

Pipe & Profile Extrusion Control



OVERVIEW

Overview of Maguire Pipe and Profile Extrusion Control...



PRODUCT INFORMATION

View our product features...



CASE STUDY

Read about how we improved product stability, ROI and reduced scrap.



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**OPTIMIZE PROCESS
AND PRODUCT
STABILITY, REDUCE
SCRAP AND IMPROVE
PRODUCT YIELD**

MAGUIRE®
Intelligent Simplicity

OVERVIEW

Pipe Extrusion Process

Pipe is formed when plastic is extruded through a round shaped die, cooled in a water bath, cut and then coiled in preparation for use or transport.

Controlling the flow of material extruded is essential for;

1. Ensuring precise wall thickness of the extruded pipe
2. Maintaining the integrity of the final product
3. Reducing scrap.



Profile Extrusion Process

Profile extrusion is the process of forming long continuous shapes by extrusion, but does not include sheet or film. Profile extrusion can range from hollow forms as well as solid forms. This process is suitable for manufacturing products such as tubing, window frames and vehicle door seals.

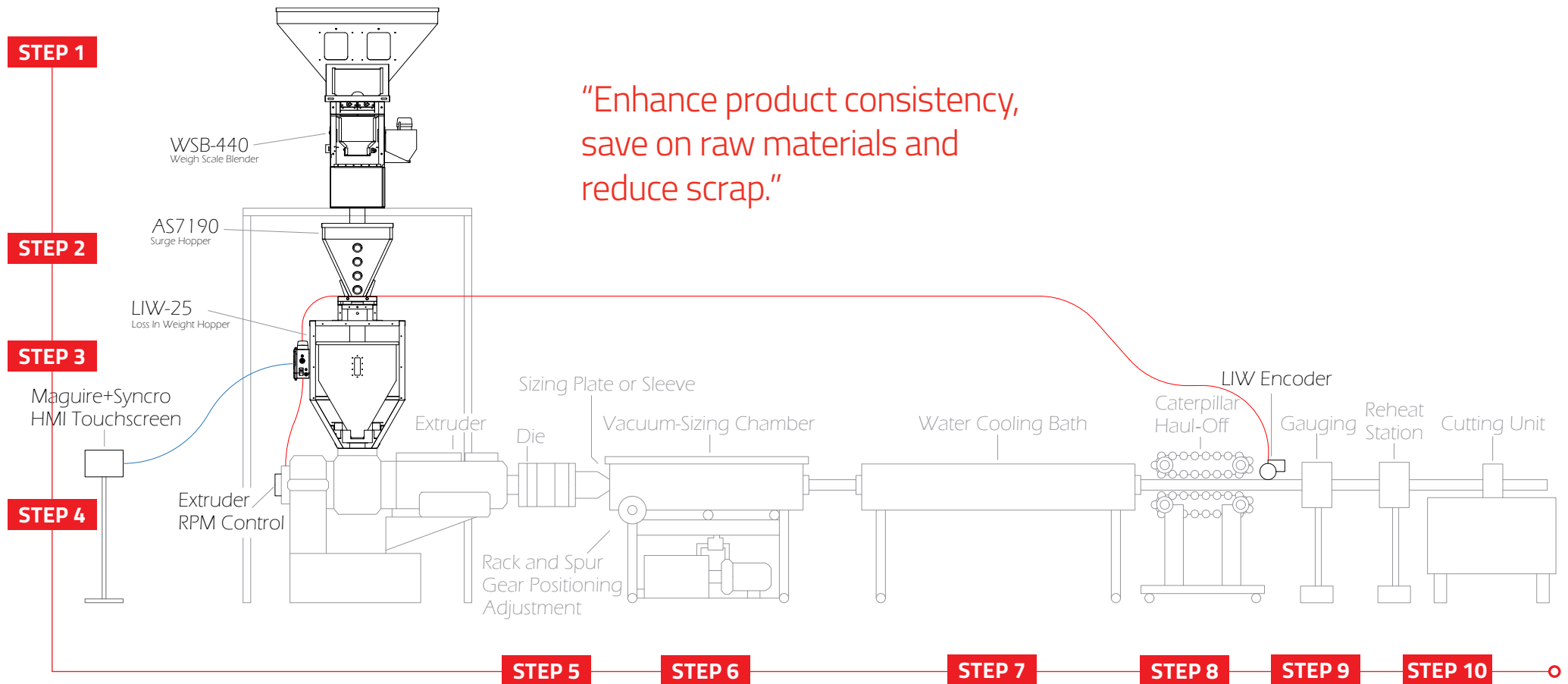
If two or more materials are used to make a product, the co-extrusion process is used. These materials will feed into a central co-extrusion die.



Pipe & Profile Extrusion Line

Carefully monitoring and controlling the steps in a pipe or profile extrusion process helps to improve product integrity, eliminate process variations and reduce operating costs.

“Enhance product consistency,
save on raw materials and
reduce scrap.”



Pipe and Profile Extrusion Equipment

STEP 1 Maguire Gravimetric Weigh Scale Blender

- Total control of a processors most expensive operational cost – raw materials.
- High consistent accuracy on every material within $\pm 0.1\%$ on a 1% setting.
- Material flow rate is constantly monitored and each batch is followed by a correction routine to deliver perfect dispense weights.
- The WSB blender automatically adjusts regrind usage to maximize on regrind consumption, while dosing the minimum required for natural and color.
- Save typically 30% on Masterbatch and additive usage compared to volumetric dosing.

STEP 2 Maguire Surge Hopper

- Quick filling of the Maguire LIW Loss-in-Weight hopper is critical to ensure uniformity of process control.
- The Maguire Surge Hopper ensures at least half the LIW batch size is available above the LIW to ensure quick refill.

STEP 3 Maguire LineMaster LIW Loss-in-Weight hopper

- Monitor actual product throughput and line speed.
- The system calculates and controls weight per length.
- Control yield automatically through control of both extruders and haul-off speed.
- Key information is provided on the LineMaster Controller.

STEP 4 Maguire + Syncro HMI Touchscreen.

- The Maguire + Syncro control package provides total control for extrusion applications, including pipe and profile extrusion.
- A digital encoder, which plugs into the Maguire + Syncro HMI touchscreen, enables you to monitor line speed and RPM of the extruder.
- The system controls each slave layer to enable total control of the output of each additional extruder and monitor blender usage.

STEP 5 Die

- As the plastic granules move along the screw they melt and are forced through a die which is located at the end of the barrel.
- The die contains the cross section of the pipe and profile of the extrusion required. Placing a pin or mandrel inside the die extrudes hollow sections.

STEP 6 Vacuum

- The use of sufficient vacuum in the vacuum box achieves proper profile dimensioning. It should be kept low enough to prevent dragging on the sizing sleeve to eliminate chatter marks.

STEP 7 Cooling

- After the pipe and profile exits the vacuum chamber it is channelled into a water bath which contains sizing formers and guides, to expedite the cooling process.
- The extruded product is cooled to maintain the integrity so it doesn't lose shape, shrink or distort prior to haul-off and cutting.

STEP 8 Caterpillar Haul-Off

- The caterpillar belt is designed to pull the extrusion down the line. Failure to pull accurately and consistently will have an adverse effect on the performance on the entire line, resulting in out-of-tolerance and poor quality production.
- Information obtained from the Maguire LIW Encoder is used to control the haul-off to ensure consistent production.
- The haul-off speed needs to be consistently maintained to retain the integrity of the extruded product.

STEP 9 Gauging

- Automatically measure and control all aspects of your dimensional process to hold the extrusion within a set tolerance limit to meet exact customer requirements.
- Tolerances are checked and operators are alerted when the extrusion is going out of specification.

STEP 10 Finishing

- Consistent control is required for cutting or sawing of the extruded pipe or profile into the desired length to prevent splitting or chattering.
- A combination of part re-heating and cutter-blade lubrication can significantly improve cut quality.

PRODUCT INFO



WSB Gravimetric Blending

Complete management and total control of a processors most expensive operational cost – raw materials. Over 120 WSB models are available to blend up to twelve components at rates up to 8,000 lbs/hr - 3,600 kg/hr. Maguire Products provides the most cost-effective Weigh Scale Blenders available.

Data – While raw materials can account for up to 70% of plastics processors cost, our blender measures right down to a 10th of a gram for every material dispensed, reducing operating costs, improving efficiency and increasing profitability.

Return on investment – Typical return on investment within 6-9 months of installation.

Vibration management – Load cell readings that have been compromised by machine shock or vibration are detected and discarded.

Automatic error correction – Every gram of material is automatically adjusted towards perfect dispense rate.

Regrind control – The WSB blender automatically adjusts regrind usage to maximize on regrind consumption, while dosing the minimum required for natural and color.

High consistent accuracy – On every material within $\pm 0.1\%$ on a 1% setting.

Color and additive control – Save typically 30% on Masterbatch and additive usage

The most popular gravimetric blenders worldwide, with 9 blender series and over 120 blender models.



LineMaster Extrusion Control

LineMaster automatically regulates the drive speeds of an extrusion line to ensure the correct amount of material is used and excess material is eliminated.

The control on the LineMaster hopper monitors weight while reading and updating the throughput calculation every second in lb/hr or kg/hr. This information is provided to the system so actual product throughput or weight per length can be calculated and controlled.

Keep control of material usage /Line speed – A digital encoder with a 12in / 300mm wheel can be supplied where line speed needs to be determined. The encoder is mounted direct to a drive shaft on a nip roller or mounted with the wheel on a roller. This accurately monitors the line speed to calculate and maintain product weight per length.

Speed of haul-off – Information obtained from the encoder is used to control the haul-off to ensure consistent production.

Faster start-up time – As soon as the extrusion line is strung up, an operator can switch from manual start-up to automatic control and set the required output, without any need for further operator involvement, saving considerable time.

Simple and easy control – Control options and product parameters are reduced to one key point of control – the operator simply enters the target required with no need to manage other process variables.

Change jobs quickly – Switch from one production order to another with direct online control, increasing production time and profits.

Data – Generate reports on material consumption, while controlling performance and production lines remotely assisting quality and cost control.

Keeping precision – Regulate fluctuations and keep tight dimensional tolerances to enable operators to meet customer product requirements for applications where precision is vital.



Maguire + Syncro - Extrusion Control

The Maguire + Syncro package is modular and easy to apply; the Maguire WSB Blenders and LineMaster LIW Hoppers can easily be combined with Syncro's extensive range of control systems for pipe and profile applications.

Maguire + Syncro Extrusion Control



opxs-kit-M

Mono Layer gr/m Extrusion Control - Master PLC with 5.7" Panel Mount Touchscreen, plus I/O inputs for 2 Digital inputs; Encoder for Line speed and Tachometer for Extruder RPM. Control interface provides gr/m, Ratio Control for Co-Ex applications, standard product recipes.

opxs-linekit

Digital Encoder to measure Line speed (1m Wheel / 3000 ppm) & Digital Tachometer to Measure Extruder RPM



opxs-kit-S

Co-Extrusion Interface per Additional co-ex layer - Moxy Slave Device allows interface to Master PLC from WSB, plus digital I/O interface for RPM data on extruder



opxs-kit-M-07

Upgrade MASTER HMI Touchscreen to 7" Screen from standard 5.7"

opxs-kit-M-10

Upgrade MASTER HMI Touchscreen to 10" Screen from standard 5.7"



Mono Extrusion Application

For a mono line, you would need 1 x opxs-kit-M (a touchscreen PLC) and 1 x opxs-linekit; a digital encoder which plugs into the touchscreen to enable you to monitor line speed and RPM of the extruder.

Co-Extrusion Applications

Where you have more than one extruder, an opxs-kit-S will be needed for each slave layer to enable you to control the output of each additional extruder and monitor blender usage. This will then connect into the Master PLC.

HMI Interfaces

The Master PLC is a 5.7" panel as standard. To increase the size of your touchscreen from the standard you will need either code opxs-kit-M-07 or code opxs-kit-M-10 to increase the size to 7" or 10" respectively.

CASE STUDY

Profile Extrusion for PVC windows

Scenario

- UK manufacturer of PVC-U and PVC-UE products.
- 21 profile lines producing products for the building and glazing industry. The profile lines are flood fed or starve fed and in total convert in excess of 70 tons of material per day.
- 500 kg/hr injection molding machine - Profile line.
- 2 strand 'back and front' window profile incorporating inline gasket extrusion. Front and back strands are mirror images of each other and technically should be equal in weight.

Key aims

- Optimize process and product stability at a consistent output, thereby reducing scrap levels.
- Improve productivity and product yield.
- Reduce material and labor costs.

Materials used in production

- PVC powder
- Impact modifier
- UV stabilizer
- Masterbatch
- Processing aid

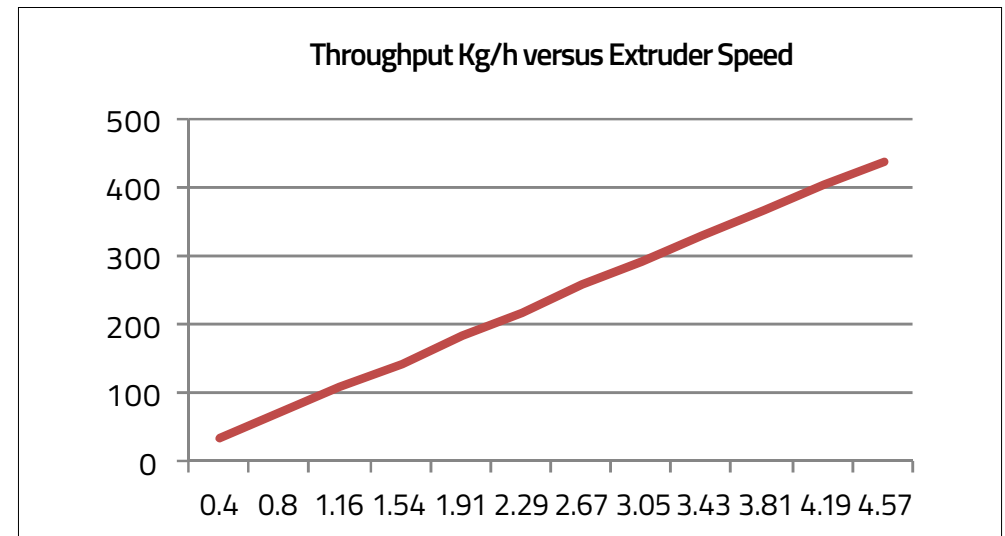
Maguire Products Installed

- LIW-25 LineMaster with Loss-in-Weight hopper and control package.



Solution

- Once the system was activated it was placed in automatic mode. Control was then made by weight readings rather than volumetric feed as before. This allowed the system to adjust to material weight and flow variances detected by the LineMaster Loss in Weight hopper.
- Weight readings are updated every 0.5 seconds, monitoring for any variations from the targeted requirement via accumulated readings.
- Once required throughput was achieved, LOCK mode is turned on and the Maguire system takes control, maintaining the required target as set on the LIW controller.



The graph illustrates voltage readings against throughput, where the straight line verifies excellent responsiveness.

Benefits

The Maguire LineMaster Loss in Weight Hopper was easily retrofitted to the existing process, being positioned between the existing holding hopper and the starve feeder controlling material feed to the line. Process and product stability was optimized at a consistent output, with Return on Investment achieved in less than 30 days.

RETURN ON INVESTMENT

Process improvements achieved with the LineMaster yield control paid for the investment in the system in less than a month.

INCREASED PRODUCT YIELD BY 3-4%

15 to 20 kg/hr saving achieved on 500kg/hr.

EASE OF RETROFIT

Line only down for 2 hours during installation.

REDUCED SCRAP TO ZERO

Zero scrap in a like for like test over 5 days. Previous month totals for the same period were between 690kg and 1155kg.

ENHANCED PRODUCT DIMENSIONAL STABILITY

Profile strand variance was cut to 3%, improved from a previous norm of between 5 and 10%.

LEAN MANUFACTURING

Specialized personnel not required to stabilize and optimize the line.

“High accuracy - Manual throughput checks when running at 500kg/h showed approximately ± 3 kg/h.”





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