

3M Advanced Materials Division

3M™ Glass Bubbles Box Unloading Suggestions

Introduction

This guide provides suggestions for the efficient removal of 3M™ Glass Bubbles from boxes. The guide and suggestions are not intended for use as a system design specification. The user is responsible for determining the method and equipment for box unloading appropriate for the user's operation.

Note: Refer to the product label and Safety Data Sheet (SDS) for product health, safety and environmental information on glass bubbles. Refer to the glass bubbles Product Data Sheet for additional storage and handling information.

Note: The purpose of this guide is to provide basic information to product users for use in evaluating, processing, and troubleshooting their use of certain 3M products. The information provided is general or summary in nature and is offered to assist the user. The information is not intended to replace the user's careful consideration of the unique circumstances and conditions involved in its use and processing of 3M products. The user is responsible for determining whether this information is suitable and appropriate for the user's particular use and intended application. The user is solely responsible for evaluating third party intellectual property rights and for ensuring that user's use and intended application of 3M product does not violate any third party intellectual property rights.

Boxes

3M glass bubbles are packaged in approximately 10 cubic foot and 45 cubic foot (0.28 cubic meter and 1.30 cubic meter) boxes with a polyethylene liner. The plastic, open-top liner is tied at the top before shipping. The large box size is approximately 45 in L × 47 in W × 45 in H, (1.14m × 1.19m × 1.14m). The small box size is approximately 20 in L × 23 in W × 40 in H (0.51m × 0.58m × 1.02m). Filled dimensions can vary by product type. Large boxes are placed one per pallet. Small boxes are placed four per pallet. Typical stacking for shipping is two high while storage is three high. The maximum shipped height is 104 in (2.64m). The pallet is a two-way entry type. Large boxes are shipped in a "high cube" trailer or a 40 foot "high cube" seagoing shipping container.

Box Unloading Overview

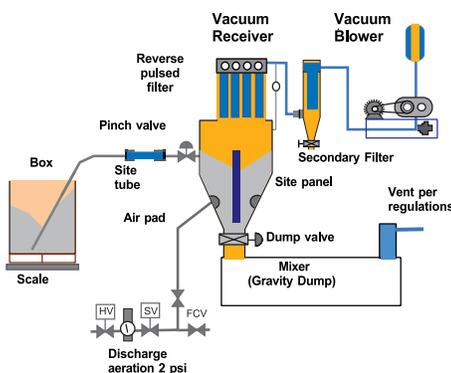
Typically, boxes are emptied by vacuum suction. Vacuum can be obtained from a vacuum receiver or a double diaphragm pneumatic pump. 3M glass bubbles are pulled through a wand placed in the box, then through a conveying line for a predetermined time or until a desired weight or level is obtained



in the receiving vessel. Filters separate air from the material in the receiving vessel. The filter is often cleaned with a pulsed, high-pressure, conditioned, dry air. Dust collection trunks or hoods are placed around the box in the unloading area. Bucket transfer, or dumping boxes into a hopper or mixer, is not recommended because it can create dust in the work area. Boxes often are placed on a vibrated tilt table in order to aid transfer of materials to the process. Small amounts can be metered to the process by placing the box on a floor scale.

Vacuum Transfer

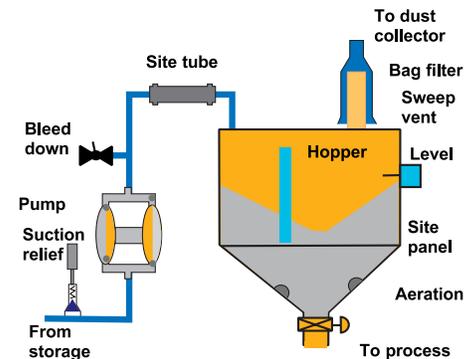
The vacuum transport system is a pull-only conveying system. The pull system operates at a negative pressure, below atmospheric. It may use a venturi, two-stage fan or a positive displacement blower (illustrated) to move the air that carries the material. The vacuum system will move material at higher line velocities than a pump system. The advantage is that it does not emit particles into the work area. The vacuum system is also not prone to line plugging problems. The primary filter is usually cleaned with pulsed, high-pressure, clean, dry air. A secondary filter is placed after the receiver filter in order to protect the fan or blower. An adjustable vacuum relief valve regulates vacuum in the receiver. Typical suction is 50 to 100 inches of water column. A sight panel and aeration of the hopper is suggested. Aeration pads are typically offset away from the center axis, near a corner of a pyramidal hopper and at different heights in the transition section. The transition section is the converging section from the hopper vertical section to the discharge valve. With hopper aeration, bubbles will flow easily. This has the advantage of reducing height for fitting into a height-limited area above a mixer. Typically, bubbles are metered continuously to a process using a loss-in-weight screw feeder. Batches processed are charged by weight from a hopper on load cells or by placing the box on a floor scale.



Ingersoll Rand pump shown for purposes of illustration

Pump Transfer

A three-inch pneumatic double diaphragm pump is typically used to move lightweight powders. It is a lower initial cost method that effectively transfers aeratable low bulk density powders. The air-driven pump is a combination pull/push, vacuum-pressure conveying system. The pump pulls material by vacuum into its inlet, then pushes the material along the conveying line with pressure. In the pressure conveying system, poor line connections will leak dust into the workplace. The pump can be placed closer to the process in order to pull material a longer distance. This will reduce line plugging. Adding purge air into the pump chamber when the pump is pushing material into the line helps to decrease pump plugging and stalling. Do not stop the pump when it is full of powder. Often a vacuum relief valve is mounted close to the pump suction port. A bleed-down valve at the pump outlet is suggested for relieving pressure from a plugged line or pump. Purging the pump and the conveying system with air or other compatible gas is suggested before and after glass bubble transfer. Operate the pump between 25 to 50 psi and below the hose maximum burst pressure rating.



Conveying Lines and Hoses

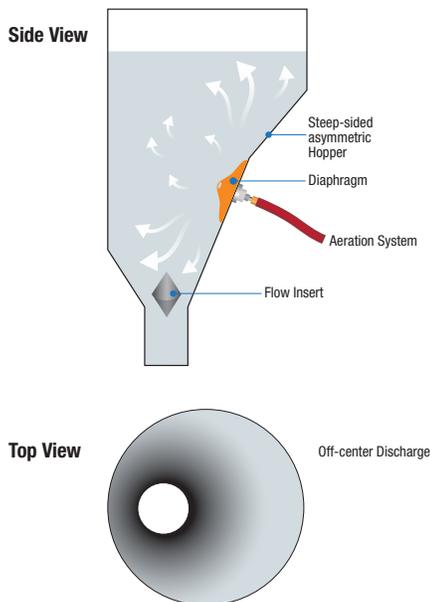
Conveying lines connect the various system components for glass bubble handling. Typically, a transfer system uses 3-inch (76mm) components. 3M™ Glass Bubbles should be transferred with a line velocity of less than 1200 ft/min (365 m/min). Lines with long radius bends or sweeps are suggested instead of ninety degree elbows. Lines can be combinations of rigid and flexible materials. All conveying lines and all components should be electrically grounded. Hoses with a smooth inner bore and a conductive drain wire are suggested. The drain wire must be connected to metal connectors. Flexible lines may range from braided chemical hose, semitransparent PVC, clear polyurethane to interlocking metal hose. Be careful, however, as some hose materials are limited to use in temperatures above 20°F.

Flow Aids

Experience shows that fluidizing a material makes it much easier to handle. Air assists in the conveying line are used to keep conveying lines trouble-free. They are typically mounted at the bottom of vertical line legs and about every fifty feet in horizontal line runs. Air pads mounted near the discharge port in hoppers are suggested to help fluidize material for easy transfer.



Nal-Tec Systems shown for purposes of illustration



Sight Windows and Sight Tubes

Sight windows and sight tubes are used to observe material flow in order to locate a problem in the transfer system. Suggested mounting locations are at the pump outlet or the bottom of vertical legs, or optionally at the receiving vessel entrance. Sight tubes use Pyrex® glass or transparent PVC schedule 80 tubing. Grounding with a wire across the length of the sight tube is suggested. Polycarbonate material is suggested for sight windows.

Tilt Table

Large boxes are often placed with the pallet on a tilt table. The table is tilted after a portion of the material has been removed. It may include options for a wand holder and vibration.

Note: Excessive vibration will decrease glass microsphere transfer rates.

Wand Pickup

Aerated pickup wands are often constructed from rigid pipe. The wand is fitted with a low-pressure compressed air line to fluidize material near the tip. The wand tip has a protective guard to reduce plugging with the plastic protective liner in the box. This enables the system to resume transfer even if the tip is covered with material. The diameter is the same as the hose connection. Fluidizing air must be synchronized with the transfer system operation.

Box Unloading Procedure

The following outline is suggested for preparing box handling procedures.

Preparation

1. Wear approved safety goggles and appropriate NIOSH/MSHA-approved respirator.
2. Remove all items from pockets that could fall into an open container.
3. Designate a box emptying area, preferably isolated from the main work area.
4. Place a suitable dust extraction trunk or hood near or in the vicinity of the box top.
5. Always remove the package containment items such as banding, cover, and bag closures slowly in order to minimize dusting.
6. Open the plastic bag box liner very slowly in order to reduce dust emissions.
7. Carefully pull the liner top slowly over the box sides, while forcing material that has gathered in the liner creases back inside the box.

Unloading (assumes full box)

1. Turn the transport system on.
2. Purge the system for a short time, perhaps 20 to 60 seconds.
3. Insert the wand into the box at one of the top corners.
4. Slowly guide the wand diagonally through the microspheres to the opposite bottom corner. Continue this procedure until the wand can be placed unattended in the trench near the box bottom. This will allow material to fluidize as it falls from the trench walls into a pool for pickup by the wand.
5. When the box is partially empty raise or tilt the box from one corner.
6. Vibrating the tilt table is helpful after a portion of the contents has been removed. Manually shoveling material toward the wand pickup tip also helps to improve transfer rate.

When unloading is nearly complete

1. Slowly gather and collapse the plastic liner into a pocket forcing material in order to allow the wand to withdraw all the material from the plastic liner.
2. Close down the liner top onto the wand or hose in order to use vacuum to collapse the liner to reduce dust in the work area.
3. Wrap, wind and secure the balled-up liner with 3M filament strapping tape or other suitable material.
4. Place plastic, cardboard and pallets in the proper recycling areas for later disposal.

Note: For product health, safety and environmental information, please read the product label and Safety Data Sheet before using product.

Appendix: Equipment Manufacturers

The following equipment manufacturers are identified for your convenience. 3M makes no representations about the manufacturers or their equipment. The user is responsible for determining what method and equipment are fit for a particular purpose and suitable for the user's application.

Systems

Nol-Tec Systems, Inc.
425 Apollo Drive
Lino Lakes, MN 55014
Phone: 651-780-8600
Web: www.nol-tec.com

Components

McMaster-Carr Supply Company
600 County Line Road
Elmhurst, IL 60126-2081
Phone: 800-990-7867
Web: www.mcmastercarr.com

Morris Coupling Company
2240 West 15th Street
Erie, PA 16505
Phone: 800-426-1579
Web: www.morriscoupling.com

Flow Aids
Solimar Pneumatics
7256 Commerce Circle
Minneapolis, MN 55432
Phone: 800-233-7109
Web:
www.solimarpneumatics.com

Porex Industries
500 Bohannon Road
Fairburn, GA 30213
Phone: 770-964-1421
Web: www.porex.com

Double Diaphragm Pumps

Ingersol Rand Fluid Products
P.O. Box 151
Bryan, OH 43506
Phone: 419-636-4242
Web: www.arozone.com
Yamada America
1200 Nuclear Drive
West Chicago, IL 60185
Phone: 800-990-7867
We: www.yamadapump.com
Wilden Pump & Engineering Co.
22069 Van Buren Street
Grand Terrace, CA 92313-5607
Phone: 909-422-1730
Web: www.wilden.com

Sight Tube

Harvel Plastics, Inc.
P.O. Box 757
Easton, PA 18044-0757
Phone: 610-252-7355
Web: www.harvel.com

Notes

Note: For product health, safety and environmental information, please read the product label and Safety Data Sheet before using product.

- Wear an appropriate NIOSH/MSHA-approved respirator and safety goggles when handling materials.
- Open containers slowly in order to minimize dusting.
- Do not tie the plastic bag box liner onto the hose or wand.
- Use aeration only when transferring material.
- Always run the system for several minutes without material in order to purge the lines.
- Keep all transfer lines plugged or covered when not in use.
- Place the vacuum wand in a wall mounted storage holder when it is not being used.
- Do not use the double diaphragm pump to meter materials to the process.
- Use vacuum to unplug blocked conveying lines.
- Use sight tubes in lines and sight windows in hoppers.
- Do not reduce a conveying line size to a smaller size (i.e., from 3 inches to 2 inches).
- Electrically ground all components in the transfer system.

Resources

For further information or sales assistance, please contact:

3M Advanced Materials
Phone: 800 367 8905 Fax: 800 81 8514

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