveying air at an approach temperature well below the material's softening point.

Bill Nesti, sales manager, AZO, 901-794-9480

The conveying gas temperature and other environmental conditions must remain below the material's threshold when handling heat-sensitive material.

When conveying gas is compressed, work is converted to heat. Therefore, vacuum conveying systems are typically used to handle heat-sensitive materials because the heat from the blower is exhausted and not introduced into the conveying gas (unless it's a closed-loop system).

Heat can be generated from friction between the material and the conveying line as it moves through the system. One way to reduce the friction is to lower the overall material velocity, which is typically done using sequencing systems or dense-phase systems to lower net velocities. Heat from a dilute-phase pressure system can be managed with a heat exchanger.

Finally, environmental conditions, such as direct sun exposure, can cause heat-related issues. Insulation, shields, and other measures should address these local issues to prevent heat addition to the system.

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