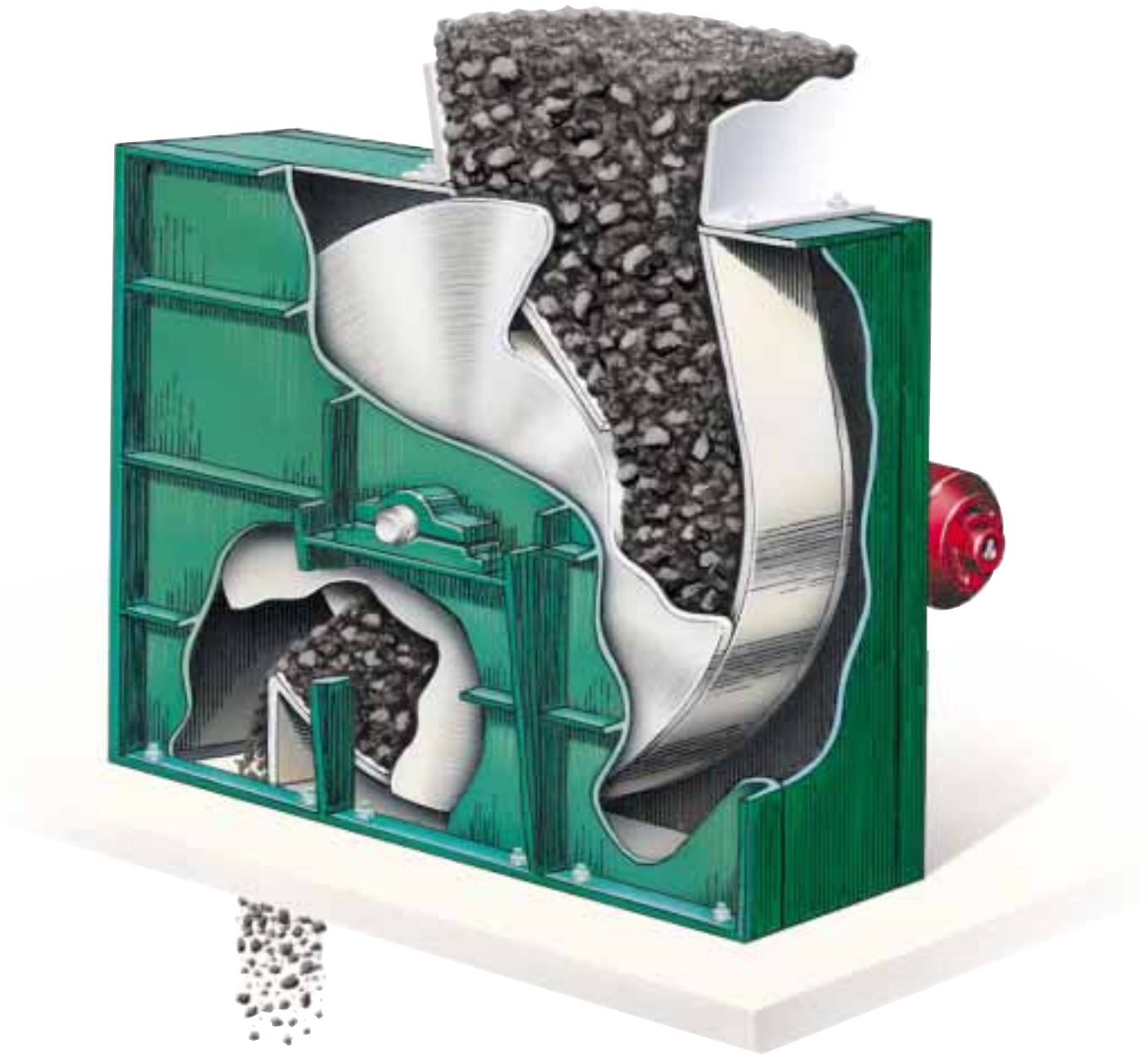


POSIMETRIC[®] FEEDERS



THE POSIMETRIC FEEDER

Because of its unique design, and due to the dramatic improvements it has made to operating efficiency wherever installed, the Posimetric® Feeder is recognized as a valuable breakthrough in feeder technology. As a result, by 2003, there were about one-hundred Posimetric installations in various parts of the world. Its principle of operation is so original that we classify it as a positive displacement feeder, the first of its kind.

Among the exceptional advantages it offers are:

- A level of trouble-free operation unknown with ordinary feeders
- Plugging and downtime are virtually a thing of the past
- Only a single moving part
- Maintenance is almost non-existent; this feeder has no belts and requires almost no attention!
- Reliably accurate and exceptionally constant feed rates
- Not subject to feed rate error due to varying moisture levels in the feed material



This sticky material is easily handled.

Materials Handled & Capacities

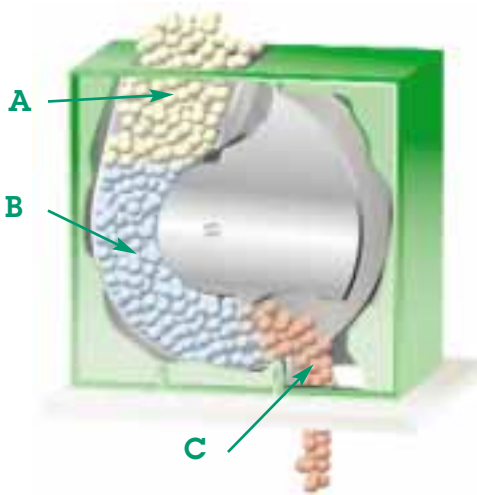
This feeder handles bulk solid materials having a broad range of bulk densities – as well as mixed loads – regardless of whether wet, dry, lumpy, sticky, abrasive or granular. These include:

- Coal
- Sand
- Culm
- Roofing granules
- Biomass
- Limestone
- Crushed stone
- Wood chips including railroad ties
- Shale
- Cereal, grain

Design and Operation

This feeder is a striking example of how simplicity of design can yield superior results, both in performance gains and equipment upkeep. The genius of this concept lies in the way it takes advantage of the bridges that bulk solid material tends to form. In most equipment, material bridging causes problems. In the Posimetric Feeder, controlled bridging is the basis of more uniform, more reliable, and more accurate feeding – in a machine with only a single moving part and which, in most applications, is nearly free of wear.

The feeder consists of a circular, rotating chamber or duct, confined within a housing. When confined within an enclosed space, most bulk material tends to bridge, or lock up, against the outer walls, filling the entire space. The Posimetric Feeder takes advantage of that fact by deliberately causing the material to continuously lock up at the feed point within the duct, and to continuously unlock at the discharge point.



Absolute Feed Rate Control in One Continuous Motion

- A.** Feed material consolidates and locks up at a constant density as it enters the rotating duct
- B.** The fully locked up material moves with the duct as if it were a solid
- C.** Material unlocks and gently discharges at a linear rate

The Secret of its Accurate and Steady Feed Rate The volume of this material lock up/transport section between the feed and discharge points, about 180° of arc, is fixed. In effect, this duct section serves as a container of known dimensions even though it is open at each end. This means that each rotation can only carry a fixed amount of material, regardless of moisture content, entirely confined by material lock up.

It will not feed partial amounts because a less than full section does not permit material lock up, and it can not feed amounts greater than the lock up section. As a result, the displacement of the duct lock up section, and therefore feed rate accuracy, is controlled as surely as if using a bucket. There are no fluctuations, over whatever time span you might wish to measure.

In addition, lock up enables the walls of the duct to literally carry the material gently along; the material has no sliding motion relative to those walls and therefore produces only negligible wear. For sticky materials, a fixed plate above the discharge point gives it an assist.

Capacities Capacity requirements are met by varying the duct size, by adjusting its rotation speed, or by increasing the number of ducts. It will feed dry, light particles at 1,200 pounds per hour or heavy, sticky minerals at 1,500 tons per hour or more without agitating or harming the material.

Controlled, steady feed rate, by means of continuous lock up at the feed opening and gentle unlocking at the discharge opening – this is the basis of the most reliable feeder technology available today

Low Speed, Low Wear Rotation speed is surprisingly slow, typically from 1/2 to 10 rpm, depending on the application. Energy demand is also low because the mass of locked up material helps to turn the duct, much as a waterwheel is turned by the falling water, except no paddles are needed. Typically, a 200-tph feeder only needs a 3-hp motor; a 500-tph feeder only requires 10 hp. This also contributes to long life of all drive components because the entire feeder is subjected to minimal stress. In addition, the Posimetric Feeder acts as a seal against downstream suction or pressure.

Other Operating Advantages For a number of reasons, the Posimetric Feeder does not begin to require the care and attention normally expected of material handling equipment, especially feeders. For example, once calibrated, it will never require recalibration.

Its single moving part, the duct, is only exposed to nominal abrasion and has routinely provided many years of service before even a token amount of wear is apparent. Compare this with other feeder types which have belts, idlers, bearings and other parts that routinely need servicing and, for some items, frequent and time-consuming replacement.

Other costs and problem areas that are absent include belt misalignment & tracking problems, internal cleanout conveyors and associated motors, idler alignment, sealing & dusting problems, and overall loss of performance over time.



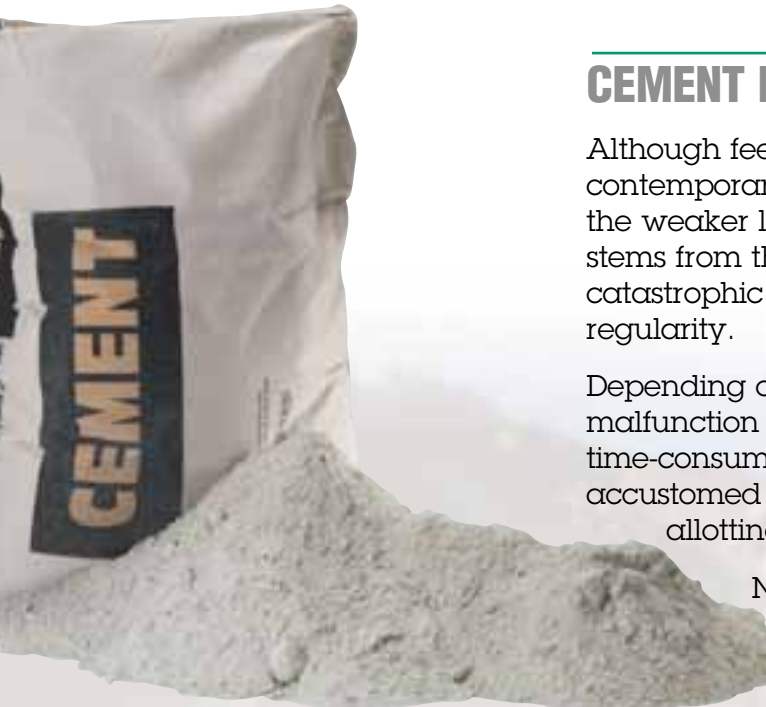
Internal view of two-duct feeder

MINIMAL MAINTENANCE, NO DUSTING

As for preventive maintenance, the Posimetric Feeder only requires occasional visual inspection and, at extended intervals, greasing of bearings. In short, the maintenance burden is minimal.

No fugitive dust is produced either, so that environmental concerns and expenses do not arise. In addition, this feeder is not subject to plugging which is common to other feeder types.

In summary, the Posimetric Feeder routinely operates day in, day out, with only minimal attention. It has demonstrated a high level of performance through years of round-the-clock service with virtually no interruptions and no significant downtime.



CEMENT PLANT APPLICATIONS

Although feeders play a pivotal role in cement plant operations, contemporary feed equipment is generally regarded as one of the weaker links in the cement-making process. This reputation stems from the plugging, high maintenance and, sometimes, catastrophic failure that some feeders exhibit with disappointing regularity.

Depending on its location within the plant, the effects of feeder malfunction can be immediate and serious, with expensive, time-consuming consequences. As a result, plant operators are accustomed to monitoring feeders with particular care, and to allotting significant blocks of time to feeder maintenance.

Now, such concerns can be a thing of the past.

With the installation of the Posimetric feeder, reliability has been elevated to the highest level enjoyed by just about any piece of equipment found in a cement plant. Here's why:

- Plugging has been essentially non-existent
- Recalibration is not necessary
- Equipment wear is virtually nil; there is little need to maintain an inventory of any parts, even in 24/7 operation. In the unlikely event of unforeseen wear, our design ensures that it would not cause catastrophic failure
- In over ten years, only one instance of significant malfunction has been documented
- Periodic inspections and lubrication are the only requirement
- Maintenance labor savings by factors ranging from 8-to-1 up to 14-to-1 have been documented



At one cement plant, feeder service hours dropped from forty hours annually for their rotary feeder to only five for the Posimetric Feeder.

When the Posimetric Feeder replaced a triple gate valve, the service and repair hours dropped from 740 hours annually to only fifty hours annually.

Those savings are exclusive of parts replacement costs formerly required.

When this feeder was first operated in a cement plant, it was found necessary to modify the design to accommodate highly abrasive silica-bearing material. Since then, plant managers report that their Posimetric feeder has only required occasional visual inspection, adding that they've never found anything that required attention.

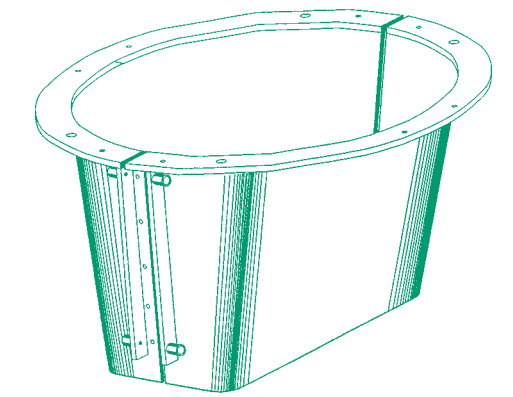
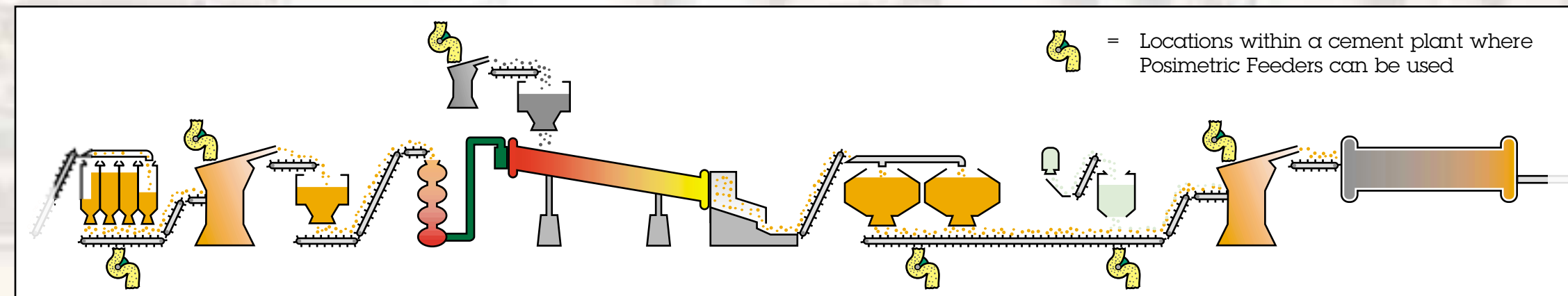
Once this feeder is on-line, plant operators can devote more time to making cement and less time to concerns about feed equipment. Material will be fed smoothly, accurately and with a level of reliability never before experienced.

This feeder may be used at various stages in the process, to feed grinding mills, coal mills, the finish mill, and anywhere that feed control and reliability are required.



OTHER APPLICATIONS

Wherever bulk solid materials are fed, the Posimetric Feeder brings a whole new dimension to feeder performance and reliability.



LIVE-WALL HOPPER

Depending on the application we can provide our patented live-wall hopper to ensure a steady flow of material into the Posimetric feeder. Each of its two walls is independently suspended and attached to a vibrator that only operates when a void is detected – the vibration induced into each wall instantly breaks up any material bridges. When voids are absent, vibration ceases, thereby avoiding consolidation or compaction of material.



PROGRAMMABLE LOGIC CONTROLLER

An optional PLC-based controller provides the user with an extraordinary window into the operation of the Posimetric Feeder. It interfaces with the feeder system display for continuous indication of feeder status, including rotation speed and delivery rate, with alarms or faults clearly displayed. Also interfacing seamlessly with other systems, whether new or existing, it can easily be programmed to provide additional information as needed.



POWER GENERATION APPLICATIONS

Power plants are where a highly accurate and steady BTU feed-rate is especially vital, and where wet coal often makes that very difficult to achieve. It's generally understood that boilers operate at peak efficiency only when there is a constant rate of BTU input. The Posimetric feeder fulfills that requirement better than any other, for reasons that follow.

Weigh feeders cannot distinguish between wet coal and dry coal, and therefore, the BTUs they deliver vary with the weather or with the condition of the reclaim pile. The amount the feeder reports one day may vary widely from the amount reported the next. This means that the BTUs fed to the pulverizers and then on to the boilers can often vary by as much as 20 percent.

When the boiler master senses a variation in how much actual coal is going to the boiler, it tries to compensate by signaling the feeder to speed up or slow down. Very often, however, the deviation from setpoint is greater than it should be. Ideally, the rate of feed should be very precise, with no variations, and the boiler should not have to play catch up.

Such discrepancies in BTU input tend to cause swings in temperature or pressure that lead to wasted fuel, reduced steaming capacity, tube leaks, unplanned derates, and fatigue of the boiler's pressure components.

The unique advantage of the Posimetric Feeder is that it cannot be fooled by surface moisture; it delivers a perfectly steady BTU input, indefinitely, regardless of the moisture condition of the fuel.

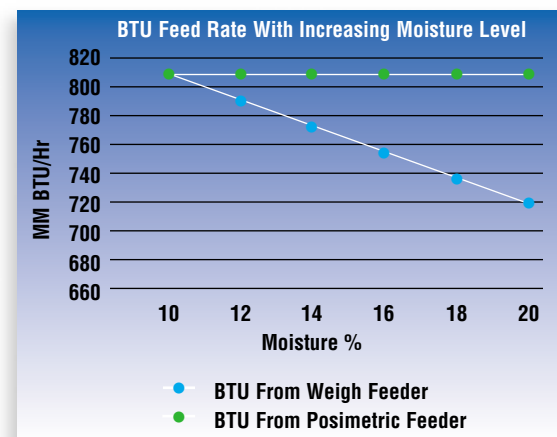
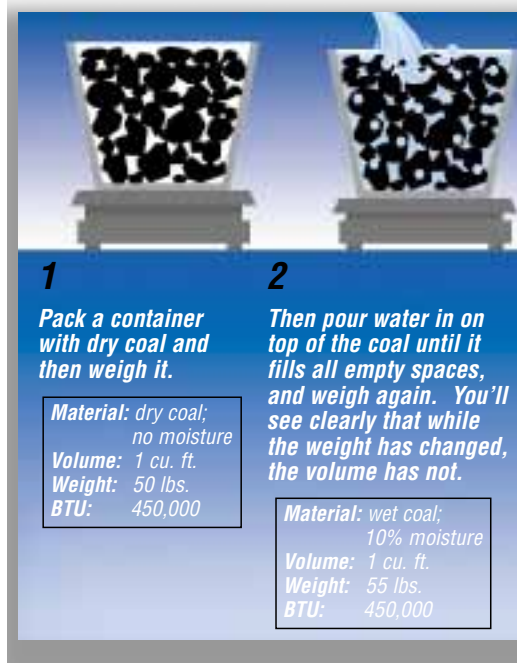
It must be understood that surface moisture adds no volume; it only adds weight. And so, a feeder that relies on weight can not feed a predictable amount of BTUs when surface moisture is present. The graphics at right

Moisture (%)	Weigh Feeder Set Point (Tons/Hr)	BTU Feed Rate (MM BTU/Hr)	Posimetric Feeder Set Point (Ft ³ /Hr)	BTU Feed Rate (MM BTU/Hr)
10	50	810	2000	810
12	50	792	2000	810
14	50	774	2000	810
16	50	756	2000	810
18	50	738	2000	810
20	50	720	2000	810

clearly explain why the Posimetric feeder delivers a predetermined amount of BTUs continuously, regardless of moisture.

The effect on the boiler is significant. For example, consider a pulverizer being fed at 50 tph with 50-pcf coal having a BTU content of 9000 BTUs per pound.

It's clear that the Posimetric feeder delivers BTUs at a rate that minimizes excursions. Smoother, more efficient boiler operation is the result.

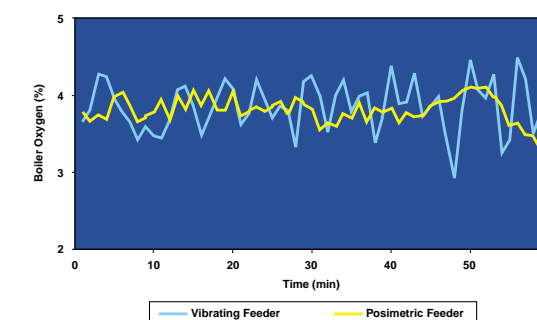


Boiler illustration courtesy of The Babcock & Wilcox Company

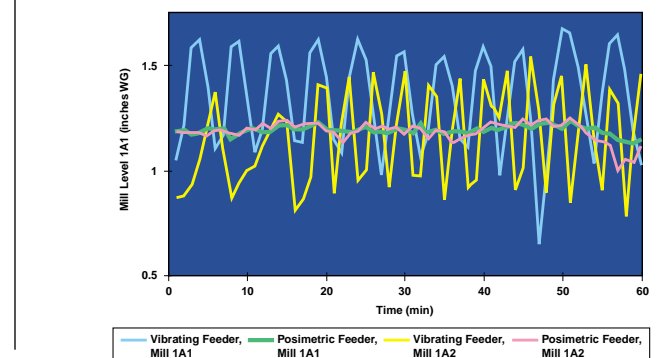
Boiler Performance Gains In one power plant, the Posimetric feeder increased feed rate accuracy to such a degree that it resulted in the following improvements:

- It eliminated repeated loading and unloading of the firing system equipment that used to occur frequently.
- Reduced wear and maintenance. Annual savings, using industry standard modeling, stemming from reduced equipment maintenance and elimination of time formerly required to clear blockages, are projected to be \$42,000 per boiler.
- Reduced excess oxygen. Flue gas oxygen levels originally averaged 4%, with swings from 1% to 7%. These swings were reduced to a mere 1% because our Posimetric feeder fed so consistently that it resulted in more stable boiler operation. Annual savings, using standard modeling, are projected to be \$70,000.
- Reduced unburned carbon (LOI). With such constant, more reliable fuel feed rates, the pulverizers now operate with far greater efficiency, resulting in more uniform product size which in turn produces far more complete combustion.
- Improved emissions control. Because the Posimetric Feeder delivers such a highly stable fuel flow rate, the operator is better able to control the boilers' fuel/air ratios.

Posimetric Feeders are available in sizes to handle every power plant feeding requirement from the largest to the smallest. Explosion-proof, gas-tight, (NFPA) construction is available.



Excess oxygen. Tests performed under varied load and reduced excess air conditions show that Posimetric feeders promote far smoother furnace transitions. Operators testified that they were the smoothest they had ever observed.



Posimetric feeders versus vibrating feeders (boilers running at full load). The Posimetric feeders resulted in extraordinary gains in stability of mill levels, excess air levels, steam flow levels and steam pressures. Current swings were reduced on the ID fans, FD fans, mill motors and exhausters.



Where used to feed coal hammermills in cyclone plants, operators have reported more uniform wear of crusher components and better control of product size. More uniform feeding translates to extracting the full service life from costly crusher components because it eliminates uneven, premature wear.

THE BOILER AS CALORIMETER

Coal density itself does not change much from hour-to-hour or day-to-day; what changes is the moisture content of the coal. The boiler control system compensates for this constantly shifting moisture level by acting as a large calorimeter, and demanding more or less coal, depending on the situation at that moment. The boiler control system does not care how much coal is being fed; only that enough coal is being fed.

What matters most is that the feed rate from the feeder be reliable and repeatable, and no feeder will perform this task as well as the Posimetric. Other feeders must shear coal from the bottom of the column below the bunker; in doing so there is often differential movement between the feeder and the coal. This differential virtually assures that the accuracy of the feeder suffers. In contrast, the Posimetric Feeder carries the coal smoothly through an arc to provide an uninterrupted, steady flow of BTUs to the boiler.

To observe how lock-up works within the Posimetric Feeder, a transparent working model is available upon request.

- Capacities from 3 - 1500 tph
- Only one moving part
- Rotation speeds as low as 1/2 - 15 rpm, using extremely low horsepower - your material itself, provides most of the power
- Improves plant safety because it's dust-free
- Seals against downstream suction or pressure



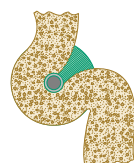
- Replaces rotary, table, weigh feeders and triple gate valves with an incredibly uniform feed rate the others can't match - always delivers a precise amount of materials
- Unvarying accuracy to 99.5%
- Truly the most trouble free, lowest down-time feeder ever built

Comparison Points	Ours	Weigh Feeders
Significant overall wear after years of service	NO	YES
Loss of performance over time	NO	YES
Belt mis-alignment and tracking problems	NO	YES
Belt wear-and-tear & replacement	NO	YES
Multiple idlers & bearings to maintain, requiring opening of the feeder	NO	YES
Regular recalibration needed	NO	YES
Plugging	NO	YES
Internal cleanout conveyor, with another motor, more bearings, etc.	NO	YES
Idler alignment is a calibration issue	NO	YES
Long inlet-to-outlet offset	NO	YES
Sealing and dusting problems	NO	YES
Accuracy to 99.5%; feeding is consistently smooth and totally reliable	YES	NO
Space limits us from showing more comparison points		


QUALITY DESIGN, QUALITY MANUFACTURE

The unique Pennsylvania® Quality Assurance Program provides our design and manufacturing teams with specific benchmarks and guidelines. Faithful adherence to this program enables us to provide customers with high quality equipment that fits properly, operates properly and that provides maximum service life. Because Pennsylvania quality is so widely accepted, our customers request inspections or copies of quality documents for fewer than five percent of all orders.

Tell Us About Your Feeding Problems We've developed successful solutions to material handling problems since 1905. If you wish to arrange for a review of your feeding situation, please contact us at any time.



Posimetric® Feeders

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The Most Choices, The Most Experience

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