

# THAYER SCALE

CONTINUOUS WEIGHING and FEEDING OF DRY BULK MATERIALS

## LOSS-IN-WEIGHT FEEDERS



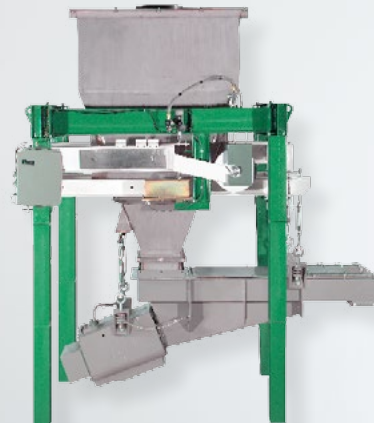
Model LWF-HC-V-50 with  
Vibratory Feeder



Model LWF-LC-V-30 with  
Rotary Feeder



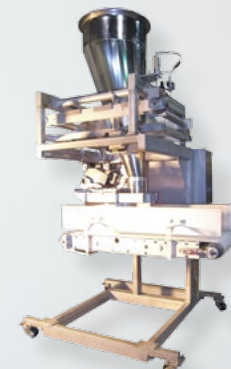
Model PF-LC-S-25 with  
Screw Feeder, Sanitary Design



Model LWF-LC-V-20 with  
Vibratory Feeder



Model LWF-LC-S-Batch Feeder/  
Tote Unloader



Cascade Blender with  
Model LWF-SC-V-10 with  
Vibratory Feeder and Model MWF-OS  
Weigh Belt



Model LWF-SC-TS-8 with  
Twin Screw Feeder



Model LWF-SC-V-6 with  
Vibratory Feeder and hopper  
SPIRALATOR™



Model PF-18L-V-20 with  
Screw Feeder



Model LWF-15-V with  
Vibratory Feeder and hopper  
SPIRALATOR™

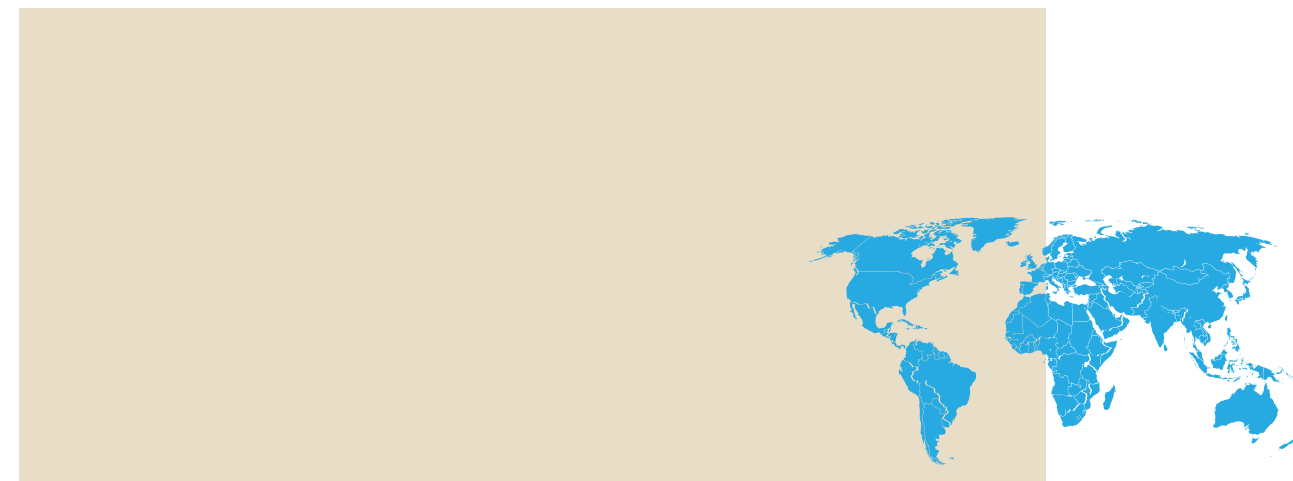


Model LWF-SG10-V-2 with  
Vibratory Feeder and Refill System



Model LWF-SG10-TS-2 with  
Twin Screw Feeder

SCREW  
VIBRATORY  
ROTARY  
BATCH  
CONTINUOUS



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Thayer Scale Loss-In-Weight Feeders are designed to provide precision class accuracy and repeatability even in the harshest of industrial environments. They range in capacity from grams per minute to tons per hour.

These are the most versatile feeders in the industry. At the heart of each Loss-In-Weight Feeder is a THAYER scale that has been designed exclusively for the stringent requirements of Loss-In-Weight feeding.

Thayer Scale offers a powerful set of proprietary add-on accessories that are designed to defeat the problematic flow issues encountered by industry such as bridging, flushing, adhesion and cohesion. Comprehensive process solutions that can only come from a company with over fifty years experience.

#### TWO TYPES OF SCALES TO CHOOSE FROM:

##### “FMSS” CABLE SUSPENSION SYSTEM

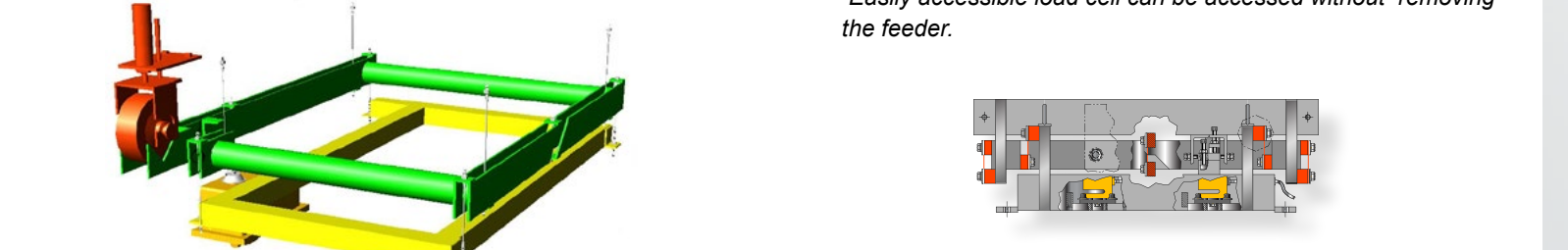
The THAYER Cable Suspension System (patented) is the most rugged and forgiving Force Measurement Weighing System available on today's market. It can take more physical abuse and can tolerate more foundation distortion/deflection than all other known designs.

The exclusive Thayer Scale “FMSS” (Force Measurement Suspension System) design provides extremely high sensitivity. Feeder and weigh hopper “dead load” are mass-counterbalanced so that only material weight (live load) is measured. This feature helps assure excellent control in “noisy” environments.

All of the articulate parts of the scale mechanism are supported from “axially inextensible, but laterally yieldable” suspension elements (stainless steel pre-stressed aircraft cable), which are arranged to hang freely, thereby avoiding any appreciable spring or hysteresis effect, variation in mechanical advantage, or binding due to imperfect leveling.

Because of this unique mechanical property of the force transmission system, any laterally directed forces and shock on the scale or its supported feeder can not cause destructive shear and bending stresses to develop in the elements themselves or at the load cell junction. The system, being yieldable in the lateral direction, is therefore effectively and completely protected by using laterally placed “stops” in proximity of the weighed structure.

Weight loss measurement is done by either Thayer's LC-137 LVDT Load Cell or NTEP approved strain gauge load cell depending on application requirements.


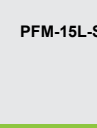
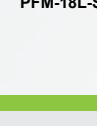
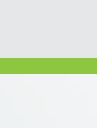
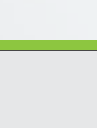
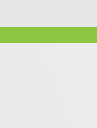
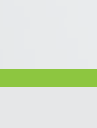
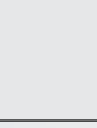


#### AUTOMATED TEST WEIGHT LIFTER (ATWL)

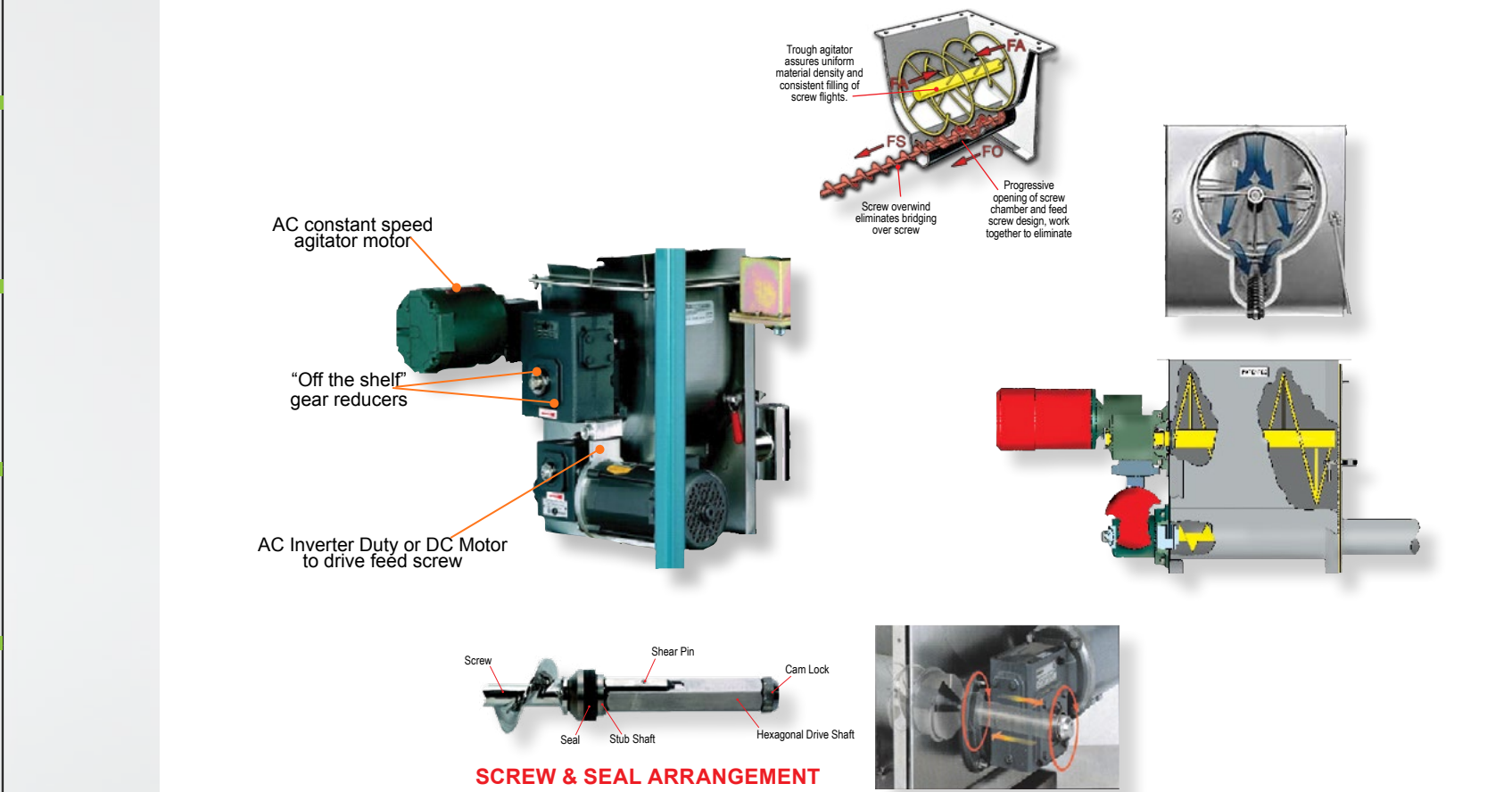
More and more weigh feeders are being used in conjunction with statistical process control where performance records are routinely generated and delivered with the product as required by a customer's quality assurance program. Such a record should contain a “validation of scale calibration” step to be truly meaningful as a quality assurance tool. Thayer Scale's Automated Test Weight Lifter (“ATWL”) provides a means for automatically applying a known test load and going through a calibration sequence on computer or push-button command to check scale calibration. A “foolproof” self-checking software algorithm in the feeder control instrumentation prevents erroneous calibration.

The test weight calibration method has proven accurate and reliable over decades of in-plant use. Unlike material sampling, it is always clean, fast and safe and free from human error. Unlike electronic signal simulation, it mechanically tests the performance of critical electro-mechanical components under the full deflection range of the load cell.

### LOSS-IN-WEIGHT SCREW FEEDERS

THAYER MODEL NO.	APPROX. FEED RATE RANGE		SCALE CAPACITY (POUNDS)		WEIGH HOPPER EXTENSION CAPACITY		AVAILABLE SCREWS		SCALE SUSPENSION TYPE	LOAD CELL TYPE	ATWL CAPABLE	TYPICAL MATERIALS HANDLED
	MIN.	MAX.	MIN.	MAX.	LIQUID	USABLE	DIA. (IN)					
 MSF-15L-S	0.25	60	3	25	3	2.4	0.375 0.5 0.625 1.0	FLEXURE	SG LVDT	NO		CANDLE WAX, RICE POWDER, SALT, FLOUR, LITHIUM ION POWDER, GROUND BIODIESEL, VITAMIN ADDITIVE, SEASONING
 PFM-15L-S	20	1,250	10	200	1.0 3.0 5.52 7.5 9.75	0.8 2.4 4.42 6.0 7.8	1.0 1.5 2.0	FLEXURE	SG LVDT	NO		GRAPHITE POWDER, ZINC OXIDE, KAOLIN CLAY, GUAR GUM, PLASTIC ADDITIVE, QUICK LIME, PIGMENT, COPPER POWDER, RUBBER GRANULES, TSP, WHEY POWDER
 PFM-18L-S	20	1,250	10	500	1.0 3.0 5.52 7.5 9.75	0.8 2.4 4.42 6.0 7.8	1.0 1.5 2.0	FLEXURE	SG LVDT	NO		TRONA ORE, MICROCELLULOSE, POWDERED MILK ADDITIVE, CALCIUM CARBONATE, SALT, SPICES, ADDITIVE POWDERS, TiO2, STEARATE, BORAX
 PF-18L-S	20	7,500	10	500	1.0 3.0 5.52 7.5 9.75	0.8 2.4 4.42 6.0 7.8	1.0 1.5 2.0	FLEXURE	SG LVDT	NO		COCOA POWDER, FLOUR, RICE, IMPACT MODIFIER, PP PELLETS, CRUMB RUBBER, SUGAR, ADVANAX, CALCIUM STEARATE, ALMONDS, TOFFEE CHIPS
 MSF-MC-S	0.50	900	5	250	1.0 3.0	1.8 3.6 5.4 7.2	0.375 0.5 0.625 1.0	CABLE	SG LVDT	YES		SPICES, SEASONING ADDITIVE, CANDLE WAX BEADS, CALCIUM CARBONATE, VITAMIN POWDER, GRAPHITE POWDER
 PFM-SC-S	20	1,250	30	500	1.2 3.0 5.25 7.5 9.75	0.96 2.4	1.0 1.5 2.0	CABLE	SG LVDT	YES		CLAY, POLYETHYLENE PELLETS, LIMESTONE, PIGMENTS, IRON OXIDE, ZINC BORATE, ZINC OXIDE, OSR RESIN, QUICK LIME, STARCH, FLUORSPAR, ZEOLITE
 PF-SC-S	20	7,500	30	500	3.375 4.5 6.75 9.0 10.0 11.25 15.0 5.73 9.83 11.83 13.83 15.83	2.7 3.6 5.4 7.2 8.0 9.0 12.0 4.58 7.86 9.46 11.06 12.66	1.0 1.5 2.0 3.0 4.0 6.0	CABLE	SG LVDT	YES		PULVERIZED LIMESTONE, AMMONIUM BICARBONATE, SODA ASH, EAF DUST, OAT FLAKES, PLASTIC RESIN, TALC, RUBBER, MICA, VITAMIN POWDER, BRIAR, CALCIUM CARBONATE, ZINC OXIDE, PLASTIC STABILIZER, PULVERIZED COAL
 PF-LC-S	100		250	2,200	6.73 9.83 11.83 13.83 15.83 20.0 30.0 40.0 50.0	4.58 7.86 9.46 11.06 12.66 16.0 24.0 32.0 40.0 48.0	3.0 4.0 6.0	CABLE	SG LVDT	YES		PLASTIC PELLETS, AGRICULTURAL CHEMICALS, CEMENT, GYPSUM SNACK, FOOD MIX, DOG FOOD PREMIX, COCOA POWDER, TiO2, CHROMATE ORE, SODA ASH, CALCIUM OXIDE, TALC

- Patented “U-Trough” feed chamber with independently driven agitator assures precise, reliable delivery of material to the feed screw.
- Eliminates material build-up, controls material aeration and delivers a steady and constant flow of material.
- Trough is designed for fast, easy, and thorough clean out. Feeder completely disassembles in less than one minute. High quality, rugged, stainless steel construction assures years of reliable, trouble free operation.



The totally unique THAYER process screw has many innovative concepts. The most obvious of these is the hex shaped, eccentric cam locking, quick release screw drive shaft assembly. This allows for hassle free “no tools” screw removal.

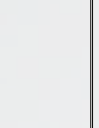
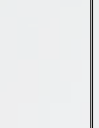
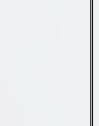
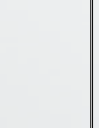
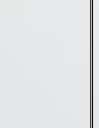
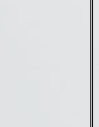
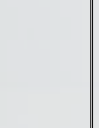
A more subtle but equally important concept is the shaft seal and how it is integrated into the process screw for ease of maintenance. With this shaft seal design the normal wear items (namely the seals) are mounted on and removed with the quick release process screw. They can then be easily cleaned, inspected or replaced without tools or additional disassembly. The process screw is designed so that the seals do not turn with the screw, rather the screw has a special adapter mounted on it which acts as a seal gland surface. This adapter rotates with the screw and runs on the inside diameter of the non-rotating seals.

In normal service the seals are the only wear items, however if abnormal screw damage has occurred, the process screw can be disassembled. This feature allows the drive shaft assembly to be removed from a damaged screw and reused on the replacement screw. Also the rotating adapter and drive key can be reused or replaced in the field with a minimum amount of down time.

Seal construction is carbon fiber (graphite) reinforced PTFE with a 302 stainless steel canted-coil energizing spring.

The process screw has a round stub shaft which the adapter slides over prior to inserting into the mating hole in the screw drive shaft. This assembly along with the drive key is pinned together. This design allows for component replacement in the field. If required, the screw can be disassembled from the screw drive shaft assembly by driving the pin out. Once completed the drive shaft assembly and adapter can be withdrawn off the round stub portion of the screw.

If the screw becomes jammed the spring pin will shear and protect the screw, reducer and drive motor.

THAYER MODEL No.	APPROX. FEED RATE RANGE (lbs/hr)		SCALE CAPACITY (POUNDS)		HOPPER CAPACITY (FT³)	AVAILABLE TRAYS		SCALE SUSPENSION TYPE	LOAD CELL	ATWL CAPABLE	TYPICAL MATERIALS HANDLED
	MIN.	MAX.	MIN.	MAX.	MAX.	WIDTH (INCHES)	LENGTH (INCHES)				
 LWF-SG-10V	0.1	20	3	25	0.5	1.75 4.0 5.0	12 20 20	FLEXURE	SG LVDT	NO	VITAMIN ADDITIVE, SEASONING, TALC POWDER, RESIN, PIGMENTS, GRASS SEEDS, SALT
 LWF-15L-V	10	750	10	200	3.0	4.0 5.0	20 20	FLEXURE	SG LVDT	NO	ZINC STEARATE, GRAPHITE POWDER, ZINC OXIDE, KAOLIN CLAY, CORN STARCH, CARBON BLACK, POLYPROPYLENE STRAND, FE POWDER, TOBACCO SEEDS
 LWF-18L-V	10	3,000	10	500	6.0	4.0 5.0 7.0	20 20 21	FLEXURE	SG LVDT	NO	ADDITIVE POWDERS, CITRATE ACID, POWDERED METAL, FLOUR, TRISODIUM PHOSPHATE, IRON OXIDE, POLYETHYLENE POWDER, RICE
 LWF-MC-V	10	3,000	10	500	3.0	4.0 5.0	20 20	FLEXURE	SG LVDT	YES	CALCIUM STEARATE, ALMONDS, CEREAL, SAND, PREMIX MASTERBATCH, CHOCOLATE CHUNKS, SCRAP FIBERGLASS, CHARCOAL, LOPE
 LWF-SC-V	10	4,000	30	500	20	4.0 5.0 7.0	20 20 21	CABLE	SG LVDT	YES	SPICES, SEASONING, CALCIUM CARBONATE, CRUMB RUBBER, SODIUM BICARBONATE, IRON POWDER, PE RESIN, NYLON PELLETS
 LWF-LC-V	100	7,000	250	2,500	75	10 12 CUSTOM	CUSTOM	CABLE	SG LVDT	YES	LIMESTONE, RESIN, PIGMENTS, FREEZE DRIED STRAWBERRIES, POLYSTYRENE, GRANULATED GYPSUM, OXIDE PELLETS
 LWF-HC-V	CONSULT FACTORY		400	4,000	CONSULT FACTORY CUSTOM	CUSTOM	CUSTOM	CABLE	SG LVDT	YES	GLASS GULLET, COKE BREEZE, ANTHRACITE COAL, PULVERIZED LIMESTONE, SCRAP, EAF DUST, OAT FLAKES, PLASTIC RESIN, TALC, RUBBER, PULVERIZED COAL

Thayer Scale has spent many years developing the Loss-In-Weight Feeder and control system for use with vibratory feeders. Since virtually all of the controllers on the market were originally designed for use with a screw feeder, it should not be surprising to find that very few of them have the versatility to cope with the special requirements of the vibratory feeder type. Without (certain) special control features, the vibratory feeder can not be controlled effectively in a volumetric mode, nor can it be controlled gravimetrically over a wide operating range without making controller adjustments to suit its non-linear characteristics.

With complete absence of motors, bearings, seals and lubricating fluids, along with the un-contested pulse free delivery “smoothness” at maximum turn down, the vibratory feeder has powerful advantages over the screw feeder in a great number of applications.

Some important differences that need to be taken into account in controlling these two fundamentally different volumetric feed devices are:

1. The gain of a screw feeder is constant over its operating range. That is the increments of change in feed output for a given change in drive input is constant throughout its range. The “gain” of a vibratory feeder increases exponentially with its operating point. That is, the increment of change in feed output becomes larger for a given change in drive input as the operating point increases. The consequence of this is overall gain of the control loop is lower in the low operating ranges and higher in the high operating ranges. If something is not provided to compensate for this effect, the controller gain needs to be adjusted if the set point is changed any significant amount.

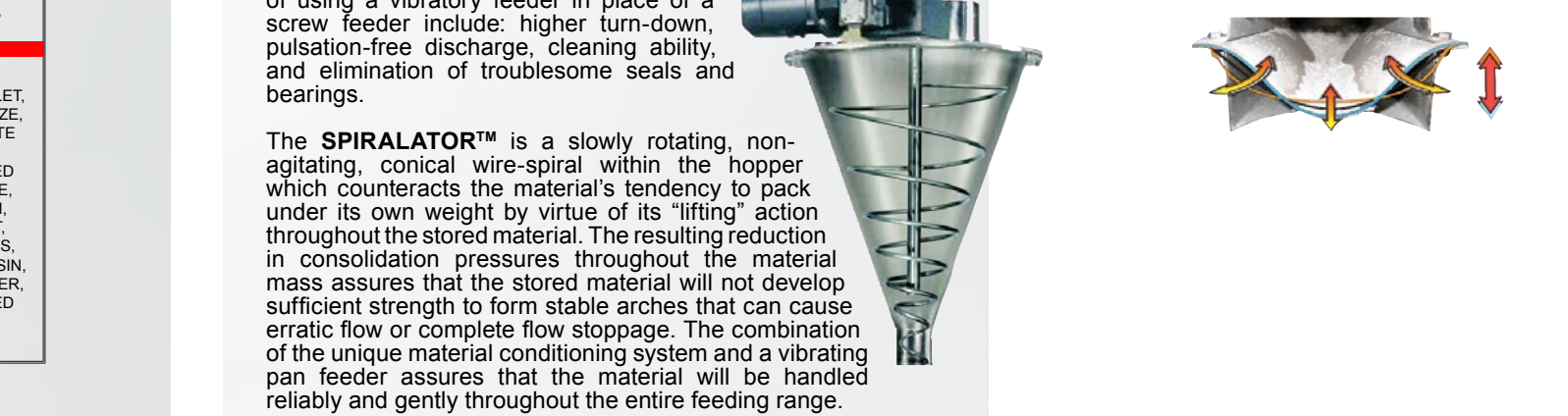
2. The “volumetric” delivery of a screw feeder stays relatively constant under a constant drive input (such as during hopper refill). Under conditions of a constant drive input, the “volumetric” delivery is relatively independent of material's bulk density. Variation in its “gravimetric” delivery under constant drive input is essentially determined by density changes of the material handled at the time.

3. The “volumetric” delivery of a vibratory feeder stays relatively constant providing the vibration amplitude is held consistent (frequency assumed constant @ 60 hz). However, for the vibration amplitude to hold constant, the drive input must be increased or decreased to offset the loading effect on the tray itself.

4. A screw feeder can accept a refill with less material “heel” (the minimum quantity of material that is always maintained over the feeder inlet) than a vibratory feeder can, since the flights of a screw within the feed tube offer greater resistance to “flushing” than does an open channel tray.

5. The magnetic-drive of a vibratory feeder is capable of rapidly responding to changes in controller output signal. A gear-motor drive system for a screw feeder, and the screw itself, represents considerable angular “inertia” which simply can not be made to respond quickly to demand changes.

**SPIRALATOR™**  
Enjoy the benefits of using a simple and reliable vibratory feeder on non-floodable materials that normally can not be reliably discharged through the small opening of a conical hopper. The benefits of using a vibratory feeder in place of a screw feeder include: higher turn-down, pulsation-free discharge, cleaning ability, and elimination of troublesome seals and bearings.



**GRAVIMETRIC MODE**  
In the gravimetric mode THAYER'S controller samples the signal from the load cell up to 16 times a second measuring the rate at which you are losing weight from the hopper/scale. The controller then adjusts the screw speed to maintain the desired flow rate (setpoint). During the gravimetric mode of operation the controller monitors the material flow rate, motor speed input from the tachometer and the length of time set in the Density Sample Time program parameter to continuously calculate the gravimetric constant. The gravimetric constant is used to maintain a constant flow rate during the volumetric mode of operation.

**VOLUMETRIC MODE**  
In the volumetric mode the controller will adjust the motor speed signal to the discharge screw motor to maintain a constant motor speed based on the tachometer signal. The desired motor speed during volumetric is based on the gravimetric constant and the current setpoint

**REFILL CYCLE**  
The LWF will automatically go into the refill mode while running in the gravimetric mode when the hopper level reaches the 'Start Refill Point' program parameter. In the refill mode the controller is running in volumetric mode with the refill output turned on. The controller will stay in the refill mode until the hopper weight reaches the Stop Refill Point program parameter or if the time set in the Abort Fill time program parameter has elapsed, typically 40 seconds. After the refill mode the controller will automatically go into the settle mode, volumetric mode with the refill output turned off. The controller will stay in the settle mode until the length of time in the Fill Settle program parameter has elapsed, typically 10 seconds. The fill settle time is the length of time it will take to completely stop the material flow into the LWF hopper, allow all of the material to fall and allow the scale to settle from the impact of material coming into the hopper. After the Settle mode the controller will automatically go back to the gravimetric mode.

**REFILL SYSTEM**  
The refill system should deliver at least 50% of the Loss-In-Weight Feeders hopper loading in less than 20 seconds. If you are using a valve it must be fast acting and the material flow from the supply hopper into the Loss-In-Weight hopper must be free flowing. If you are using an auger, rotary valve or other delivery device it must be fast acting and properly sized. The refill valve or device must be located near the inlet (within 3 ft.) to allow for prompt cutoff of material flow when the system has been satisfied. The refill system must also provide a positive shutoff of material flow when closed or stopped and isolate the Loss-In-Weight hopper from any pressure differential that may be present in the supply hopper system.

