

MAGUIRE PRODUCTS INC.

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MSF STARVE FEEDER®

**Model MSF®**

MAGUIRE STARVE FEEDER

INSTRUCTION MANUAL



# Maguire Products Inc.

## Model MSF STARVE FEEDER With AUTOMATIC CALIBRATION

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To every person concerned with use and maintenance of the MSF Starve Feeder it is recommended to read thoroughly these operating instructions. Maguire Products Inc. accepts no responsibility or liability for damage or malfunction of the equipment arising from non-observance of these operating instructions.

To avoid errors and to ensure trouble-free operation, it is essential that these operating instructions are read and understood by all personnel who are to use the equipment.

Should you have problems or difficulties with the equipment, please contact Maguire Products Inc. or your local Maguire distributor.

These operating instructions only apply to the equipment described within this manual.

## Manufacturer's Contact Information

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# Maguire MSF Overview

The Model MSF starve feeder carefully regulates the volume of natural material supplied to the feed throat of the process machine. The Model MSF starve feeder, weighing less than 50 pounds, is compact and easy to install. It is mounted between the existing hopper and the feed throat of the machine adding only 8 inches to the height of your hopper. Your hopper remains directly over the feed throat of your machine and is not off-set as is the case with some competitors' units.



## IMPROVES CONTROL OF VENTED SCREW

When used in conjunction with a vented screw the MSF starve feeder allows the operator to regulate the feed to the rear portion of the screw. If the front portion of the screw is unable to extrude plastic as rapidly as the rear portion, then the excess flow from the rear will be forced out the vent. This condition could result from:

- A. The use of backpressure during screw return time
- B. Worn screw flights in the forward zone
- C. Intentionally unbalanced temperatures over the length of the barrel, etc.

Use of a starve feeder allows careful regulation of the volume of material that is metered to the rear feed section of the screw, so an operator may override the tendency for material to escape from the vent.

## IMPROVES MATERIAL PROCESSING

As plastic pellets are heated and plasticized, surface moisture and some volatiles will be driven off as vapor and steam. The vapor and steam that travel backwards will re-condense on the colder pellets in the feed zone and hopper, and then will be carried into the screw over and over again. "Starve feeding" does two things to help remedy this problem. First, a "starved" screw will have a continuous air passage directly behind the spiraling screw flight that will allow vapors to easily escape back through to the feed throat. Second, the starve feeder itself provides a vent to atmosphere so that vapors need not travel up through the cold resin in the hopper.

## REDUCE DRIVE MOTOR TORQUE

Some granular forms of resin feed so efficiently at the feed section of the screw that the horsepower or torque available to drive the screw is not sufficient, and the drive motor becomes overloaded. Starve feeding will correct this problem by metering resin at a rate that does not exceed the horsepower or torque of the drive motor.

## CONTROL SLIPPAGE

When the feed zone of a process machine is NOT cooled, the plastic pellets in the throat may preheat considerably if throughput rate is low and residence time in the throat is too long. This may cause premature melting in the barrel, resulting in screw slippage that will produce erratic and extended screw return times. Starve feeding eliminates residence time and consequently prevents screw lippage. In these situations, starve feeding actually can produce a shorter screw return time than with "flood" feeding.

## NO CALIBRATION REQUIRED

Your operator need only select the "percent" of full flow desired; such as 70% or 80%. The microprocessor will self-calibrate by first matching the extrusion rate and then automatically cutting back to the selected reduced "starve" rate of feed. No calibration of the system is ever necessary.

## MANUAL BYPASS

A hinged flow plate allows conventional flood feed for manually bypassing the "starve" system.

## MSF Key Features

1. Large clear viewing window allows a visual check of flow rates.
2. Fully automatic speed regulation is achieved without any operator intervention through an automatic self-calibration cycle.
3. Percent of starve is easily set to one of 12 settings to achieve feed rates as low as 20% of full flow.
4. Controls also allow the operator to operate the unit MANUALLY for testing or for production when the operator wishes to have full manual control over feed rate.
5. Material sensor prevents over-feeding or 'stuffing' of material if operator should accidentally use incorrect control settings.
6. Full, unrestricted flow is easily achieved by lowering the feed channel plate, thereby flooding the feed throat.
7. Lowering the feed channel plate clears all pellets that normally lay under the feed auger. This minimizes possible pellet contamination during color changes. No other starve feeder has this feature.
8. Removable viewing window allows quick access for clean-out if required.
9. Controls are microprocessor-based with full noise suppression and transient voltage protection developed over many years of actual in-plant operation under the most demanding industrial environments.
10. Motor speed regulation is precisely held through digital tachometer feedback. Plant voltage fluctuations have no adverse effect on metering rates.
11. The Starve Feeder with controls is compact and easy to install, weighing less than 50 pounds. It is mounted between your existing hopper and the feed throat of your machine and adds only 8 inches to the height of your hopper. Your hopper remains located directly over the feed throat of your machine, not offset as is the case with some competitive units.

## Installation

1. The unit is shipped to you fully assembled. It must be mounted directly to the throat of your process machine under your existing natural material hopper.
2. In selecting the proper ORIENTATION for mounting, consider the following:
  - Easy viewing through the clear window.
  - Easy viewing and access to the controller front panel.
  - Ease of removal of the viewing window.
3. Remove the existing natural material hopper from your process machine. Locate and drill the proper bolt pattern on both top and bottom plates of the 10" square ADAPTOR frame. This frame will be bolted directly to the feed throat of your process machine and the natural material hopper will be bolted on top.
4. A 110 volt continuous power source is required for operation.

**For INJECTION MOLDING** machines, a 110 volt intermittent power source that cycles on and off with the "screw running" time is required.

**For EXTRUSION**, the 110 volt "screw running" signal can be combined with the "continuous" power source since the screw does turn continuously.

### 5. **WIRING:**

If your unit is supplied with TWO power cords, a BLACK one and a GRAY one, the BLACK one is for continuous power and the GRAY one is for SIGNAL power. Signal voltages from 24 to 240 can be handled. The Black one for continuous power must be 120 volts.

If your application is EXTRUSION, then both plugs can be connected to either a continuous power source or a source of power that is energized only when the extruder is on.

If your unit is supplied with ONE power cord, it is a four conductor cord.

The BLACK lead is for CONTINUOUS 110 volt power.

The RED one is for 110 volt SIGNAL power.

The WHITE one is the 110 volt COMMON line for both SIGNAL and CONTINUOUS power.

GREEN is earth ground.

If your application is EXTRUSION, then the BLACK and RED lines can be connected

together, if you like, to either a continuous power source or a source of power that is energized only when the extruder is on.



## START UP PROCEDURE for INJECTION MOLDING Machines

1. Plug the "CONTINUOUS POWER" (black) cord into a standard 120 volt continuous power source.
2. Plug the "SIGNAL" (gray) cord into outlet that is energized only when the screw is turning. This SIGNAL outlet will provide a voltage signal to an internal electronic relay. (If SIGNAL voltage is less than 80 or greater than 180 volts, the controller must be specially modified, or a relay with the proper coil voltage must be added as part of the signal circuit.)

The main switch should now be set on "AUTOMATIC". In this position, the unit passes through 4 phases during the first several minutes of operation:

1. On power up, the auger runs at full speed to flood the feed throat with material. It stops only when the throat is filled to the level of the sensor and the sensor is covered.
2. As material is used by the process, the auger comes on as required to keep the sensor covered. This on and off period continues to keep the sensor covered until a series of uniform screw return times is established.
3. After the microprocessor has detected four consecutive uniform screw return times, the auger will stop for a period of 15 seconds of screw-on time. This time of NO feeding allows the throat to empty rapidly before "starve" feeding begins.
4. Based on how many auger turns were required to maintain a full throat during the last four cycles of phase two, and knowing the time length of these cycles, computations are automatically made to determine how fast the starve feed auger should turn to exactly match full extrusion rate.

The "starving" of material now begins. The rate of "starve" is based on the setting of the PERCENT selection knob.

Once the process has reached this phase, this four step process will be repeated only if the sensor detects a back up of material in the throat or if power is turned off.

3. Select the PERCENT of full flow that you desire (higher numbers represent higher feed rates). The "percent" represents the percent of the "full flow" rate that was determined during the automatic calibration portion of the startup. A typical setting would be 75%.

This setting may be changed at any time to alter the degree of "STARVED" flow that is occurring.

## START UP PROCEDURE for EXTRUSION

1. Plug in (or wire) the unit as described in the INSTALLATION instructions.
2. Set the MAIN switch to MANUAL.

The auger will run at a speed determined by the thumbwheel setting. Adjust as required to obtain the proper starve required.

If the feed throat becomes flooded with material and backs up to the level sensor, the feed auger will stop.

While your extruder is running, carefully adjust the thumbwheel switches until the starve feeder is just keeping pace with your extruder. Note the display reading. This will represent full flooded feed rate. Now set the thumbwheel switches lower by the degree of starve that you want.

The PERCENT knob has no effect in this mode. It is designed for to be used in AUTOMATIC mode for INJECTION MOLDING applications.

## DESCRIPTION OF CONTROLS

### 1. AUTOMATIC-OFF-MANUAL SWITCH

#### **AUTOMATIC position: (for INJECTION MOLDING)**

In this position, the unit passes through 4 phases:

1. On power up, the auger runs at full speed to flood the feed throat with material. It stops only when the throat is filled to the level of the sensor and the sensor is covered.
2. As material is used by the process, the auger comes on as required to keep the sensor covered. This on and off period continues to keep the sensor covered until a series of uniform screw return times is established.
3. After the microprocessor has detected four consecutive uniform screw return times, the auger will stop for a period of 15 seconds of screw-on time. This time of NO feeding allows the throat to empty rapidly before "starve" feeding begins.
4. Based on how many auger turns were required to maintain a full throat during the last four cycles of phase two, and knowing the time length of these cycles, computations are automatically made to determine how fast the starve feed auger should turn to exactly match full extrusion rate.

The "starving" of material now begins. The rate of "starve" is based on the setting of the PERCENT selection knob.

Once the process has reached this phase, this four step process will be repeated only if the sensor detects a back up of material in the throat or if power is turned off.

#### **OFF position:**

In this position, power is removed from the microprocessor and motor. The unit will not operate.

To allow material to continue flowing to your process machine, it will be necessary to lower the auger feed channel to the 'flooded' position. If you wish to force a RECALIBRATION of the unit, you may do so by switching to the OFF position and then back to AUTOMATIC.

#### **MANUAL position: (for EXTRUSION)**

In this position, the unit will run at a speed determined by the thumbwheel switches ('counter' setting). No automatic calibration takes place. The sensor located behind the viewing window will still override if necessary to prevent overpacking of material.



## **2. PERCENT SELECTION KNOB**

Takes effect in the AUTOMATIC mode only. The percent of full flow desired is adjustable from 95% to 20% (higher numbers representing higher feed rates), with a "full flow" (no starve) position also available. The "percent" represents the percent of the "full flow" rate that was determined during the automatic calibration portion of the startup. A typical setting would be 75%. This setting may be changed at any time to alter the degree of "STARVED" flow that is occurring. In the "full flow" position, your Starve Feeder will run at the full flow rate as determined during the initial calibration time period.

## **3. DIGITAL DISPLAY**

The 3 digit digital display shows the actual RPMs of the feed auger at all times. Through experience you will gradually become aware of the proper operating range of your unit on your particular process machine. This display will tell you at a glance if everything is operating as expected.

In the MANUAL mode, motor speed and this display will follow the setting of the 3 digit counter setting.

## **4. THUMBWHEEL SWITCHES (COUNTER SETTING)**

These switches control motor speed in the MANUAL operating mode ONLY. If you wish to bypass the automatic calibration mode and you are sure of the proper feed rate, the MANUAL mode is available for this 'direct control' way of operating the unit.

## DESCRIPTION OF MECHANICAL FEATURES

### 1. SENSOR

The sensor should be placed behind the window, inside the frame. It should hang by the clip provided so that it rests close to the outlet opening in the bottom of the starve feeder frame. The sensor should be adjusted to remain ON (red indicator light OUT) during normal 'starved' operation. It should go OFF as soon as plastic pellets are forced to accumulate up against the end of the sensor. To adjust the sensor, turn the small adjusting screw on the rear of the sensor body.

### 2. VIEWING WINDOW

The viewing window is removable to allow access for clean out in the event you change materials or change colors. The slot opening below this window allows for venting of vapors from the process machine throat during 'starve' operation.

### 3. FLOW CONTROL AUGER FEED CHANNEL

This channel allows for either full FLOODED flow or STARVE operation. Remove the long retaining pin on the side to allow this channel to fall for FLOODED operation.

## BENEFITS OF STARVE FEEDING

1. When used in conjunction with a vented screw--either injection molding or extrusion--the Starve Feeder allows the operator to regulate the feed to the rear portion of the screw. If the front portion of the screw is unable to extrude plastic as rapidly as the rear portion, then the excess flow from the rear will be forced out the vent.

This condition could result from:

- a. The use of back pressure during screw return time
- b. Worn screw flights in the forward zone
- c. Intentionally unbalanced temperatures over the length of the barrel, etc.

Use of a "Starve Feeder" allows careful regulation over the volume of material that is metered to the rear feed section of the screw, thus allowing an operator to override the tendency for material to escape from the vent.

2. As plastic pellets are heated and plasticized, surface moisture and some volatiles will be driven off as vapor and steam. That portion that travels backwards will re-condense on the colder pellets in the feed zone and hopper and will again be carried into the screw over and over again. "Starve Feeding" does two things to help remedy this problem. First, a "starved" screw will have a continuous air passage directly behind the spiraling screw flight which will allow all vapors to easily escape backwards to the feed throat. Second, the Starve Feeder itself is provided with a vent to atmosphere so that vapors need not travel up through the cold resin in the hopper.
3. Some granular forms of resin will feed so efficiently at the feed section of the screw that the horsepower or torque available to drive the screw is not sufficient and the drive motor becomes overloaded. "Starve Feeding" will correct this problem by metering resin at a rate that does not exceed the horsepower or torque of the drive motor.
4. When the feed zone of a process machine is NOT cooled, the plastic pellets in the throat may preheat considerably if thru-put rate is low and residence time in the throat is too long. This may cause premature melting in the barrel, resulting in screw slippage producing erratic and extended screw return times. "Starve Feeding" eliminates residence time and consequently prevents screw slippage. In these situations, "starve feeding" actually can produce a shorter screw return time than with "flood" feeding.

## WARRANTY - Exclusive 5-Year

MAGUIRE PRODUCTS offers one of the MOST COMPREHENSIVE WARRANTIES in the plastics equipment industry. We warrant each Starve Feeder manufactured by us to be free from defects in material and workmanship under normal use and service; our obligation under this warranty being limited to making good at our factory any Starve Feeder which shall within FIVE (5) YEARS after delivery of such Starve Feeder to the original purchaser be returned intact to us, transportation charges PREPAID, and which our examination shall disclose to our satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on our part, and MAGUIRE PRODUCTS neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.



This warranty shall not apply to any Starve Feeder which shall have been repaired or altered outside MAGUIRE PRODUCTS factory, unless such repair or alteration was, in our judgment, not responsible for the failure; nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by Maguire Products.

Our liability under this warranty will extend only to Starve Feeders that are returned to our factory in Aston, Pennsylvania PREPAID.

It should be noted, however, that we strive to satisfy our customers in whatever manner is deemed most expedient to overcome any problems they may have in connection with our equipment.



## Technical Support and Contact Information

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