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AMO®

BAGGING SYSTEM

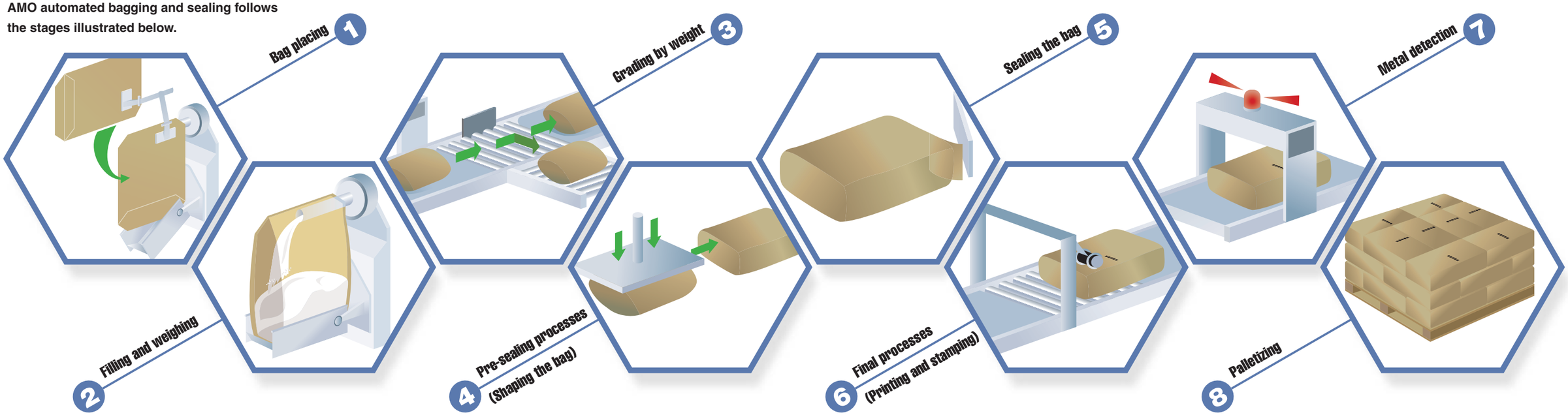
General Catalogue

2012.1.500

We provide the machinery and facilities for bagging of powders, as fully automated system solutions.

The Automated Bagging Process

AMO automated bagging and sealing follows the stages illustrated below.

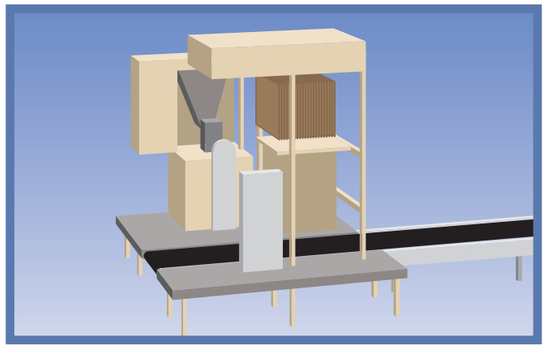


Various types of bagging lines

AMO designs and engineers bagging lines according to the specifications required by customers.
As shown below, there are four main processing types at the bagging line level.
AMO is also ready to discuss your requirements in the powder pipage and delivery system at the top end of the bagging process.

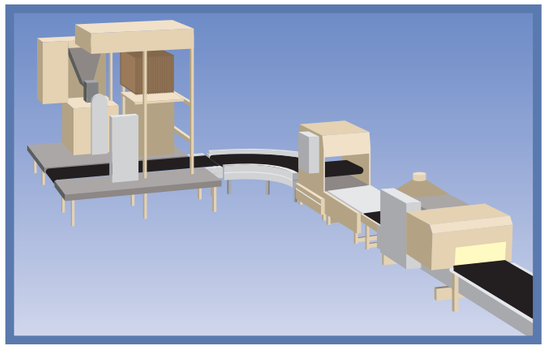
Stand-Alone Packer Unit

AMO's automatic weighing and bagging machine (the Packer) can operate as a stand-alone unit. The AMO Packer will deliver accurate quantities and improve operating efficiency when continuous operation is not needed, such as for smaller quantities of bagged products, or in cases where there is not enough space for a conveyor line. In addition, the AMO Packer creates a clean and comfortable working environment.



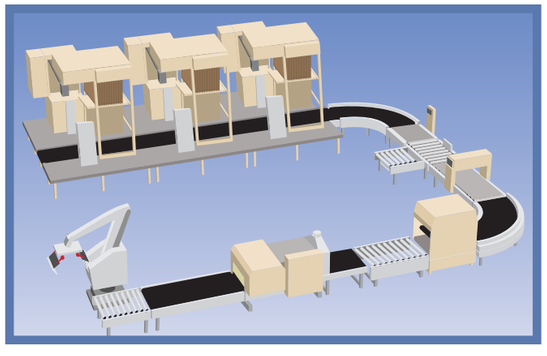
Packer and Bag Placer (Automated Bagging Facility)

An automatic bag placer machine was designed especially for the Packer. Linking the Bag Placer to the Packer creates an automated bagging facility. Installation of a belt conveyor can reduce the labor needed for bagging operations, and promises substantial improvement in efficiency of operations. One feature of this automated facility is that it does not take up much working space.



Automated Bagging Facility & Sealing Line

Although the Packer unit can operate as an independent unit, it shows its true value as part of a conveyor line that includes a Bag Placer machine and a bag sealing machine. Linking the operations of the machines on the line enables continuous, automatic operation. This represents dramatic increases in production capacity and efficiency of operations. Another feature of the AMO system is considerable reduction of space requirements, which was thought to be impossible for automatic systems of this kind.



High-Capacity Bagging Line

The flour industry requires high production capacity, and AMO systems satisfy that requirement. With interconnected control of up to four Packers and a high-capacity sealing machine, one line can now process 1,400 bags per hour. Talk with AMO about line engineering to obtain the maximum capacity out of each machine, and about total line design.

Meeting customer objectives and conditions with total support for automated bagging and sealing lines

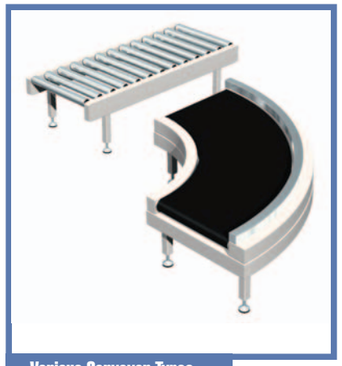
The machines in a typical bagging line

Packer

As an automated filling machine, the Packer measures the weight of powder or other materials it deposits into bags with valve openings. The machine type and options can be selected according to the type of powder and the capacity required. (Please leave selection and coordination of machines to AMO.) The Packer requires a separate AC power source, compressed air source, transporter facilities for carrying the powder to the hopper at the top of the machine, and other associated equipment.

Bag Placer

This automated placer machine for valve bags was designed specifically for the AMO Packer. The operator simply sets a batch of empty bags into the bag magazine; the machine then feeds the bags automatically to the Packer. The Bag Placer is suitable for all types of valve-nozzle bags and can be adapted for a wide range of bag dimensions, large and small. Like the AMO Packer, the Bag Placer is compact and needs only very little floor space. One Bag Placer teams up with one Packer.

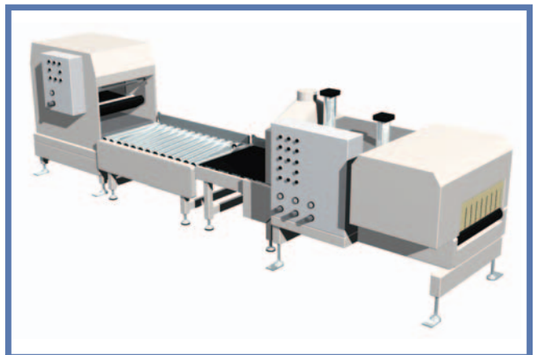


Various Conveyor Types

Various types of belt conveyors and roller conveyors necessary for a bagging and sealing line are available. These include the belt conveyor leading to the Packer and conveyors linking the various machines, direction-changing conveyors, and conveyors for optional equipment.

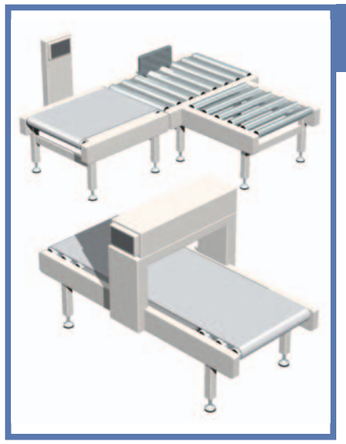
Design & Engineering

To obtain the maximum potential from lines and individual machines designed to meet customer specifications, AMO undertakes engineering studies of customer worksites. We consider this process to be essential for the safe and smooth operation of machines with individual specifications. Much more than just manufacturing and selling machines, AMO offers full solutions encompassing detailed line engineering.



Valve Sealer & Press Belt Conveyor

The machine for automatically gluing and sealing the valve bag after it has been filled with powder, and the press-belt conveyor, which undertakes pre-sealing processes, operate as one integrated unit. Furthermore, all machines on the line are controlled from a central console. AMO can customize all design and machine manufacture specifications to suit customer specifications and required capacity.

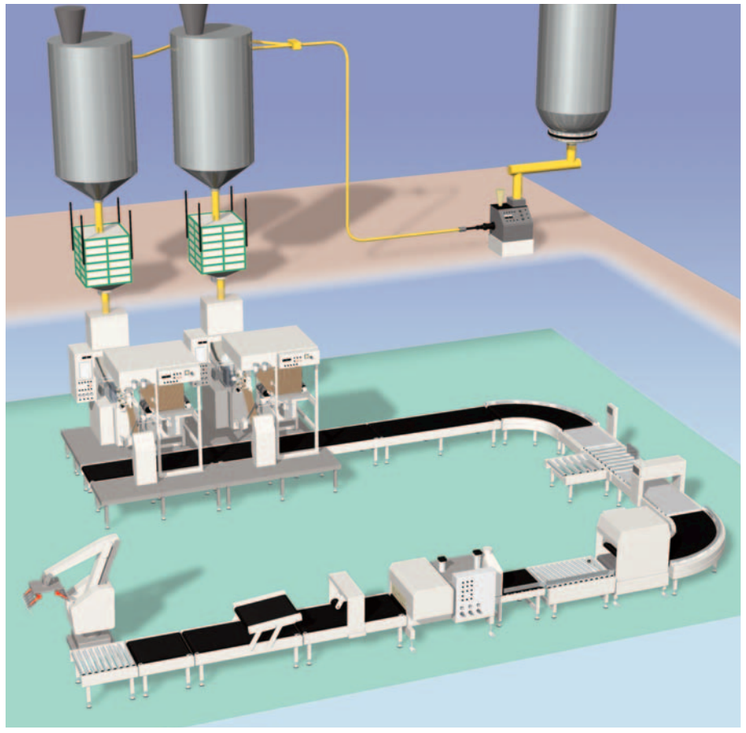


Metal Detector & Weight Checker

As the filled bags move along the belt conveyor, the Metal Detector detects any metal fragments that may have entered the powder or the bags. The Weight Checker is a weight grading machine with a high-precision built-in platform scale. Both made by other manufacturers, the Metal Detector and Weight Checker are incorporated into the line. AMO will select machine types, based on many years of experience.

Palletizer Robot

Made by another manufacturer and adapted for AMO systems, the Palletizer Robot automatically palletizes the finished products as they come down the line. AMO modifies and installs the Palletizer Robot according to available space, capacity requirements, and other customer needs.



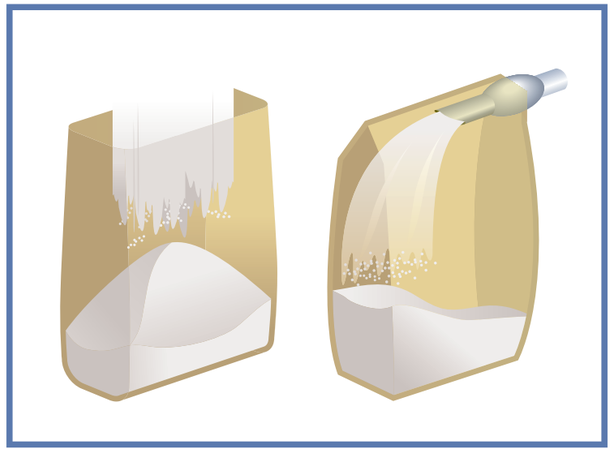
Choosing the right valve bag is essential for proper bagging.
We will recommend the ideal combination of powder and facilities.

Open bag & Valve bag

Broadly, there are two main bag types - the open bag and the valve bag. Although the multi-purpose open bag is widely used, the AMO bagging system is designed basically for the valve bag. The reason for this is valve bags have considerable advantages in terms of cleanliness, safety and efficiency.

For open-bag filling, the entire top of the bag is the mouth and powder is dropped into the bag from above. In contrast, the valve bag is filled through a valve built into one corner at the top of the bag. A filler nozzle is inserted into the valve, maintaining a closed environment as the bag is filled.

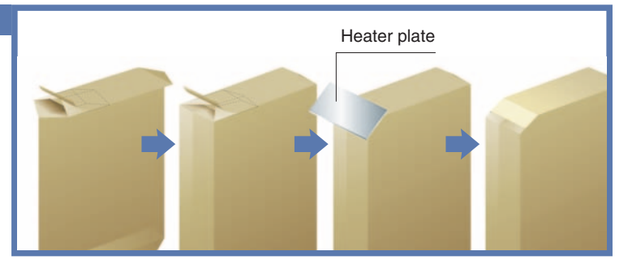
With a valve bag, the Packer unit will complete the basic processes of filling; there is no need for secondary processes, such machine sewing of the bag. Another considerable merit is that the valve bag enables smaller bag dimensions, with a higher fill density.



Types of valve bags & sealing methods

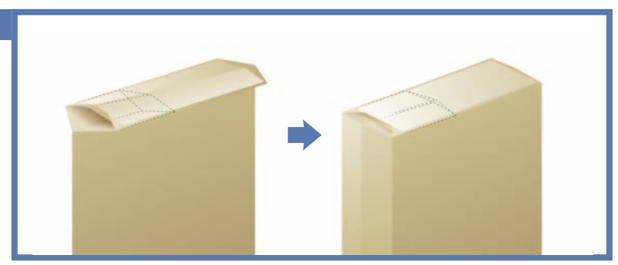
Inner Sealed Valve Type

The valve is inside the valve bag, and the bag is sealed with an adhesive sealing label. As the valve is inside, the possibility of powder spillage after filling is reduced considerably. The sealing machine covers that sealing label with adhesive and seals the bag. This method eliminates powder spillage after sealing and prevents foreign materials from entering the bag. The AMO system uses the inner valve bag for automated sealing.



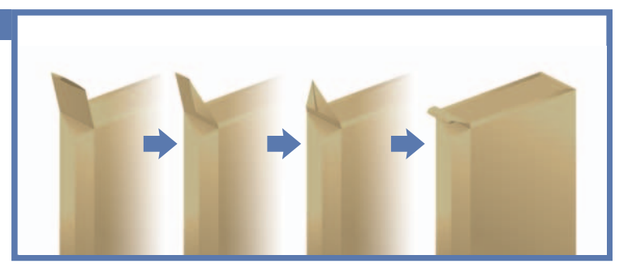
Inner Sleeve Valve Type

This is the general name for bags with internal valves. The Inner Sealed Valve Type, above, is one variation of the Inner Sleeve Valve Type. As the bag fills, the powder pushes the valve upward, effectively closing the valve and thereby preventing powder spillage. In other words, simply filling the inner sleeve valve bag prevents spillage of contents.



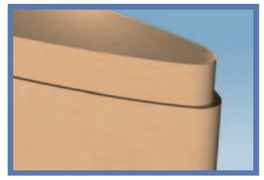
External Sleeve Valve Type

A bag with an external sleeve valve appears to have a tube extending from the bag. After filling, the bag is closed by folding the external sleeve valve. Adhesive or other sealants are not necessary, and the bag is effectively sealed simply by folding the valve. This valve bag and sealing method are thus often used for manual bagging operations. The valve can also be heat-sealed for complete closure.



Bag Specifications

Bag Materials

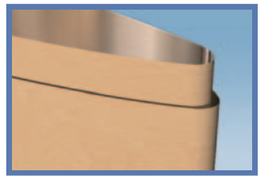


Kraft Paper Bags

Paper is widely used as the bag material in bagging of powders. It is the standard for many kinds of bags, due to cost, strength, ease of handling and other features.

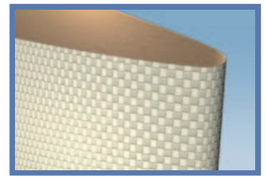
Polyvinyl-Kraft Paper Bags

A layer of plastic is inserted between layers of kraft paper. This type of bag features high resistance to moisture and is used for bagging materials that deteriorate in quality on contact with air.



Inner Laminate Paper Bags

These are kraft paper bags laminated with an innermost layer of plastic or other material. Inner laminate bags raise the level of hygiene as the powder does not contact paper. They are highly airtight and resistant to humidity.

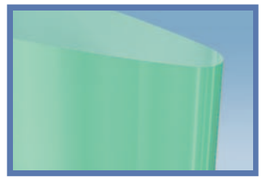


PP-Cross Internal-Layer Bags

From outer to inner, these bags have layers of PP-Cross, paper and film. They are used particularly for exporting, and other situations where high bag strength is required.

Slit Polyvinyl-Kraft Paper Bags

The plastic film in this bag is slit to allow air to escape more easily while maintaining a certain level of humidity resistance. Cement bags are usually this type of inner-valve bag.



Vinyl Bags

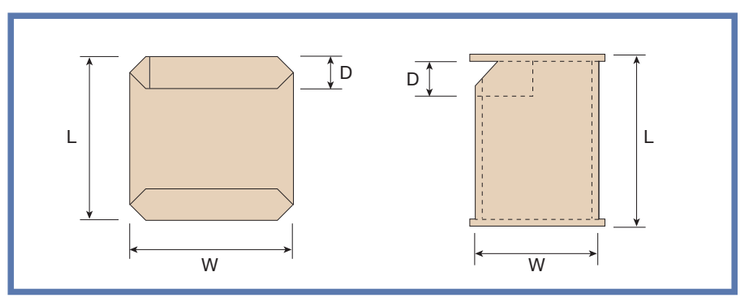
These bags use only plastic. They may be single- or double-layered and can be many shapes and sizes.

Layer Composition

Many layering variations of the bag types and materials outlined here are possible. For example, a bag might have three layers of kraft paper, and that bag could then be combined with a vinyl bag. Or, to reduce costs, a certain layer might be made of recycled paper.

Sizes of Bags & Valves

Even with the same materials and layer compositions, bags can have an infinite variety of valves and sizes. In the case of valve bags, the diagram below shows how bags are measured according to length (L), breadth (W) and flat width (D). Although the volume of the bag is roughly set by the length and breadth, the flat width is crucial when bagging. This is because the valve size is in many cases decided by the flat width. As the AMO Packer inserts a nozzle into the valve, the valve size must be selected to match the nozzle.



Example of Palletized Bags

When using valve bags, the filled bags can be neatly stacked on pallets, as shown below.

AMO Screw Type

The AMO Screw-Type Packer is a world-class machine. Innovative design and features are far ahead of other manufacturers.

The AMO Screw-Type Packer revolutionizes the powder-bagging worksite, which with other machines is a harsh, dust-filled environment for machine operators. Two internal screws combined with small quantities of compressed air are at the heart of the AMO method. This basic structure has been steadily improved over 40 years. The merits are acknowledged all over the world, as shown by the fact that some 4,000 units have been delivered in Japan and abroad. Due to the strength of reliability, it is now in practice the standard machine for bagging of powdered foodstuffs by companies throughout Japan. Of course, the AMO Packer is not limited to bagging of foodstuffs. The internal structure and bagging controls can be modified for bagging of just about any other kind of powder.

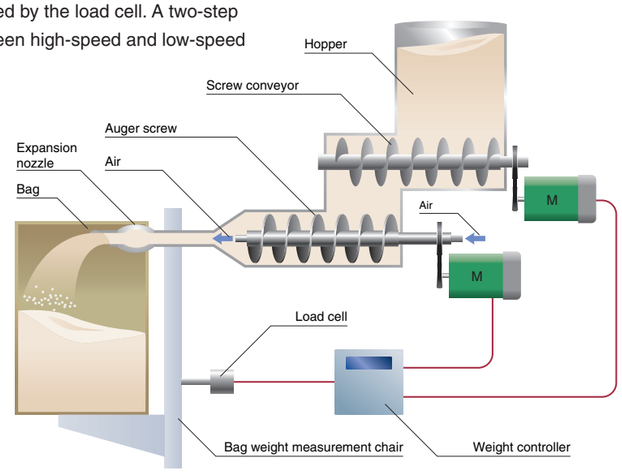
N-8E-300CST (With certain options attached)

Structure of the AMO Screw-Type Packer

Two screw conveyors transport powder from the hopper to the nozzle. Small quantities of compressed air sent to the nozzle force the powder through the nozzle into the bag. This is the basic structure of the AMO Screw-Type Packer. The screw conveyors operate according to electronic quantity data collected by the load cell. A two-step controller switches the Packer instantaneously between high-speed and low-speed operation, thereby enabling both high-speed filling and weighing accuracy. (A machine under linear control is now being developed.)

The nozzle section has a rubber expansion nozzle which expands to a tight fit on the inside of the valve while filling. This has the dual merits of stopping the nozzle from slipping out of the bag, and preventing powder spillage.

The material, pitch and other specifications of the auger screw are selected and coordinated according to the powder being transported. Furthermore, specific surface-finishing of screws and cylinders, and other modifications, enable bagging of powders with special properties, prevent contamination, and so on.



AMO PACKER
Automatic Set-Quantity Bagging Machine

Features of the AMO Screw-Type Packer

Virtually dust-free

The construction of the AMO Screw-Type Packer is such that the powder has no direct contact with outside air. It is effectively semi-closed. Moreover, the use of an expansion nozzle at the end of the nozzle section seals the connection between nozzle and bag while filling. The AMO Screw-Type Packer therefore raises almost no dust.

Compact & convenient

The AMO Packer is extremely compact, at about 1.2 m wide, 1.8 m deep and 1.9 m high. This machine is a flexible solution even in cases where there is not much space for installation of the Packer and other machinery. Because the Packer needs only an AC power source and a source of small amounts of compressed air, it is ideal also for small-scale facilities.

High fill density with valve bags

When filling open-top bags, the nature of the system makes it impossible to raise the fill density. The shape of the filled bag is irregular, and the lack of uniformity causes problems with packing on standardized pallets. The AMO Packer uses valve bags and easily achieves a high fill density. Automated palletization is thus no problem.

Prevention of contamination

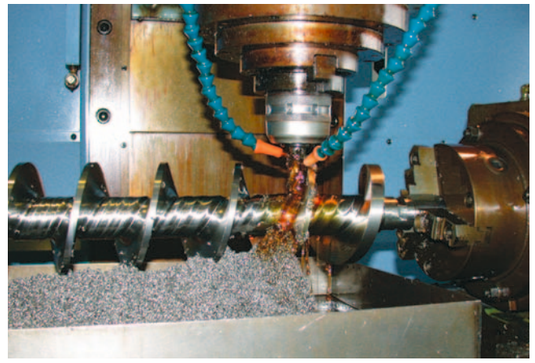
The semi-closed structure of the Packer essentially prevents unexpected accidents such as foreign bodies entering the powder from outside. Furthermore, components coming into contact with powder are designed to maximum safety specifications to virtually eliminate the possibility of machine elements dropping into the powder. Please ask us about contamination prevention measures under HACCAP and ISO9000 series guidelines.

Expanding to automation of bag placement & sealing

As a total solution manufacturer, AMO designs and makes automated lines including bag placer and sealing machines. For customers who installed the AMO Packer and are planning to automate, we will take responsibility for development of automated production lines.

Each machine is custom-made

We custom-build the auger screw and other components for the AMO Packer. This enables us to provide customers with machines ideally suited to their specific objectives.



Machining an auger screw that has been designed for a specific type of powder handled by a customer

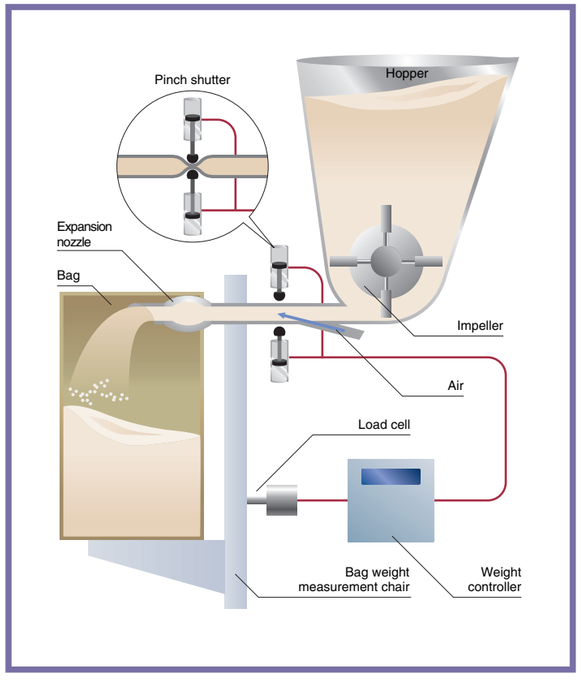
The Airless Packer range

In contrast to the standard AMO Screw-Type Packer, the Airless Packer uses no air, only the screw, to bag powders. This machine exercises its strength in filling airtight bags with powders that have very high fluidity when mixed with air, materials with extremely low fluidity, materials with adhesive properties, and other powder types with special properties.

Impeller Type

**Super-high-speed filling of highly fluid powders.
Ideal for cement and other mineral-based powders.**

Although the screw conveyor has high volume measurement accuracy, it also has fundamental performance limitations.
In addition, the screw conveyor cannot easily transport powders with high fluidity.
The fixed-quantity bagging machine using a rotating vane (impeller) was developed to overcome this difficulty. This unit does not use a screw conveyor and achieves super-high-speed filling.



Merits of the Impeller type

Capacity emphasis cuts fill-cost per bag

Bagging capacity is crucial when cutting costs through mass production. The Impeller bagging machine is also available as a single-step-control model. This machine can fill a bag with 25 kg of portland cement in just 5 or 6 seconds.

High wear resistance for working with mineral powders

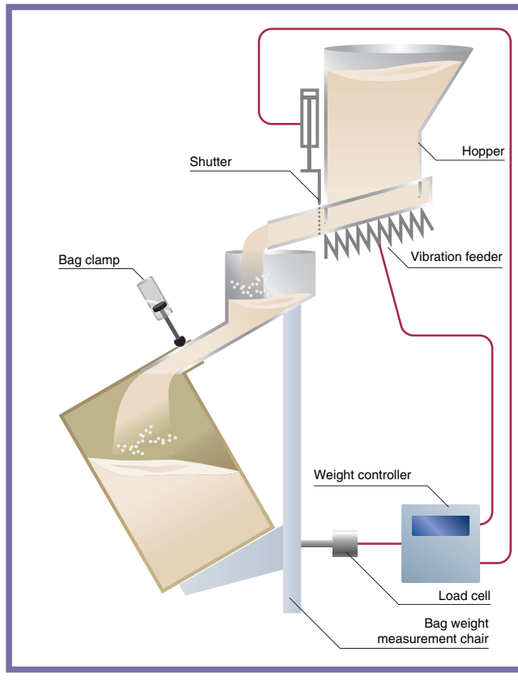
Generally, machines working with hard materials such as mineral powders require frequent maintenance of components due to heavy abrasion and wear. In contrast, the Impeller Packer uses parts with high resistance to abrasion and wear, greatly reducing the frequency of parts replacement.

AMO PACKER
Automatic Set-Quantity Bagging Machine

Gravity-Flow Type

Accurate bagging of fragile granular products into valve bags.

Granular products that risk being compressed and damaged by the screw conveyor method of transportation can be efficiently bagged using gravity. The AMO Gravity-Flow Packer uses a vibrating feeder to smoothly shift the powder. The two-step flow-volume control at the gate raises the measurement accuracy far above that of other machines.



Merits of the Gravity-Flow type

Granular products into valve bags

The structure of valve bags minimizes the risk of powder leakage and spillage when filling. We recommend this machine for filling valve bags particularly with products of high unit value, and if you wish to minimize the risk of product spillage due to filling errors.

Reduced size of facilities

Granular products tend to be bagged by the open-bag method. However, the machines for this purpose are usually large and bulky. In contrast, the AMO Gravity-Flow Packer is comparatively small, and can be operated independently if the appropriate power supply and compressed air supply are available.

Options for the Packer

Service tank

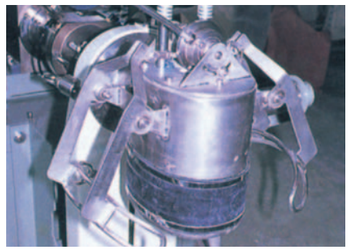
A service tank can be attached to the hopper to maintain the level of powder in the hopper. This will further improve filling volume accuracy.

Pinch shutter

Standard feature on

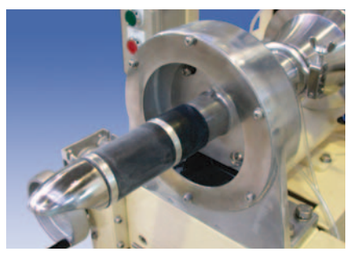
When bagging highly fluid powders, powder tends to leak from the nozzle after completion of filling. This device raises volume accuracy and the level of worksite cleanliness.

Attachment for open bags



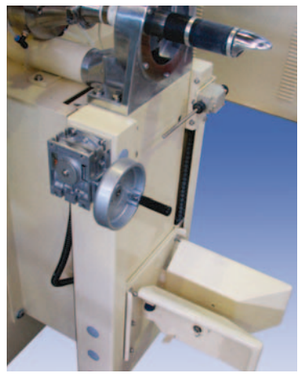
This option attaches to the nozzle section of the AMO Packer to enable filling of open-mouth bags. Attachment and removal are simple, and can be completed in a short time.

Dust collection hood



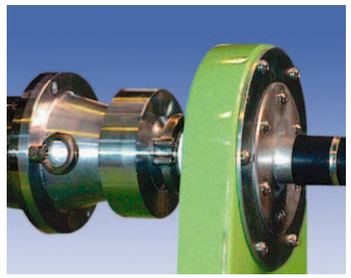
After completion of filling, the expansion nozzle contracts and separates from the bag. This option captures powder that escapes upon removal of the bag from the nozzle.

Bag chair height adjuster



With this device, the height of the bag chair can be adjusted for filling bags of diverse sizes, simply by turning the handle.

Metal detector



A small but highly sensitive metal detector can be attached to the rear of the nozzle section. If it detects a metal fragment, the detector stops the Packer and sounds an alarm.

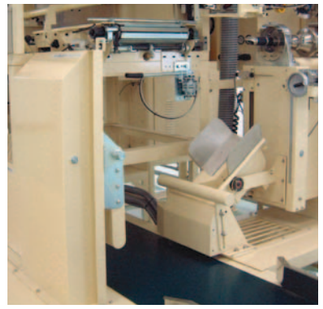
Cushioned tipping bag chair with air ejector

On completion of filling, this unit safely tips the bag onto one side and prevents the bag from becoming soiled or damaged. If using kraft paper bags, an air ejector function can also be applied.

AMO PACKER
Automatic Set-Quantity Bagging Machine

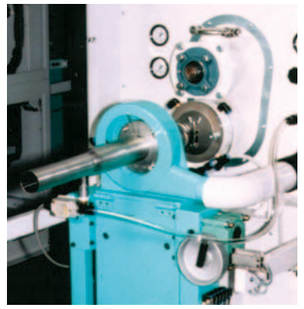
Options for the Packer

Bag Tipping Guide



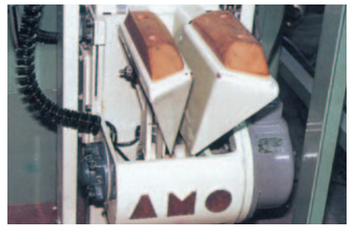
The Bag Tipping Guide attaches to the Packer and the belt conveyor in front of the Packer. It controls the tipping of the bag thereby reducing powder spillage. Moreover, this unit is essential for raising bag sealing precision.

Force-feed attachment



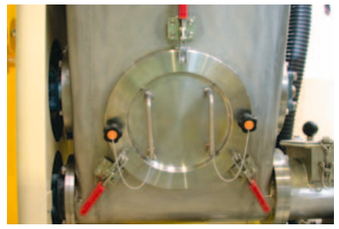
When changing the type of powder to be bagged, the force-feed attachment effectively forces out any powder remaining in the Packer unit, thereby improving work efficiency.

Bag chair with vibrator



The vibrating bag chair raises fill density when bagging bran and other powders with low specific gravity. It does not affect quantity accuracy.

Hopper cleaning hatch



A hatch is set into the side of the Packer hopper to enable internal cleaning and inspection when changing powder type.

Ring-nozzle unit

Standard feature on

When bagging powders with adhesive properties or low fluidity, forcing air into the powder as it moves through the Packer can improve flow. The ring-nozzle unit is one such device.

Ejector unit

When filling airtight bags, it is necessary to control backpressure. The ejector unit forces air out of the bag.

Blow-off device

The small amount of powder remaining in the nozzle after filling is blown into the bag with compressed air, raising volume accuracy and improving worksite cleanliness.

Can be used with the Screw type
Can be used with the Impeller type
Can be used with the Gravity-flow type

Flexible Container bags

The AMO Packer is a machine designed for bagging powders in valve bags up to about 50 kg in weight. However, we also have a range of machines for flexible container bags. Please contact our Sales Department for details.

AMO PACKER

Some of the main powder types proficiently handled by the Packer

Foodstuffs

Flour
Mixed flour
Tenpura flour
Cake-mix powder
Cornstarch
Processed starch
Potato starch
Sweet potato starch
Wheat starch
Tapioca starch
Rice starch
Dried pressed rice
Rice flour / glutinous rice flour
Buckwheat flour
Albumen powder
Protein powder
Superfine soybean powder
Curry powder
Cocoa powder
Food additives
And others.

Animal Feed & Fertilizer

Bran
Wholemeal flour
Pressed wheat / soybean
Rice sugar / wheat sugar
Coarse-grind old rice
Fish meal
Mixed feed
Fish-farm mash
Skim milk powder
Feed additives
Rapeseed husks
Barley crust
Chaff feed
Beer waste mixed feed
Dried yeast
Calcium phosphate
Corn feed
Gluten meal
Cornmeal
Corn flour
Corn grits
Semolina
Magnesium silicate coal

Chemicals

Coarse acrylic resin
Melamine resin
Methylmethacrylate
ABS resin
Polyvinyl chloride resin
Nylon resin
Polyethylene resin
Styrenic resin
Polypropylene
Vinyl acetate
Various types of resin pellets
Crystallized glutamic acid
Methionine
Sodium glutamate
Amino acid
Fumaric acid
Sodium propionate
Oxalic acid
Pentaerythritol
Isophthalic acid
Fatty-acid esters
Dicyandiamide
Cellulose powder
Enzymes
High-molecular coagulant
Desiccated biomass powder
BHC agrochemicals
Pigments / granular pigments
Dye intermediate
Rubber raw materials
Anhydrous sodium sulfate
Anhydrous silica
Crude oil pitch powder
Granular carbon
Activated carbon
Sulfur powder
Iron oxide
Zinc white
Metallic soap
Nickel sulfate
Manganese dioxide
Chromium oxide
Chromium chloride
Ammonium chloride
Barium chloride
Titanium oxide
Barium carbonate
Barium metaborate
Alumina
Magnesium hydroxide
Magnesium oxide
Calcium sulfite
And others.

Minerals & industrial wastes

Calcium carbonate (heavy)
Calcium carbonate (light)
Calcium carbonate (glutinous/colloidal)
Plaster of paris
Hydrated lime
Feldspar powder
Clay powder
Rock powder
Zircon sand
Silica sand
Magnesia clinker
Abrasive compounds
Talc
Activated clay
Dolomite
Bentonite
Graphite
Cement
Cement aggregate
Dry mortar
Welding flux
Castable
Foundry sand
Soil coagulation hardener
Coal powder
Glass powder
Wall materials
Wall spray finisher
Plywood adhesive
Polishing powder
Crude oil incineration ash
Fly ash
Powder from waste-water treatment
Dried manure fertilizer
And others.

AMO BAG PLACER

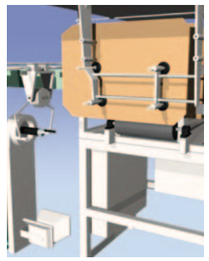
Bag Placing Machine

Promoting automated filling. The best partner for the AMO Packer.

The AMO Bag Placer automatically supplies empty bags, and was developed specifically for the AMO Packer. Previously, an operator had to manually open the bags and set them onto a bagging machine. Automation of this process is one step in today's completely automated bagging and sealing line. The Bag Placer features integration with the AMO Packer and minimal space requirements. Using an original method for turning the bags 90° and setting them onto the Packer, the Bag Placer needs very little room. The AMO unit is highly compact, compared with similar machines, and can be arranged so that it uses the space over the belt conveyor running in front of the Packer.

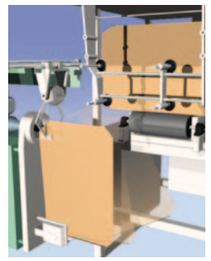
The AMO Bag Placer enables an extremely flexible response. Bag types can be changed with very little stopping time. AMO custom designs each machine according to customer bag specifications, valve construction, and so on.

Operation of the automatic bag placer

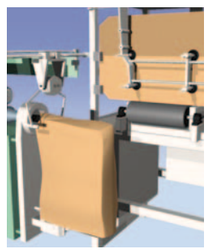


A suction arm pulls one bag from the magazine.

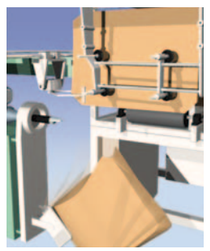
While clamping the bag, the placer opens the valve.



After turning it 90˚, the placer sets the bag onto the nozzle.



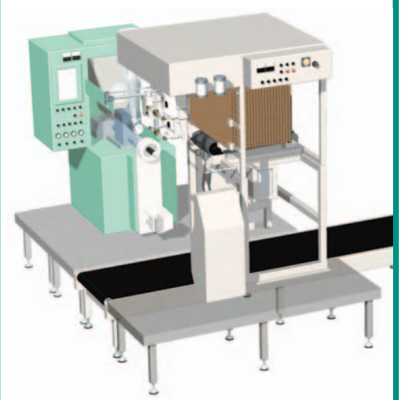
While the bag is filling, the clamps return to the home position and begin preparing the next bag.



The next bag is readied, and the process repeats.

Installation Space

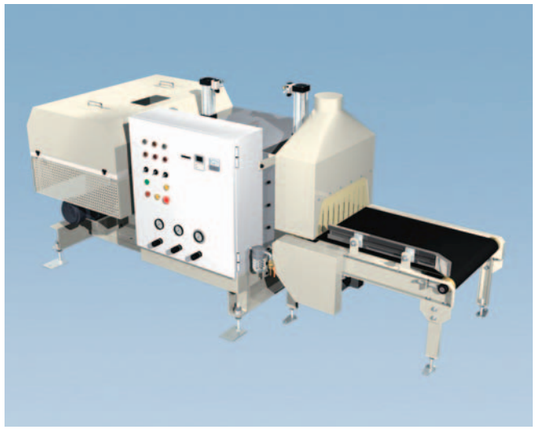
The AMO Automatic Bag Placer can be installed as a standing frame or as a suspended frame. It is situated in front of the Packer. As shown in the illustration below, the Bag Placer is directly above the belt conveyor that passes before the Packer. We recommend simultaneous installation and engineering of the Bag Placer, the belt conveyor in front of the Packer, and the Bag Tipping Guide.



AMO VALVE SEALER

Valve Sealing Machine

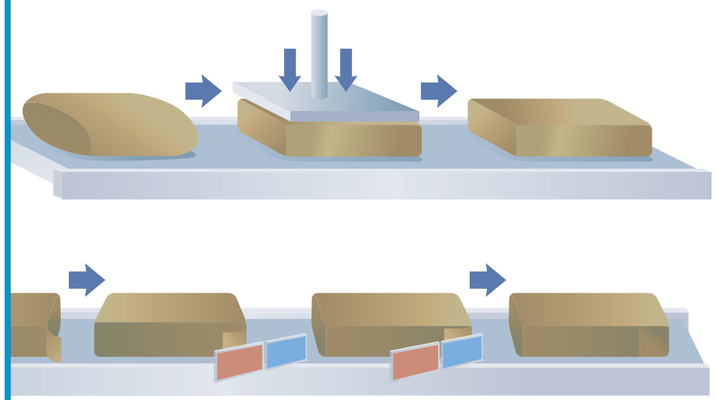
Displaying strengths in automatic sealing of valve bags. Fast and sure operation.



The AMO Valve Sealer automatically closes adhesive-type valves and seals the bags. Having achieved automation of the filling using the Packer and the Bag Placer, integration with a sealing machine and appropriate conveyors on a sealing line completely automates the powder bagging system.

Based on bag shape and the manner of conveyance, the capacity required, arrangement of conveyor lines, and other factors, AMO will fully customize installation of the sealing line to satisfy customer specifications.

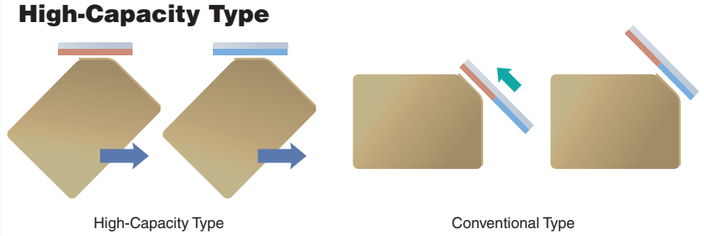
Sealing of Valve Bags



To enhance the sealing accuracy of the AMO Valve Sealer, a separate press belt conveyor is necessary. This applies pressure to flatten bags that have become rounded while filling. It cleans the valve to improve the strength of the adhesive and coordinates the timing for sending bags to the sealing machine. AMO engineers all aspects of conveyors needed before and after sealing processes.

The AMO Valve Sealer applies a heater plate and cooler plate in turn to the valve. (The diagram to the left illustrates the progressive stop-start method of sealing.) To obtain the highest sealing efficiency, AMO offers solutions based on consideration of type of bag, valve and adhesive, temperature, the state of the valve after the bag has been filled, and other factors.

High-Capacity Type



High-Capacity Type　　Conventional Type

Capacity of the sealing process can be further raised with a high-capacity sealing machine. Angling the bag enables continuous movement of the line. This method allows processing of about 1,400 bags per hour. Moreover, the high-capacity sealing machine can be adapted for bags of various sizes, arriving at random on the same line.

AMO POWDER PUMP

High-Density Force-Feeding of Powder

The ultimate pipe-feeding system for powder, proven by many years of results and experience.

Nakashima Seisakusho Co, Ltd. was founded on development of a pump for feeding powders by pipe. Over the more than 40 years since, we have built up a highly satisfactory delivery record. The new model incorporates technological elements developed for the Packer and numerous improvements. This powder pump is suitable for a wide variety of powders, has enhanced operating environment cleanliness, and many other highlights. It is a masterpiece of engineering that more than satisfies customer requirements.

Features of the AMO Powder Pump

High-capacity pressure feeding through narrow pipes

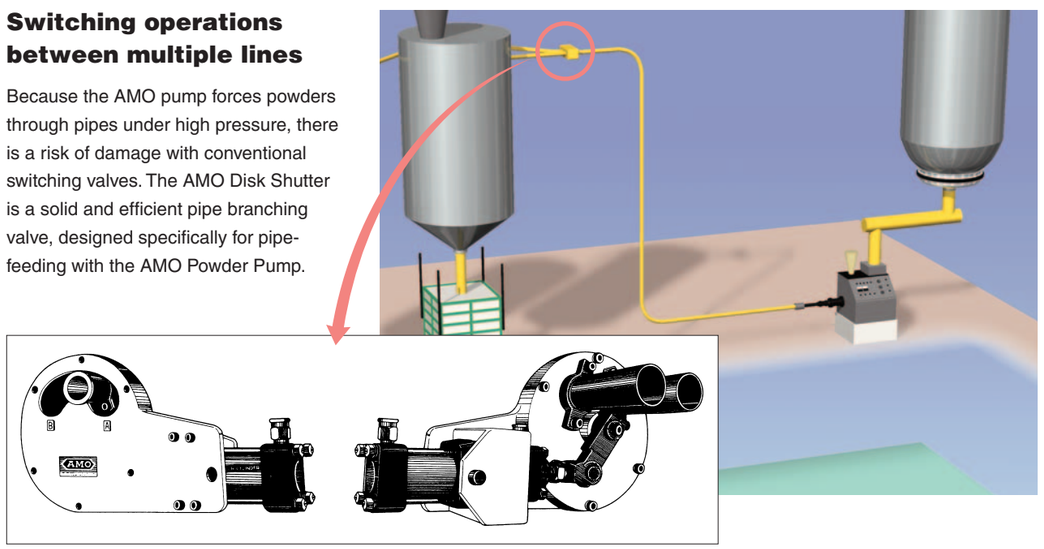
The AMO screw technique mixes only a small quantity of air into the powder and achieves high-density force-feeding of powder. Pipes and receiving hoppers thus do not need auxiliary measures, making this a simple and effective facility for conveyance by pipe.

Minimal space requirement

Space available for pump installation might be limited by piping layout, or the delivery of powder for transportation to the pump might be low down or close to the floor. In such cases, especially, the space-saving design of the AMO pump demonstrates real merits.

Switching operations between multiple lines

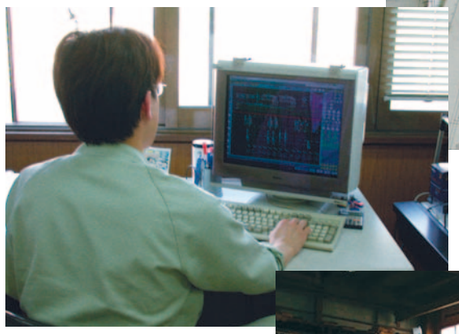
Because the AMO pump forces powders through pipes under high pressure, there is a risk of damage with conventional switching valves. The AMO Disk Shutter is a solid and efficient pipe branching valve, designed specifically for pipe-feeding with the AMO Powder Pump.



What is the most important factor to consider when handling facilities and machinery for factory use? We believe it is engineering. Simply lining up and arranging standard machines does not allow each machine to wield its full potential. Furthermore, this can be a cause of various problems and impediments. Therefore, our first step is to obtain full awareness of the specifications wanted by the customer. We then conduct experiments and studies with the particular powders, bags and other materials used by the customer, examine the customer worksite as necessary, and prepare solution plans.

Starting with the Packer, we set out various machine types, in addition to diverse optional equipment and optional specifications. Based on our expertise and knowledge of the machines, we select the machines and specifications that are ideal for the customer's purposes and propose a plan. When the customer accepts the proposal and agreement is reached on actual manufacture and delivery, our factory undertakes production and coordination based on individual specifications. Our engineers are fully involved all the way through installation at the worksite and running tests. This level of responsibility builds trust with customers. We believe such trust and confidence is the very relationship desired by customers.

The readiness to respond to customer requirements and requests is apparent in the proposal. To prepare a better proposal, we have frequent meetings with customers to fine-tune details.



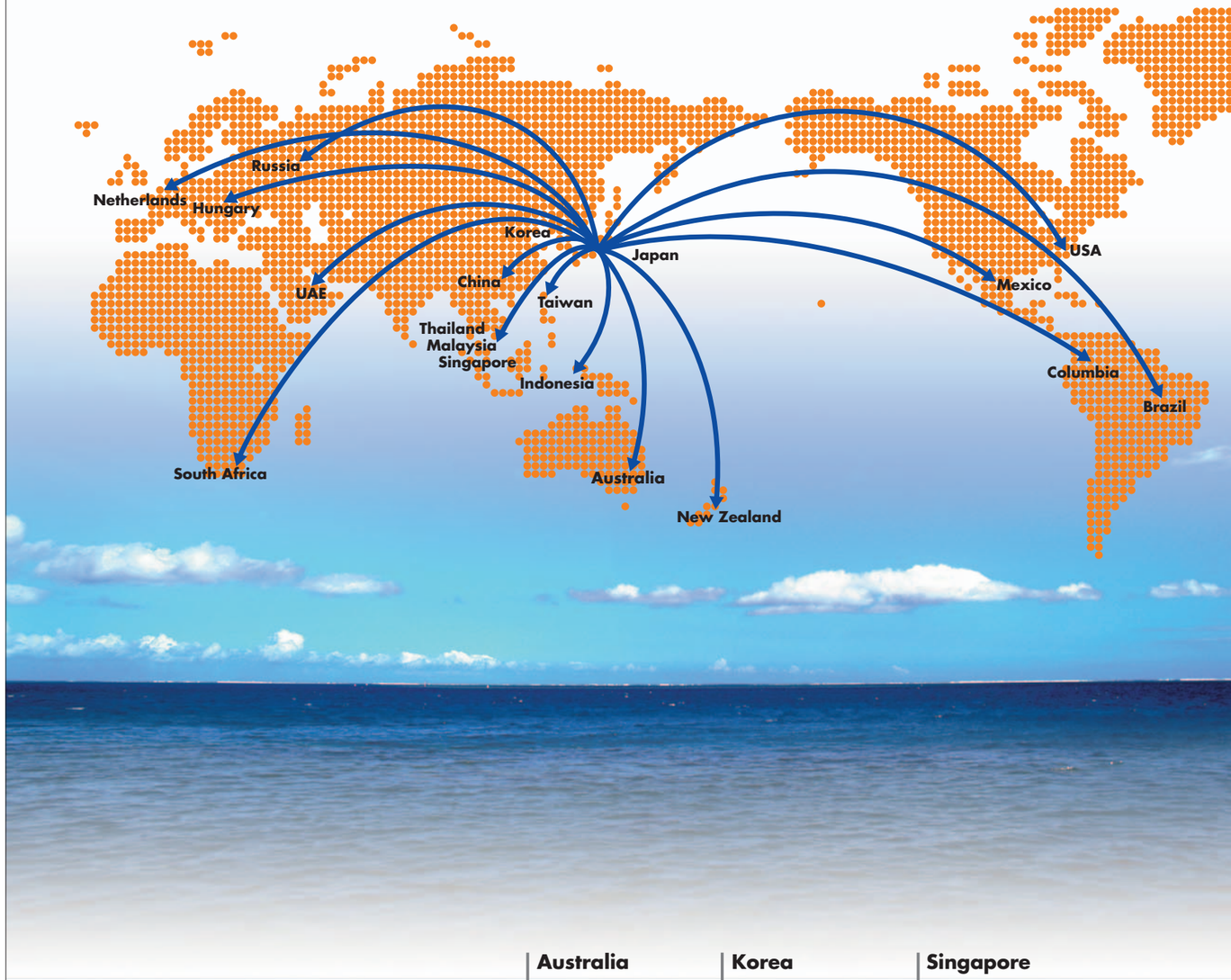
Engineers with extensive field experience take charge of specific design operations.

Skilled operatives assemble each custom-designed machine at our factory. Unlike manufacture of mass-produced goods, our strength includes the ability to deliver specifications that are finely tuned to meet customer needs.

When assembling a line, we first undertake running tests at our factory. The customer is encouraged to be present at such tests.

The outstanding potential of these machines cannot be fully realized if the operating conditions and environment are deficient. To attain maximum customer satisfaction, we take the greatest care with installation and operating conditions.

Global Launch



Major Global Delivery Sites

Australia	Korea	Singapore
Brazil	Malaysia	South Africa
China	Mexico	Taiwan
Columbia	Netherlands	Thailand
Hungary	New Zealand	UAE
Indonesia	Russia	USA