PROCESS CONTROL CORPORATION

Auxiliary Equipment for the Plastics Processing Industry

GRAVIMETRIC BLENDING

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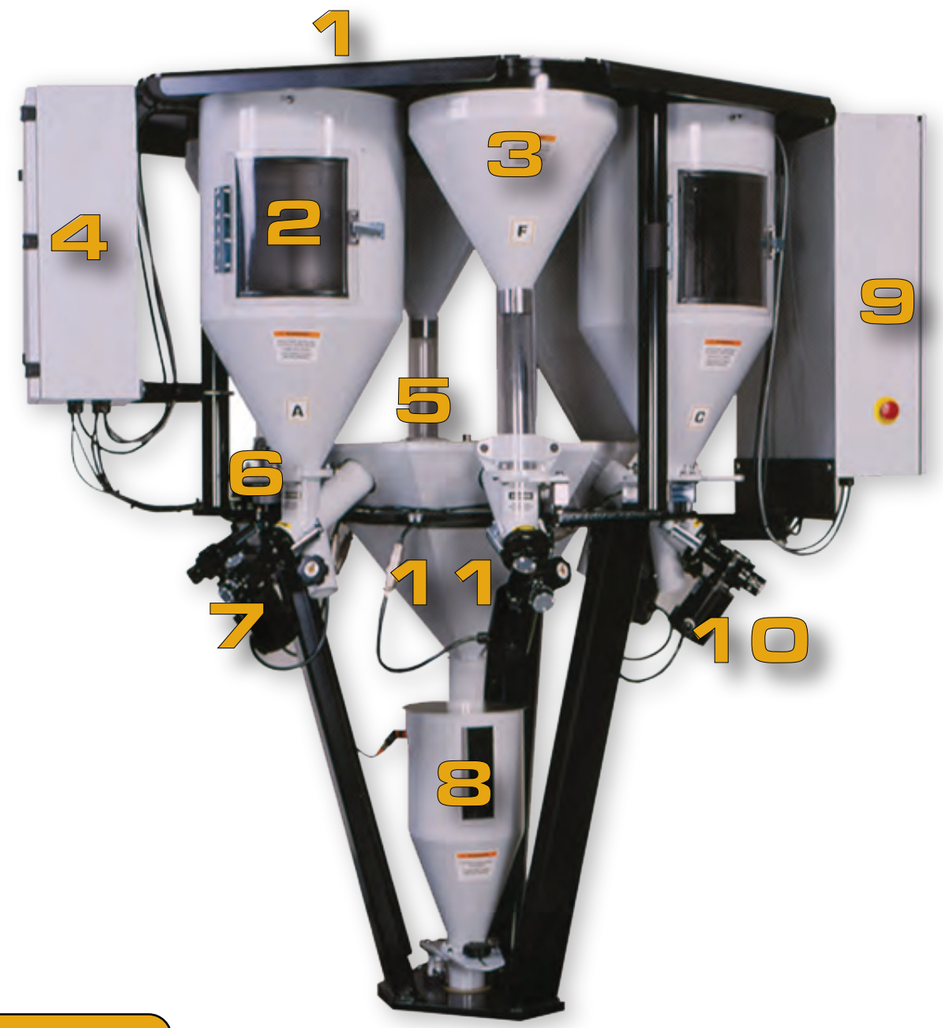
CONTINUOUS GRAVIMETRIC BLENDERS

Precise Blends

X Series Continuous Gravimetric Blenders are designed to produce precise, homogenous blends by weight, regardless of ingredient bulk density variations. The X Series control system incorporates the latest in microprocessor technology for total automation of recipe entry and storage, inventory control and process monitoring. All hardware and software has been developed in-house by Process Control with an emphasis on reliability and ease-of-use. Functions are menu-driven and step the operator through the required sequences of actions with simple instructions.

Superior Low Rate Metering Accuracy

For metering ingredients at low rates, the X Series gravimetric blender offers unsurpassed weighing resolution and unique feeder designs to guarantee accurate and consistent feeding. The Process Control weighing system uses 20-bit A/D resolution which enables us to detect weight changes of one part per million. The patent-pending Tube Hopper has been shown to improve low-rate feed accuracy by as much as 40% over conventional feeder designs. We have experience with a wide variety of materials and applications and stand ready to assist you with your own requirements.



Benefits

- Improved product quality and consistency
- Minimize use of expensive ingredients for reduced manufacturing cost
- Reduce inventory of blended material
- Allow faster startups and product changeovers
- Provide inventory and production reports for management
- Reduce labor costs through automatic operation
- Reduce scrap or off-spec product
- Communicate with other systems for complete plant level control

Steep Wall Hoppers Promote Flow

Materials which do not flow well, such as regrinds and flake, can create problems. With standard feeder designs, these materials can feed inconsistently and can even "bridge" causing all feeding to stop.

To solve these problems, Process Control utilizes steep wall hoppers with enlarged feed openings when necessary to promote consistent material flow.

1 **Integral Loader Support Platform** supports typical loading equipment without external support.

2 **Clear Polycarbonate Access Doors** allow visual inspection and cleanout of hopper contents.

3 **Low-Rate Tube Hopper** precisely meters critical additives at low rates.

4 **Onboard Drive Electronics** use BDC drive system to precisely control feeder speed and reduce field wiring.

5 **Large Cascade Chamber Door** for easy cleanout.

6 **Ingredient Hopper Load Cells** accurately measure material weight loss under real-world conditions.

7 **Quick-Change Auger/Metering Units** use variable speed brushless DC gear motors with closed-loop control for precise ingredient measuring.

8 **Integral Downcomer** maintains supply of blended material for use by process. Plug-flow design avoids de-mixing of ingredients.

9 **Onboard Weighing System** digitizes load cell signals for error free transmission to central computer. System designed to detect changes of 1 part per million.

10 **Material Cleanout Drains** with manual valves for quick material cleanout and changeover.

11 **Cascade Mixing Chamber** thoroughly homogenizes blend with no moving parts.

CONTINUOUS GRAVIMETRIC POWDER BLENDERS

Unsurpassed Accuracy

The XU Series continuous gravimetric powder blender offers unsurpassed blend accuracy and blend homogeneity in a wide range of configurations to meet the needs of any application by incorporating the PF Series powder feeders. It allows gravimetric blending and non-freeflowing powder materials with freeflowing powder and pellet materials at unprecedented metering and mixing accuracy.

The powder feeders allow rates as low as 0.2 PPH and as high as 3,000 PPH. Metering augers are available in full pitch or 1/2 pitch configurations with helix diameters from 1/4 inch to 2-1/4 inches. The drive system of all blender components utilizes a brushless drive with a brushless DC gearmotor and encoder for accurate motor speed feedback. This allows each of the individual feeders to maintain a constant weight throughput. The weighing system is designed with DSP (digital signal processing) technology (patent pending) to filter out unwanted noise and vibration which can wreak havoc with any feeding system, especially at very low feed rates.

Stainless Steel Design

Incorporated into the electro-polished stainless steel design is a patented round-to-trough feeding area which provides more consistent mass flow for better metering accuracy. The feeder is designed with a steep wall, removable hopper which features a dust-tight band clamp for easy mounting of hopper extensions and quick disassembly for clean out. The bottom trough design is optimized to provide maximum material exposure to the auger.

The XU Series Continuous Powder Blender is also available in food grade stainless steel.

The operator enters the desired blend recipe at the operator station. All ingredients are simultaneously metered in the correct blend ratios by augers from individual weighed PF Series powder feeders. The ingredients then flow through a cascade chamber which produces the best blend homogeneity.

1 **Universal Frame**
available in 4 and 6 element configurations.

2 **Stainless Steel Weigh Hopper**
electro-polished and available in food grade.

3 **Gear Motor**
uses variable speed brushless DC gear motors with closed-loop control for precise ingredient measuring

4 **Feeding Area**
round-to-trough and agitated.

5 **Material Supply Hopper**
optional knife gates are available.

6 **Cascade Chamber**
for mixing all of the ingredients.

7 **Metering Augers**
available in a full pitch or 1/2 pitch and up to 2-1/4 inch diameter.

8 **Weighing Platform**
with incorporated dual load cells, held by quick clamps.

CONTINUOUS BLENDER FEATURES

Simple Installation

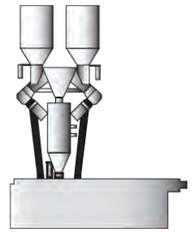
The X Series has been designed to make installation quick and easy, based on our experience with thousands of continuous gravimetric blender projects throughout the world.

Mechanically, the blender has been designed to mount directly to the throat of the extruder, on a mezzanine or on a blender stand. An integral loading support platform is included which allows most typical vacuum receivers and/or shutoff valves to be mounted without additional support.

Electrically, field wiring has been kept to an absolute minimum due to our unique distributed control system. All drive system and weigh system connections are factory wired. The operator station, which houses the central computer, may be located up to 1000 feet from the blender. Wiring between the blender and the operator station consists of four-wire network and power connections. When standard Process Control vacuum receivers are used, they are designed to plug right in to the blender.

Superior Blend Homogeneity

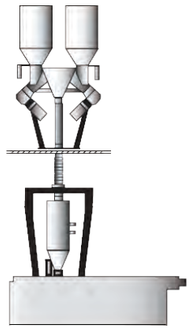
The quality of your end product is influenced by many factors, including consistency of the blend being fed to your process. Each ingredient in your blend has a purpose, and the best results are achieved when the blend ratios are highly consistent in the short term. Continuous blenders achieve superior blend homogeneity by precisely metering each ingredient simultaneously in the correct ratio. The individual material streams are brought together in a cascade mixer designed to thoroughly homogenize the blend. The resultant blend is then captured and preserved all the way through the process. This continuous approach produces more homogenous blends than designs which rely on mechanical agitation for mixing.



Extruder Throat Mounting

Extruder Throat Mounting

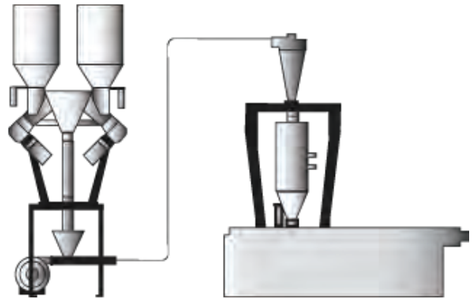
When space is available, the blender with integral downcomer may be bolted directly to the throat. This is the simplest installation and provides excellent blend homogeneity and cleanout.



Mezzanine Mounting

Mezzanine Mounting

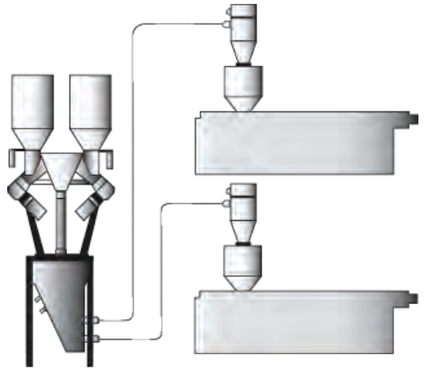
For applications with an existing mezzanine structure above, this arrangement offers the benefits of throat mounting. This blender configuration uses a remote downcomer mounted on the extruder throat to capture the gravity-fed blend of materials from the mezzanine mounted blender.



Off-Line Mounting with Pressure Conveying

Off-Line Mounting with Pressure Conveying

For applications where the blender must be mounted off-line, the pressure conveying system offers the benefits of extruder throat mounting. AS the blend is produced, it is conveyed via pressure continuously to the extruder throat mounted remote downcomer. This prevents demixing and allows accurate calculation of extruder rate for gravimetric extrusion control applications.



Off-Line Mounting with Vacuum Conveying

Off-Line Mounting with Vacuum Conveying

For applications where there is not enough headroom for either throat or mezzanine mounting, or where more than one extruder is to be served by the same blender, off-line mounting is to be used. The blender is mounted on a stand with a vacuum pickup box below it to capture the material blend. On demand, the blend will be vacuum-conveyed to the machine(s) being served. Care must be taken to minimize the chances for blend separation during this conveying.

GUARDIAN® SERIES 2 GRAVIMETRIC BATCH BLENDERS

Do it right the first time, every time

The Guardian® Series 2 gravimetric batch blender was developed for processors who want the simplicity of operation combined with the most accurate dispensing and superior blend homogeneity at a low cost.

The outlet of each of the individual material hoppers is equipped with a fast acting V-gate valve. Each of the materials is dispensed sequentially into a common weighing hopper in the desired proportions. The weighed materials are then released into a separate mixing chamber which provides the most consistent homogeneous blend of any batch type blender.

Process Control engineers have produced a highly advanced metering and weighing system that accurately controls each ingredient of every batch to the desired amounts and is not averaged over multiple batches as is common in other batch blenders in the industry. At the blender's highest accuracy setting, each ingredient can be dispensed to an accuracy of +/- 0.02%.

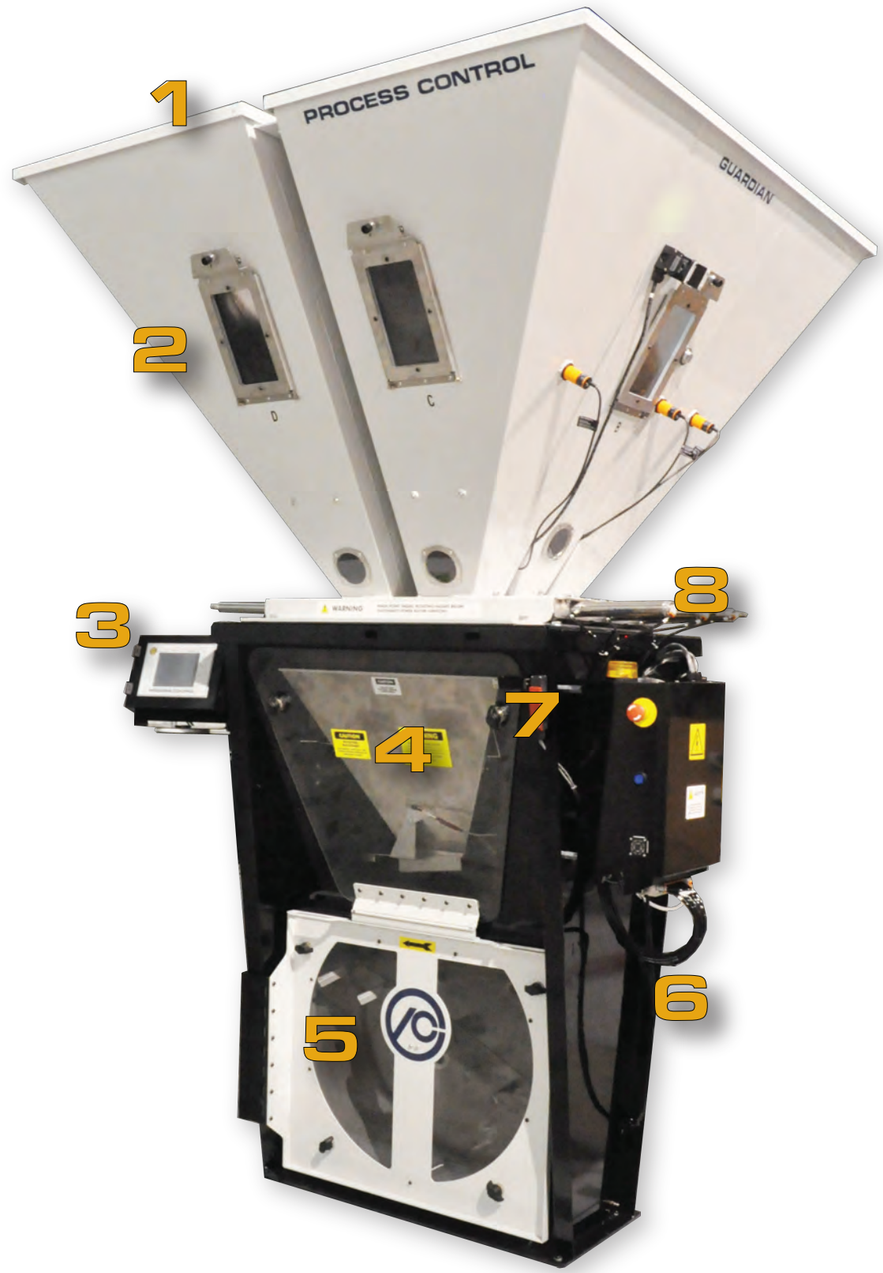
The metering gates are controlled with one initial dispense cycle and then the balance of the requested weight amount is fine tuned by "short cycling" the gate. Every batch is exact, batch after batch. The competition makes up for discrepancies on the next batch. Why assume that their next batch will correct the previous inaccurate batch? Do it right the first time, every time.

Advanced Performance

In addition to precise batch-to-batch dispensing, the performance of the mixer is just as critical to the end product. The mixer actually determines how uniform the blend will be. Process Control has spent many years of research and testing in developing the most thorough homogeneous mixer in the industry. Inadequate mixing can lead to inconsistent product characteristics such as color variations or other imperfections.

The mixer section of a Guardian® Series 2 blender is designed with total mixing action and NO dead spots. No other blender design comes close to this. No stratification, no matter how dissimilar the blended materials are in specific gravity or how they may vary in composition.

The Guardian® Series 2 blenders have incorporated in the design a built-in clean-out system. With a pull-out drain chute and manual slidegate controls, the blender can be cleaned-out quickly and easily during product change-overs.



1 **Integral Loader Support Platform**
supports typical loading equipment without external support.

2 **Segmented Material Hopper**
-Blenders have 4-8 elements in individual fixed hoppers that are welded together
-Special configurations for up to 12 ingredients

3 **PLC Touchscreen Microprocessor**
Color touchscreen operator interface that insures ease of use and quick startups

4 **Weigh Hopper**
-Rests on dual load cell platform
-Easily removable with no tools for cleaning

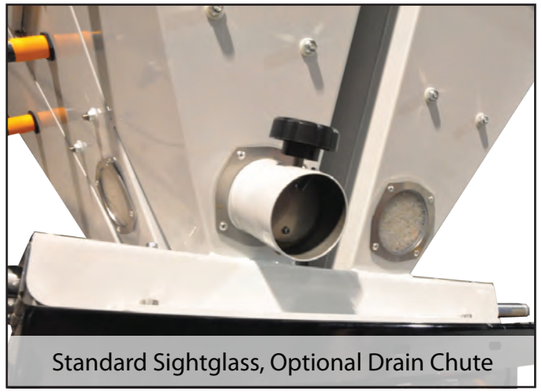
5 **Mixing Chamber**
-Agitator designed for waterfall type mixing to ensure every batch is mixed
-Engineered for no dead spots and to achieve a consistent homogeneous blend
-The proximity switch controls the mixer outlet gate to prevent classification of mixture

6 **Air Hose**
The attached air hose and nozzle ease the cleaning process

7 **Clean-Out Dump Chute**
Fixed inside the blender behind the weigh pan for ease of material change

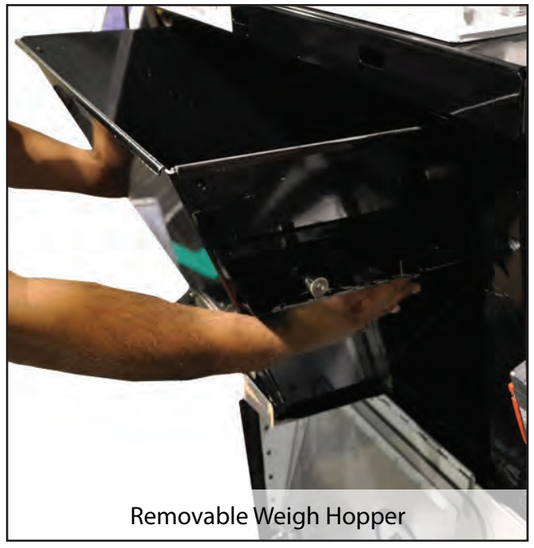
8 **Pneumatic Metering Gate**
Pulsing V-gate to achieve dosing accuracy of every ingredient in each and every batch. Restricted gates for high accuracy at low percentages.

BATCH BLENDER FEATURES

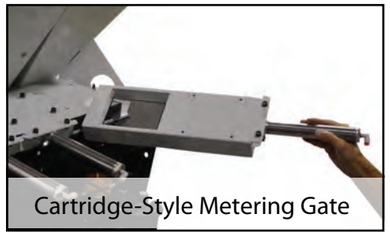

Standard Sightglass, Optional Drain Chute

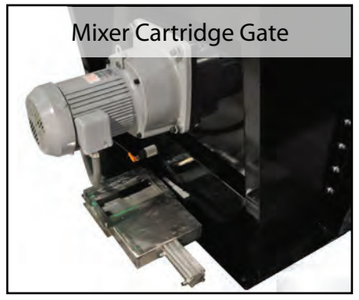

Easy-Open Doors

AVAILABLE ONLY ON GUARDIAN® SERIES 2


Removable Weigh Hopper

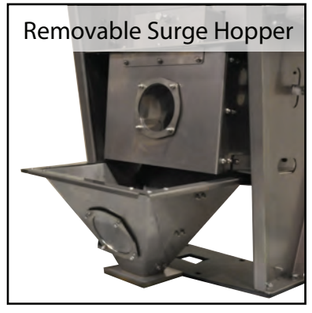

See-Through Door


Cartridge-Style Metering Gate

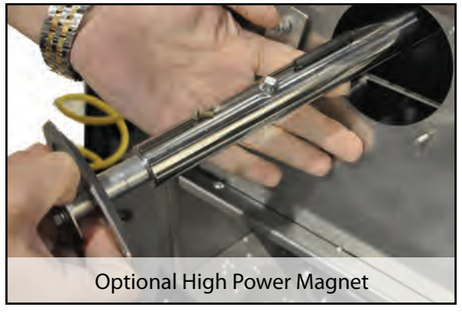

Mixer Cartridge Gate


Front Access Doors

AVAILABLE ON GUARDIAN SERIES 2 AND GUARDIAN® SERIES 3


Removable Surge Hopper


Removable Material Hoppers


Optional High Power Magnet

AVAILABLE ONLY ON GUARDIAN® SERIES 3

GUARDIAN® SERIES 3 BLENDER

G3 FEATURES

- All stainless steel construction
- 1 kg = up to 350 PPH
  2 kg = up to 800 PPH
  2, 3 or 4 Ingredients
- Cartridge style metering gates
- Integral surge hopper option
- Simplified, stationary loading platform
- Sightglass style polycarbonate access doors
- Quick removal agitator
- Color PLC based touch screen control system
- All-In-One removable metering unit and material hopper
- Improved design for clean out convenience
- Cartridge style mixer discharge valve with zero dead zone
- Integral surge hopper, pickup box, or outlet transition option
- Magnet option to catch ferrous contamination
- Integral weigh hopper with extrusion monitoring option

Stainless Steel Design

IThe Guardian Series 3 family has been made with all-in-one removable metering unit and material hoppers to hold each of the ingredients. The 1kg and 2kg can be supplied with up to four separate ingredient hoppers as standard.

The outlet of each of the individual metering hoppers is equipped with a fast acting V-gate valve. Each of the materials are dispensed sequentially into a common weighing hopper in the desired proportions. The weighed materials are then released into a separate mixing chamber which provides the most consistent homogenous blend of any batch type blender.

The all stainless steel construction of the Guardian Series 3 blenders has been designed to greatly reduce nooks and crevices, making color changes quick and easy and wipe down snag-free.

Touchscreen Operator Interface

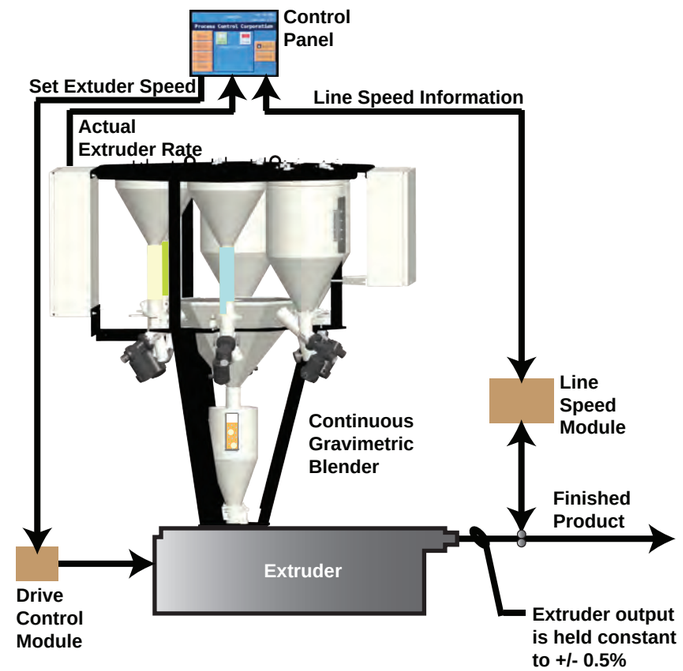
Gravitrol® Gravimetric Extrusion Control

Integrated Controls at Your Fingertips

In order to produce a desired blend of materials, the operator presses RECIPE and enters the recipe, which consists of the percentage by weight for each ingredient. The recipe may be keyed in directly or recalled from up to 400 stored recipes. The operator then presses the AUTO button to start blending. Once the blending has started, the computer continuously monitors the blend operation and corrects the individual feeder speeds to maintain the desired blend ratios. The touchscreen comes standard on all batch and continuous blenders, and is available in an upgrade package for all existing models.

Features

- Color touchscreen operator interface that insures ease of use and quick startups
- Standard ethernet port for communication ability and integration with remote systems
- Performs a test dispense for metering accuracy and verification
- Performs automatic calibration when a new recipe is entered
- Can be remote mounted
- Shows in real time the actual throughput and the maximum throughput based on the current recipe running



Blender Operation with Extrusion Control

The operator presses RECIPE and enters the desired blend percentages by weight and the desired extruder rate into the operator station. When RUN is pressed the blender automatically maintains the desired blend percentages by weight. Simultaneously, the blender computer calculates the actual extruder usage rate and periodically adjusts the extruder screw speed to maintain extruder output to +/- 0.5% by weight.

In applications which incorporate line speed control, the operator also enters desired weight per length as part of the recipe and the computer controls line speed in addition to extruder speed to maintain the desired product weight per length.

Control Extruder Output by Weight

For processors who seek the benefits of both gravimetric blending and control of extruder output by weight, we offer a solution that combines both technologies in one integrated, easy-to-use system. In many applications, line speed control is also added for complete control of product weight per length. This feature can be retrofitted to most existing blenders in the field for both mono- and coextrusion applications.

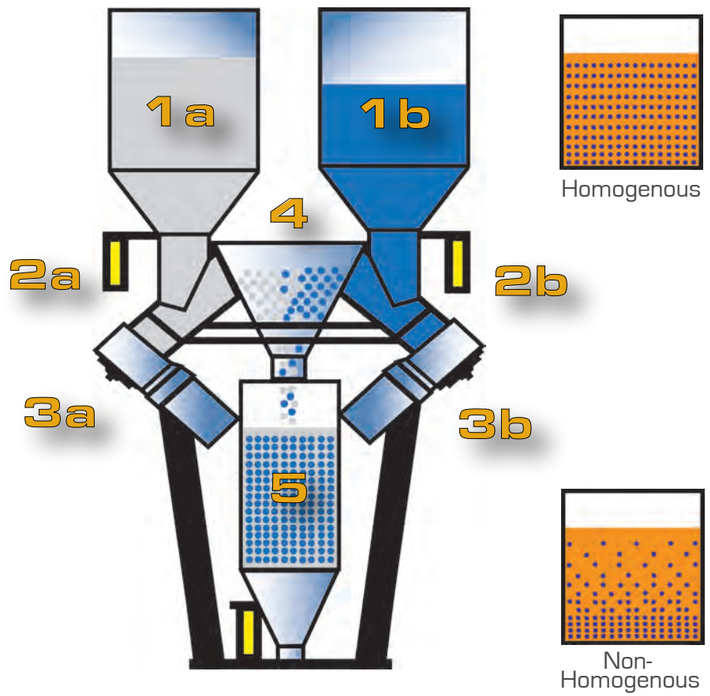
Coextrusion System

For coex applications, the PCC Blender is part of a complete Gravitrol® system for controlling product layer ratios and total line throughput. On a typical coex line, layers which require blending use X Series blenders and single-component layers use HG Weigh Hoppers. Both the blenders and weigh hoppers report actual extruder usage back to the central Gravitrol computer. This information is periodically compared to the desired layer percentages and adjustments are made to the extruder screw speeds. In addition, line speed can be adjusted for complete control over product weight per length.

Benefits

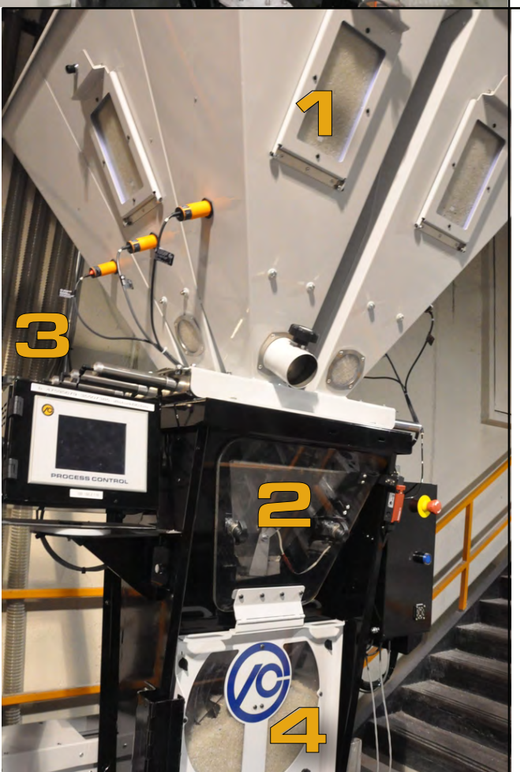
- Improved product quality
- Reduced material usage
- Quicker startups & product changeovers
- Reduced scrap
- Improved product repeatability
- Accurate inventory reporting
- Improved identification of off-spec product

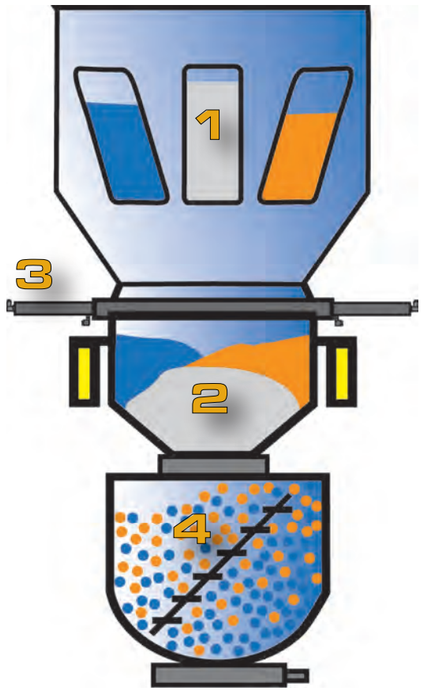
Comparing Continuous and Batch Blending



Continuous Blender Operation

Materials are kept in separate weigh hoppers (1), each mounted on a load cell (2) which measures the weight of the hopper and its contents. Target metering rates are determined for each material based on the recipe and the current blender total rate. As the materials are simultaneously metered by auger (3) into the cascade mixing chamber (4), the actual metering rate of each ingredient is frequently calculated from the weight loss of the hoppers. These actual rates are compared to the target rates and the speeds of the augers are adjusted to correct for any variation, maintaining an accurate blend. The materials simultaneously flow through the cascade chamber, thoroughly homogenizing the blend. The resultant blend is then captured in a plug-flow hopper (5) designed to preserve the blend all the way to the extruder throat (or other process).





Batch Blender Operation

Materials are kept in separate material hoppers (1) above a central batch weigh hopper (2). The metering gates (3) are controlled with one initial dispense cycle and then the balance of the requested weight amount is fine tuned by "short cycling" the gate. At this point, the materials are dropped into a mixer (4) which agitates material for a fixed time period, homogenizing the blend. At the end of the mix cycle, the blend is available for the process.

Blend Homogeneity is Key to Product Quality

Blend accuracy is a term commonly used by blender manufacturers to rate the performance of their systems. Accuracy is an important specification, but it is often stated over a long time period which has little relationship to the consistency of the product or end product. Blend homogeneity, which is just short-term blend accuracy, is much more important to your product quality. For example, the two boxes at the right are each filled with 80% base material and 20% additive. Even if the blend contained in each box is accurate to 0.10% there is a big difference in the homogeneity. If these two boxes were fed to side-by-side extruders, significant differences in the end products would be seen. The more homogeneous blend will produce the superior product and allow you to adjust your recipe for lowest material cost.

Batch Blenders Rely on Mechanical Agitation

Batch blenders use mechanical mixers to transform the layered materials into a usable blend. There are many different mixer designs and some do a better job than others of homogenizing the materials. The resulting blend consistency is highly dependent on many factors - the mixer design, the blend ratios, the shapes and densities of the materials, and mix time. When mixed, smaller, denser materials tend to settle towards the bottom through the lager, lighter materials. For less critical applications or applications which run the same blend recipe and materials day-to-day, batch blenders can be a cost-effective alternative.

Continuous Blenders Offer Improved Consistency

With a continuous blender, each component is simultaneously metered by weight in the desired blend ratios. The individual material streams are combined in a cascade mixing section, which homogenizes the blend and directs it to the process. Below the cascade mixer, the resultant blend is typically stored in a plug-flow hopper which preserves the blend consistency all the way to the process. At no time is mechanical agitation relied on, so superior blend homogeneity is achieved across a wide range of materials and ratios.

Complementary Systems for Gravimetric Blenders

PROPER LOADING IS THE KEY

Continuous Gravimetric Blenders Require Proper Sizing of Loading System

With a continuous blender, it is very important that material be delivered in a timely manner to the ingredient hoppers. Process Control takes the guesswork out of this selection by providing a complete guaranteed system based on your usage and conveying distances. Our sophisticated computer models and experience with a wide array of real world applications assures you of a vacuum conveying system that meets your requirements.

Blender Loading is Fully Automated

The blender ingredient hoppers call for material as required and control system directs the operation of the pump and vacuum receivers to ensure that materials are loaded to the proper stations at the proper times. Standard PCC receivers utilize proximity switches mounted in a location that will deliver the optimum refill size. The receivers fill until the specified volume is reached, eliminating the need for setting fill times. Loading by volume is more precise than loading by time and maximizes the output of the loading system.

Vacuum Power Units

Our Vacuum Power Units offer dependable and economical performance for a wide variety of conveying rates, distances and materials. Typical applications include in-plant distribution systems and machine loading.

Vacuum Receivers

Our Vacuum Receivers come in a range of sizes and designs for handling pellets, regrinds or granular materials. Our vacuum receivers are designed to be mounted at any point where resin delivery is needed.

Inventory Manager

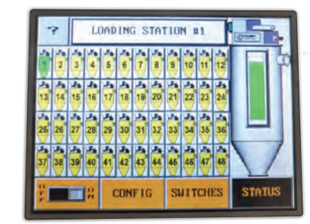
The Gravimetric Inventory Management System will accurately weigh re-pelletized materials prior to being re-processed or stored as inventory. The system can also be used to verify delivered resins before entering them into inventory. It can provide totals for a given production shift, a complete production run or an overall running total of material. It runs automatically with little or no operator intervention logging shift weight totals.

AccuDispense

AccuDispense - an economical, single dose, gravimetric dispensing system. AccuDispense is a versatile product that can be used not only in the plastics industry, but also for pharmaceutical, chemical and food applications. With precision metering, this system delivers a pre-selected weight of free flowing material, such as powdered, flaked, granular and pelletized ingredients, directly to the process. AccuDispense is used when it is necessary to obtain pre-weighted doses of material that do not need to be blended, but require an accurate dispense.

Director Sequencing Panel

The Director Sequencing Panel provides automatic control for your complete vacuum conveying system. The sequencing panel controls the vacuum pump and vacuum receivers to select which receiver is being loaded and the duration of the load.



Blend Manager

Blend Manager is an integrated real-time trending, material management, and monitoring program. A simple, easy to use wizard guides the user through setup and programming which are then stored seamlessly in SQL databases.

VNC Viewer

The VNC Viewer provides a central control point for an unlimited number of touch screen supplied PCC blenders, and offers remote viewing for up to four touch screen controllers at a time.

GRAVIMETRIC BLENDER UPGRADES

Upgrades for Autobatch and Guardian® Blenders

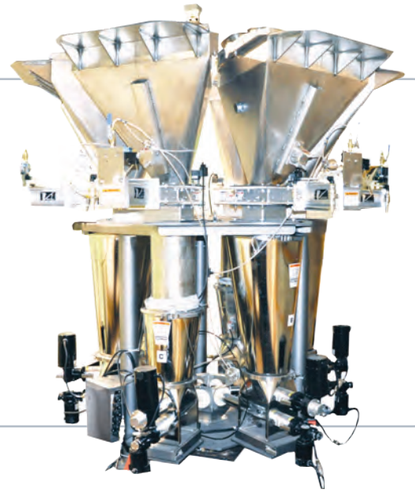
Autobatch Blender

Guardian® Blender

Process Control offers a new touch screen controller for Autobatch and Guardian® blenders that is an off-the-shelf solution to improve your blender's performance and longevity. This non-proprietary upgrade will not only add years to your blender's life, but it will actually improve your blender's accuracy and output as well. The upgrade is also a way to simplify the blending process and postpone future blender replacement, which makes things easier and saves you money all at once. Your older Autobatch or Guardian® controls are facing the threat of becoming obsolete; ensure that will not happen by upgrading to our new touch screen control system today.

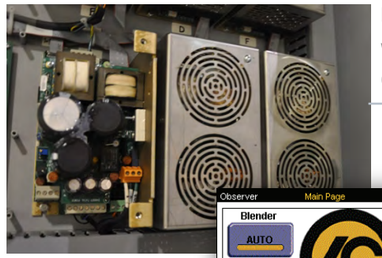
Upgrades for Continuous Blenders

X Series Continuous Gravimetric Blender



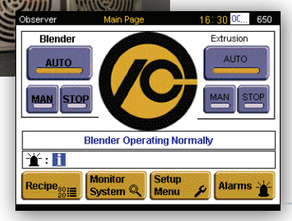
XU Series Continuous Gravimetric Powder Blender

Process Control offers a new selection of upgrades for Continuous Gravimetric blenders, including a color touch screen controller, brushless motors and drives, and a DSP weigh module upgrade kit, that will improve your blender's performance and longevity. These upgrades not only add years to your blender's life, but can actually improve your blender's accuracy as well. These upgrades offer a way to simplify the blending process and postpone future blender replacement, making operation easier and saving you money all at once. Your older Continuous Gravimetric blender controls, drives, and weigh module chips are facing the threat of becoming obsolete; ensure that will not happen by upgrading today.



New Motor Drives can operate with either new brushless or older permanent magnet motors.

Brushless Gearmotor installed on an X Series Continuous Blender



The new touch screen controller for Continuous Blenders

For detailed product information, including specs and dimensions, please request a PCC cut sheet:

For more information about the company and other PCC products, please visit our website:

PROCESS CONTROL CORPORATION

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