



PROCESS CONTROL CORPORATION
Quality Auxiliary Equipment for the Plastics Processing Industry

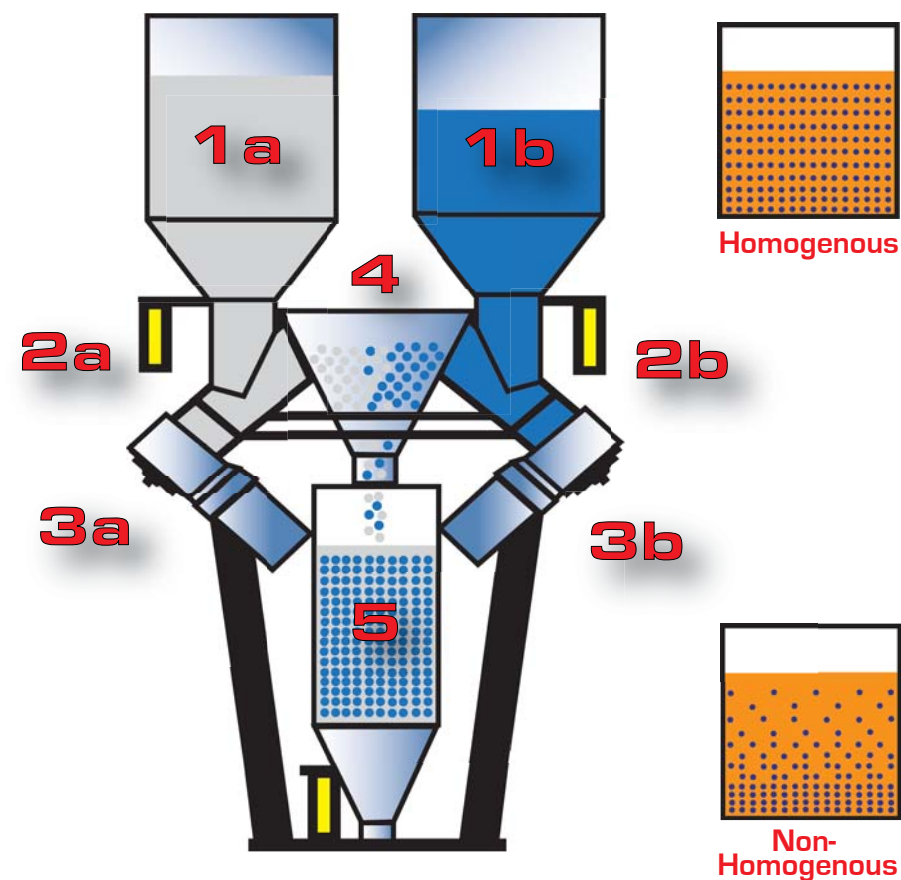
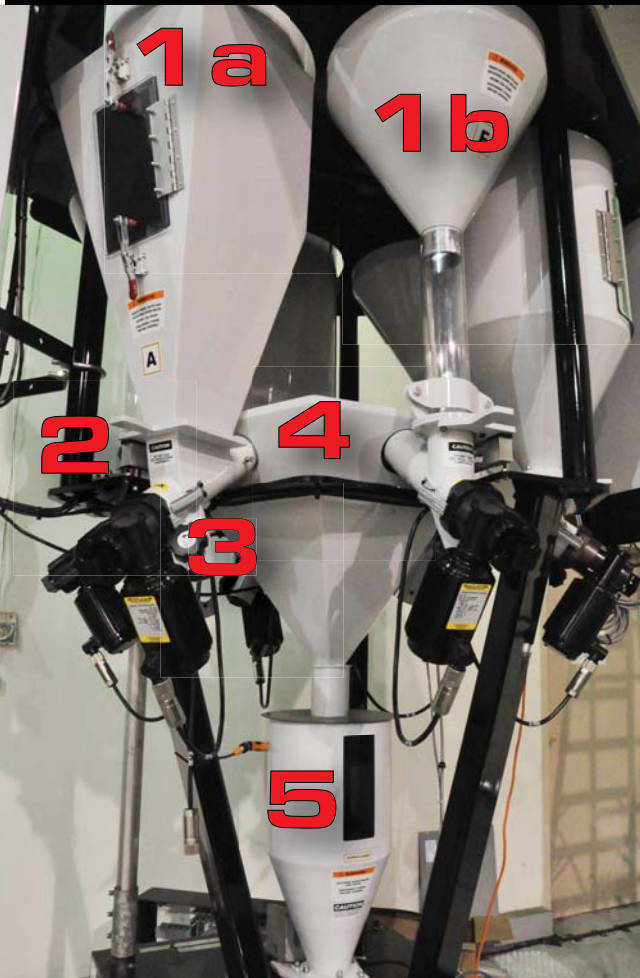


GRAVIMETRIC BLENDING

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Comparing Gravimetric Continuous and Batch Blending



Continuous Blender Operation

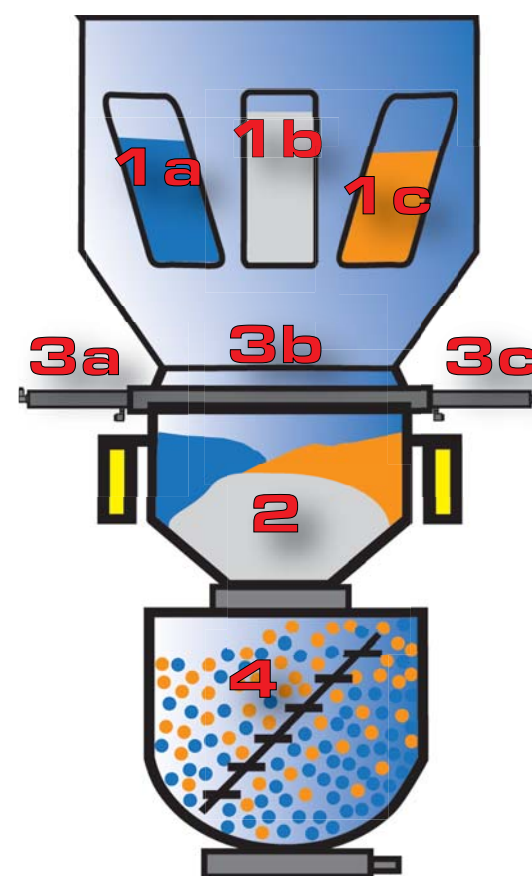
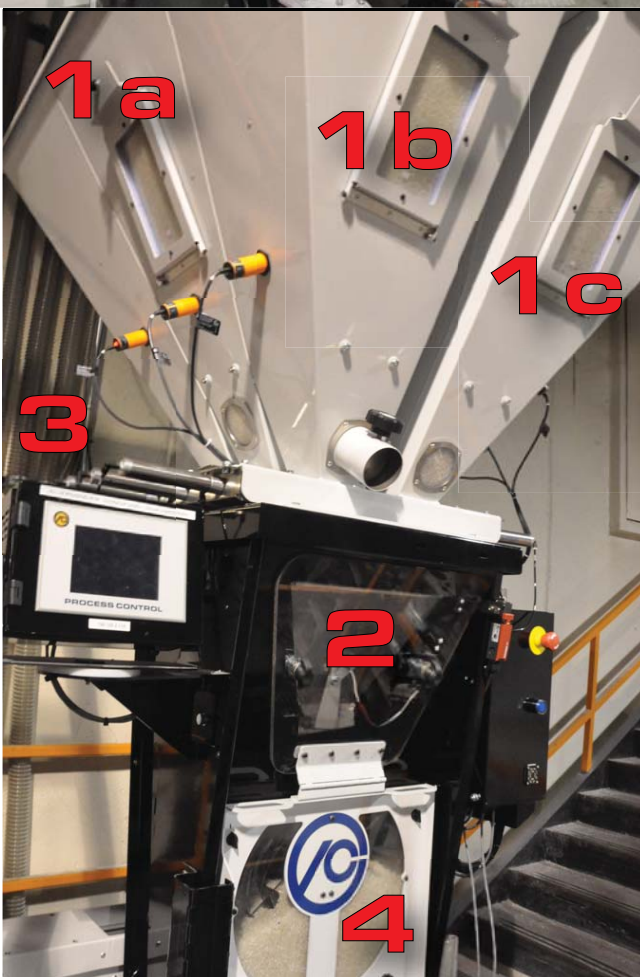
Materials are kept in separate material hoppers (1), each mounted on a load cell (2) which measures the weight of the hopper and its contents. Target metering rates are determined for each material based on the recipe and the overall total blender throughput rate. As the materials are simultaneously metered by the 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 automatically adjusted to correct for any variation, maintaining an accurate blend. The materials simultaneously flow through the cascade chamber, which thoroughly homogenizes the blend. The resultant blend is then captured in a plug-flow optimized weigh hopper (5), designed to preserve the blend homogeneity on the way to the extruder.

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 products. Blend homogeneity, which is just another term for blend accuracy, is much more important to your products' 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 costs.

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 ingredient ratios.



Batch Blender Operation

Materials are kept in separate material ingredient 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 "pulse cycling" the gate. At this point, the materials are gravity fed 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 then available for processing by the extruder, or for the next step in the overall process.

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, the smaller, denser materials can tend to settle towards the bottom through the larger, lighter materials. For less critical applications or applications which run the same blend recipe and materials day-to-day, batch blenders can be a highly cost-effective alternative.

Continuous X Series 2 Gravimetric Blenders

X Series 2 Features

Precision Blending

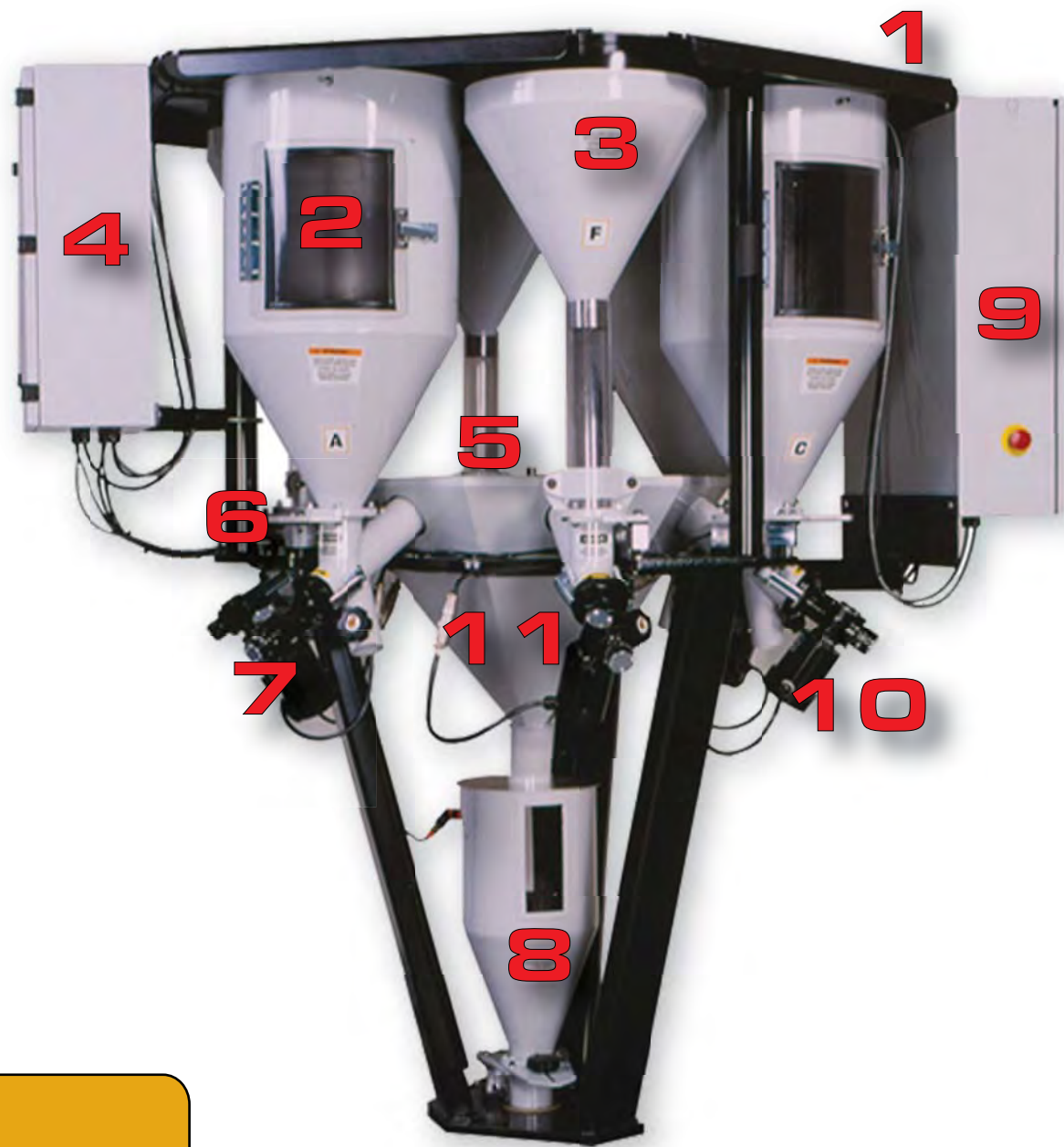
X Series 2 Continuous Gravimetric Blenders are designed to produce precise, homogenous blends by weight, regardless of ingredient bulk density variations. The control system for the X 2 series incorporates the latest in micro-processor technology for total automation of process functioning/monitoring, recipe entry and storage, and inventory control. Functions, actuated through a 6" color touchscreen, 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 2 gravimetric loss-in-weight 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 extremely minute weight changes. Our innovative tube hopper design has been shown to improve low-rate feed accuracy by as much as 40% over conventional feeder designs. Additionally, we have extensive experience with a wide variety of materials and applications, and we stand ready to assist you with your specific blending requirements.

Benefits and Advantages

- o Improved product quality and consistency
- o Reliability, operational longevity and ease of use
- o Minimize use of expensive ingredients for overall reduced manufacturing costs
- o Reduce inventory of blended materials
- o Allow faster startups and product changeovers
- o Provide inventory and production reports for management
- o Reduce labor costs through automatic operation
- o Reduce scrap or off-spec product
- o Ethernet port standard; can be networked for remote monitoring/operation, and can communicate with other systems for complete plant level control



Optional Steep Wall Regrind Hoppers Utilized to 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 employs optional steep wall regrind 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** allows visual inspection and cleanout of hopper contents
- 3** **Low-Rate Tube Hopper** precisely meters critical additives at low rates
- 4** **Onboard Drive Electronics** uses a brushless drive control system to precisely control feeder speeds
- 5** **Large Cascade Chamber Cover** for easy cleanout
- 6** **Ingredient Hopper Load Cells** accurately measures material metering/weight loss in real time
- 7** **Quick-Change Auger/Metering Units** uses 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 your processes. Plug-flow design avoids de-mixing of blended ingredients.
- 9** **Onboard Weighing System** digitizes load cell signals for error free transmission to central PLC controller
- 10** **Material Cleanout Drains** with manual valves enables quick material cleanout and changeovers
- 11** **Cascade Mixing Chamber** thoroughly homogenizes blend with no moving parts

Continuous XU Series 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 of 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 lbs/hr and as high as 6,000 lbs/hr. 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 hall effect sensor for accurate motor speed feedback. This allows each of the individual feeders to maintain a constant weight throughput. The weighing system is designed with digital signal processing (DSP) technology 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 an innovative 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 for construction in food grade stainless steel.

The operator enters the desired blend recipe at the touchscreen 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 powder blend homogeneity.

XU Series Features



- 1 Universal Frame**
available in either 4 and 6 element configurations
- 2 Stainless Steel Weigh Hoppers**
electro-polished; also available for construction in food grade stainless steel
- 3 Gear Motors**
use variable speed brushless DC gear motors with closed-loop control for precise ingredient measuring
- 4 Feeding Area**
round-to-trough and agitated design, for more consistent mass flows
- 5 Material Supply Hoppers**
with flapper valves; optional knife gates valves for improved performance are available
- 6 Cascade Chamber**
for mixing all of the ingredients
- 7 Metering Augers**
available in a full pitch or 1/2 pitch configurations, and in up to 2-1/4 inch diameter feed tube sizes
- 8 Weighing Platform**
with incorporated dual load cells, anchored with quick clamps for easy removal and cleanout

Continuous Blender Features

Simple Installation

The X Series 2 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.

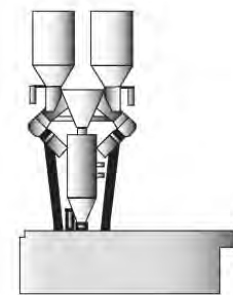
Superior Blend Homogeneity

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.

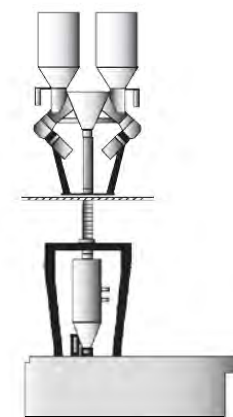


Blender Mounting Options

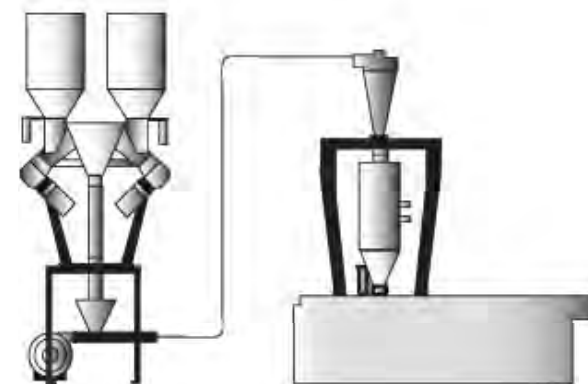
Extruder Throat Mounting



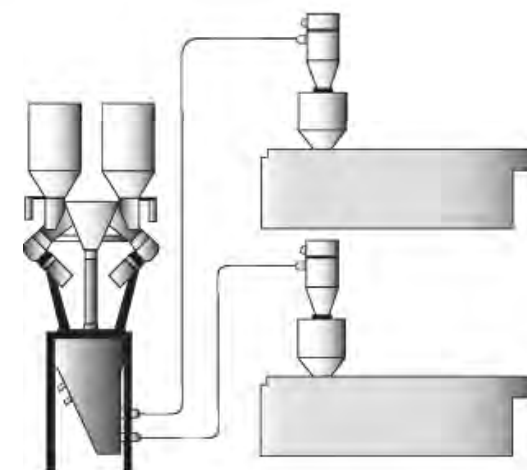
Mezzanine Mounting



Off-Line Mounting with Pressure Conveying



Off-Line Mounting with Vacuum Conveying



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

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

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

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 Blender

Do It Right the First Time, Every Time

The Guardian® Series 2 gravimetric batch blender was developed for manufacturers and businesses who want the simplicity of operation combined with the most accurate dispensing and superior blend homogeneity, all 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 weigh scale type batch 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; ingredients are 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 $\pm 0.02\%$! This level of accuracy saves you significant money over time, especially in the areas of color pellets and other high priced additives.

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.

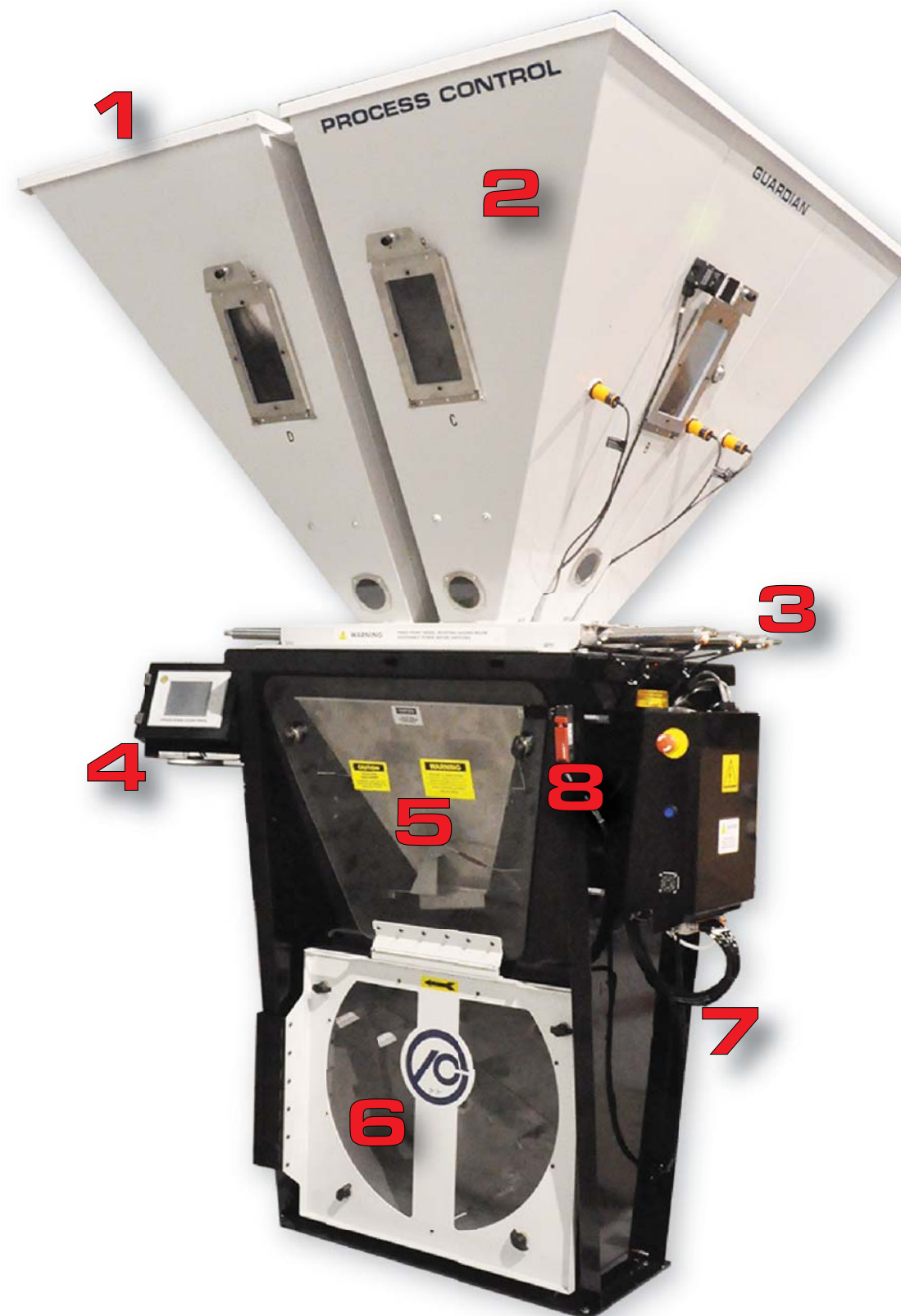
Advanced Performance

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. In head to head comparisons with other manufacturer's gravimetric batch equipment, PCC mixing has been shown to be superior to the competition.

The mixer section of a Guardian® Series 2 blender is designed with total mixing action and "No Dead Zone" mixing chamber. 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 a built-in clean-out system incorporated into their design. With 4 bolt-removal dispensing gates and a quick removal pull-out drain chute, the blender can be cleaned-out quickly and easily during both individual ingredient and overall product change-overs.

Guardian 2 Features



- 1 Integral Loader Support Platform**
supports typical loading equipment without external support
- 2 Segmented Material Hoppers**
-Blenders have 4-to-8 elements in individual fixed hoppers that are rigidly welded together.
-Special configurations are available for up to 12 ingredients.
- 3 Pneumatic Metering Gates**
-Pulsing V-gates achieve dosing accuracy of every ingredient in each and every batch.
-Restricted metering gates optionally available for ultra-high accuracy at very low ingredient percentages.
- 4 Touchscreen PLC Microprocessor with Built-in Ethernet Port**
-Color touchscreen operator interface insures ease of setup/use, and quick startups.
-Remote communications capabilities standard; various protocols supported.
- 5 Weigh Hopper**
-Rests on dual load cell platform.
-Easily removable with no tools for cleaning.
- 6 Mixing Chamber**
-Agitator designed for waterfall type mixing to ensure every batch is thoroughly mixed.
-Engineered for no dead spots and to achieve a consistent homogeneous blend.
-See-through mixing chamber door allows for visual monitoring of blend quality.
- 7 Air Hose**
The attached air hose and blow nozzle ease the cleaning process
- 8 Clean-Out Dump Chute**
Fixed inside the blender behind the weigh pan for ease of material change-over

Batch Blender Features

AVAILABLE ONLY ON GUARDIAN SERIES 2

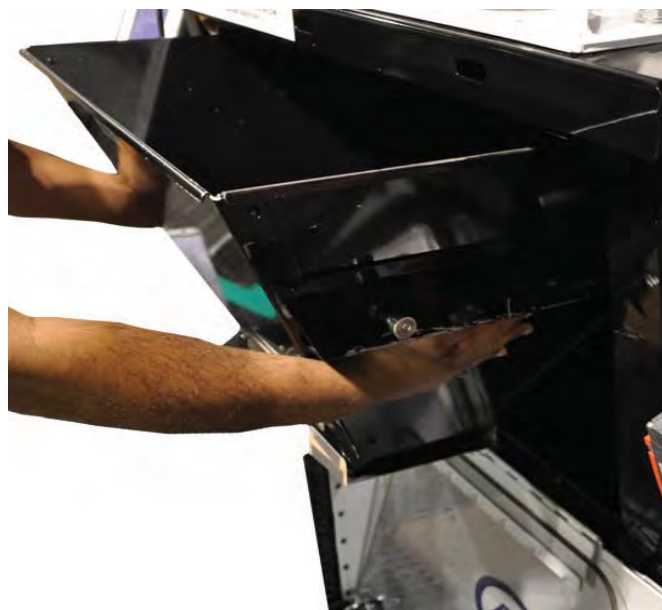


Standard Sightglass, Optional Drain Chute



Easy Open Doors

AVAILABLE ON GUARDIAN SERIES 2 AND GUARDIAN SERIES 3



Removable Weigh Hopper



See-Through Door



Cartridge-Style Metering Gate



Mixer Unload Cartridge Gate



Front Access Doors

AVAILABLE ONLY ON GUARDIAN SERIES 3



Removable Surge Hopper



Removable Material Hoppers



Optional High Power Magnet

Guardian® Series 3 Blender



G3 FEATURES

- All stainless steel construction
- 1 kg/2.2 lb model = up to 350 lbs/hr
2 kg/4.4 lb model = up to 800 lbs/hr
- 2, 3 or 4 Ingredient capabilities
- Cartridge style metering gates
- Integral surge hopper option
- Simplified, stationary loading platform
- Sightglass style polycarbonate access doors
- Quick removable agitator
- Color PLC based 6" touchscreen 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 mixing chamber
- 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

The 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 [2.2lb] and 2kg [4.4lb] batch size models 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 gravimetric batch type blender.

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

Touchscreen Operator Interface



Gravitrol® Gravimetric Extrusion Control

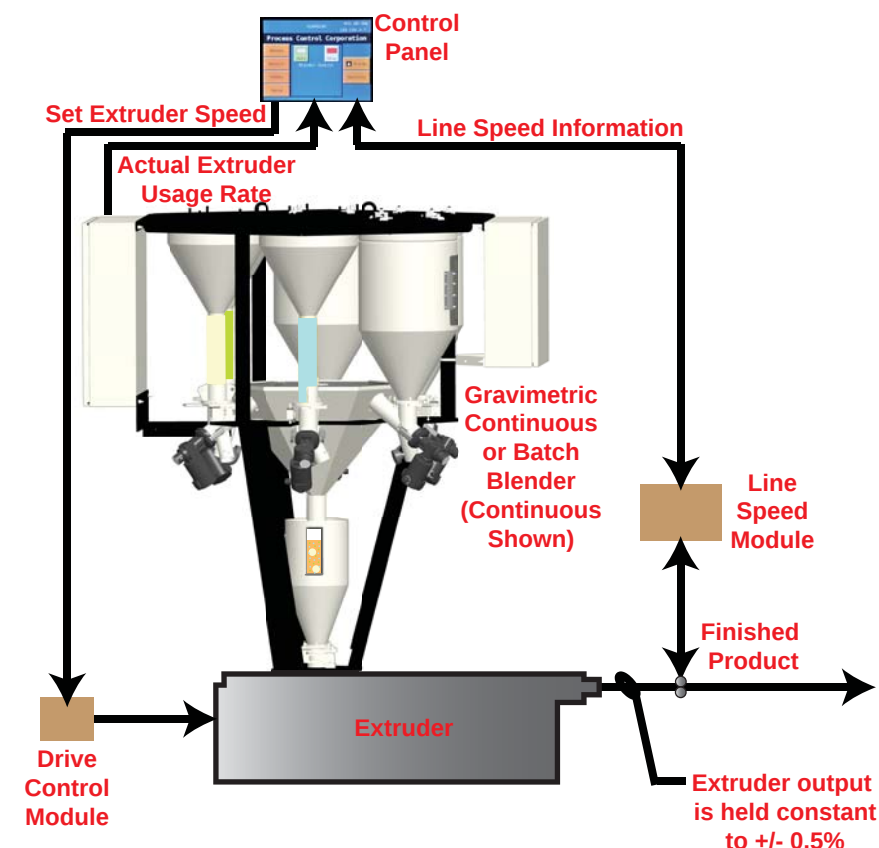
Integrated Controls at Your Fingertips

The 6" color touchscreen microprocessor controller comes standard on all batch and continuous blenders, and is available in an upgrade package for all existing PCC models.

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.

Features

- o PLC touchscreen operator interface that insures ease of use and quick startups
- o Standard Ethernet port for communication ability and integration with remote systems
- o Performs a test dispense for metering accuracy and verification
- o Supports 6 different foreign languages
- o Performs automatic calibration when a new recipe is entered
- o Can be remote mounted up to 1000 ft away
- o Shows in real time the actual throughput and the maximum throughput based on the current recipe running
- o SCADA capable for plant wide integrations



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. The computer then automatically controls line speed in addition to extruder speed, to maintain the desired product weight per length.

Control Your Extruder's Output by Weight

For manufacturers and businesses who seek the benefits of both gravimetric blending and control of the extruder's output by weight, we offer systems that combine both technologies in one integrated, easy-to-use solution. In many applications, line speed control can also be 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 coextrusion line, layers which require blending utilize X Series 2 blenders and single-component layers use HGB 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 automatically and in unison. In addition, line speed can also be adjusted automatically for complete control over product weight per length.

Benefits

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

Complementary Systems for Gravimetric Blenders

PROPER MATERIAL LOADING IS CRITICAL

Continuous Gravimetric Blenders Require Proper Sizing of the Loading System

With all blenders, and especially with continuous blenders, 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 material usages and conveying distances. Our experienced industry and engineering staff, computer simulation modeling, and practical experience with a wide array of real world applications assures you of a vacuum conveying system that meets your requirements.

Blender Ingredient Loading is Fully Automated

The blender ingredient hoppers call for materials as required, while the 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 material 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 and Dust Collectors

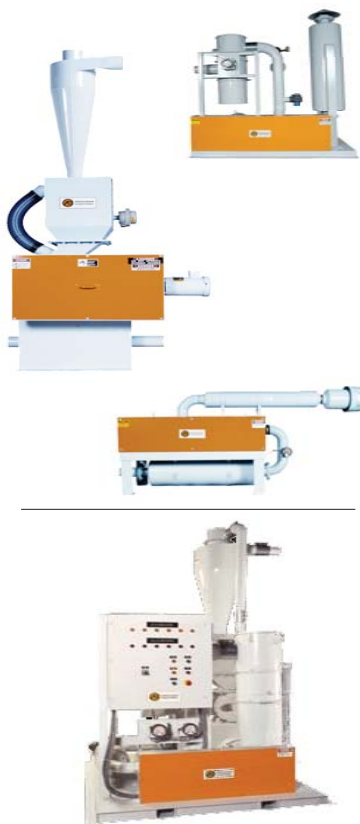
Our Vacuum Power Units offer dependable and economical performance for a wide variety of conveying rates, distances and materials. Typical applications include in-plant distribution systems and blender/machine loading.

Easily removable pellet screens are standard on all pellet receivers



Vacuum Receivers

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



Railcar Unloading Systems

One of PCC's specialties is conveying of plastic materials. Our high volume equipment is designed to stand up to the toughest demands of your bulk rate applications, including high material flow rates, multiple distribution points and long conveying distances.

We provide complete turnkey railcar vacuum/pressure unloading systems, using a single or dual blower system, depending on conveying length and rate. PCC railcar unloading systems include pneumatic conveying equipment, tubing and hardware, controls, silos, silo accessories, and installation.

A typical railcar unloading system consists a vacuum pump, a transfer station, and a pressure pump, plus railcar attachment hardware and conveying tubing. The system is designed to vacuum the material out of a railcar compartment or a tractor/trailer tanker into a transfer station, which then delivers the material to the pressure side of the system for conveying to a storage silo or other in-plant destination.

Other times, a railcar unloading system is more compact, where the vacuum/transfer/pressure equipment is integrated into a single palletted system. We offer both types of systems, depending on your needs.

Director™ Conveying System 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.



Desiccant and Hopper Dryers

PCC Desiccant Wheel and Hopper/Hot Air dryers provide manufacturers and businesses with a wide variety of solutions for their particular plastics drying and/or dehumidification needs. Typical features across various models include process stability, comparative energy efficiency, and uniform process and regeneration heating operations.



PCC Process Manager

Process Manager is an integrated, real-time SCADA process visualization/monitoring, trending, and material management program. An intuitive, easy to use customizable software package that allows blender monitoring+control, or monitoring only from any remote Windows 7 PC. Graphical trending statistics & inventory data is then stored seamlessly in a SQL database. Can be expanded to monitor nearly any PLC/Ethernet based-equipment - future programmable to monitor your entire plant.



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

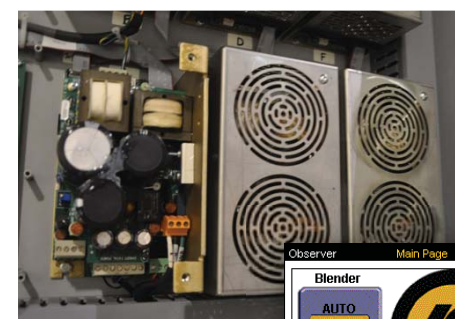


X Series Continuous Gravimetric Blender



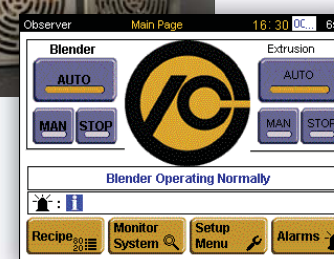
XU Series Continuous Gravimetric Powder Blender

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

Brushless Gearmotor installed on an X Series Continuous



The new touch screen controller for Continuous Blenders



PROCESS CONTROL CORPORATION

Do It Right The First Time, Every Time!

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For detailed product information, including specs and dimensions, please request a PCC data sheet or download one from our website



For more information about the company and other PCC products, please visit our website at:
www.process-control.com



American Made Quality - Since 1967