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Overview of Maguire Wire & Cable Extrusion…

MINIMIZE DEFECTS, MATERIALS USAGE AND COSTS

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Overview of Maguire Wire & Cable Extrusion…

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MAZGUIRE
Intelligent Simplicity
Wire and Cable Extrusion

Wire and Cable extrusion is the process of converting plastics raw materials into a continuous profile, providing protection against external damage and physical wear. The process is used in building and construction, long distance communication, automotive and power cable industries.

Co-extrusion is widely used on cable extrusion for the application of identifying stripes and of multilayer sheathing to high voltage power cables. The choices of die opening, capstan speed and screw RPM are all variables that determine the dimensions of the coated wire.

Wire and Cable extrusion lines are often run at very high speeds, so any errors can quickly escalate into severe rejection rates. Effective extrusion control can provide accurate grams per meter on cable extruded, reducing overall materials costs.

Maintain stable output and control of your materials blend to reduce materials costs and end-product defects.
Wire & Cable Extrusion Line

Carefully monitoring and controlling the steps in a wire and cable extrusion process provides accurate gram per meter extruded, improves product integrity and reduces operating costs.

“Enhance product consistency and protect against mechanical damage and environmental hazards.”
OVERVIEW

Wire & Cable Extrusion Equipment

STEP 1  Maguire Gravimetric Weigh Scale Blender
- Total raw materials control.
- High consistent accuracy on every material within ±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 throughput and line speed.
- The system calculates and controls weight per length.
- Control yield automatically through control of both extruder and capstan speed.
- Key line 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 Wire and Cable 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, while also monitoring blender usage.

STEP 5  Maguire MGF Gravimetric Feeder
- This compact loss-in-weight additive feeder precisely measures the amount of additive that is fed directly into the machine throat to eliminate costly waste.
  - Our cost effective AGL Venturi Loader ensures dosing accuracy of ± 0.2% of a set point. The loader is automatically activated by the MGF controller.

STEP 6  Preheater
- Preheating of the conductor prevents stresses that may occur in the jacket due to premature chilling of hot plastic from the relatively cold conductor.

STEP 7  Crosshead Die
- As the plastic granules move along the screw they melt and are forced through the crosshead die which is located at the end of the barrel.
  - The crosshead die contains the guide tip, which keeps the wire or cable centrally located in the molten insulation.
  - The selected die controls the wall thickness of the final product.

STEP 8  Cooling
- The wire or cable extrusion is channelled into a water bath.
  - Sufficient immersion time is needed to allow cooling of the coated product without distortion of the jacketing.

STEP 9  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.

STEP 10  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 11  Spark Tester
- A spark tester is used to check for defects during the extrusion process with the insulation or sheathing.
  - Cable passes through a high-voltage bead chain electrode in the spark tester and any insulation fault causes a spark and registers as a fault.

STEP 12  Take-up – Maguire LIW Encoder
- The wire or cable is pulled through the line by a capstan puller or, for large dimensional cables, caterpillar capstans are used.
  - Information obtained from the Maguire LIW Encoder is used to control the speed of the haul-off to ensure consistent production and to retain the integrity of the extrusion.
WSB Gravimetric Blending

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 ±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.

**Keeping precision**

Regulate fluctuations and keep tight dimensional tolerances to enable operators to meet customer product requirements for applications where precision is vital.
MFG-ST Gravimetric Feeder

This compact loss-in-weight additive feeder precisely measures the amount of additive that is fed directly into the machine throat to eliminate costly waste.

3 standard modes of operation
Extrusion following, cyclical and continuous.

Advanced accuracy
The hopper is mounted on two load cells to prevent distorted readings from cantilevered loads in the hopper.

Controlled feed rate
Automatic recalibration guarantees that the feed rate is held to within ± 0.2% of the desired let-down rate.

Choice of screw sizes
Standard and specialist solutions for cable and wire extrusion.

High resolution
Only material and hopper weighed, not the complete feeder. In combination with digital control, the 200-step rotation achieves fine metering resolution of ± 0.2%.

Intuitive setup and control
User-friendly controller is fast and simple to setup.

Precision
Consistent stepper motor control.

Clear ROI
Our MGF provides clear ROI vs. comparable and volumetric systems.

AGL Venturi Loader
Cost effective loading solution, ensures dosing accuracy of ± 0.2% of a set point. The loader is automatically activated by the MGF controller.

No tools required for assembly or removal of load cell assembly, hopper and metering device.
**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 wire and cable applications.

### Maguire + Syncro Extrusion Control

<table>
<thead>
<tr>
<th>P/N</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>opxs-kit-M</td>
<td>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.</td>
</tr>
<tr>
<td>opxs-linekit</td>
<td>Digital Encoder to measure Line speed (1m Wheel / 3000 ppm) &amp; Digital Tachometer to Measure Extruder RPM</td>
</tr>
<tr>
<td>opxs-kit-S</td>
<td>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</td>
</tr>
<tr>
<td>opxs-kit-M-07</td>
<td>Upgrade MASTER HMI Touchscreen to 7” Screen from standard 5.7”</td>
</tr>
<tr>
<td>opxs-kit-M-10</td>
<td>Upgrade MASTER HMI Touchscreen to 10” Screen from standard 5.7”</td>
</tr>
</tbody>
</table>

### 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.
Cable Extrusion using XLPE

**Scenario**
- Qatar based cable manufacturer – major global producer.
- Experiencing too many defects during production.
- Require premium mix of blended materials.
- Currently using volumetric feeder – requires higher accuracy to feed one Masterbatch color.

**Key aims**
- Reduce labor costs and scrap rate.
- Reduce waste of colorants.

**Solution**
- The blender provided high consistent accuracy on every material within ± 0.1% on a 1% setting.
- Automatic error correction – every gram of material is automatically adjusted towards a perfect dispense rate.
- MGF-ST placed at extruder feed throat. Dual load cells prevent distorted readings from cantilevered loads in the hopper.
- The AGL Venturi Loader provided a cost-effective loading solution which was automatically activated by the MGF controller.

**Maguire products installed**
- WSB-940
- FLEXBUS THREE PHASE VACUUM PUMP
- MGF-8-ST
- AGL VENTURI LOADER

High quality end-product from XLPE requires effective mixing and high consistent accuracy.
CASE STUDY

Benefits

The Maguire Blender and Maguire MGF were easily retrofitted to the existing process. Dosing accuracy was kept between ± 0.2% of let-down ratio and control of the material blend maintained product integrity. The optimized process achieved a Return on Investment within 8 months of installation.

**NO DEFECTS**
Good blend of materials minimized bubbling and pin holes, reducing scrap rate.

**COLOR AND ADDITIVE CONTROL**
Savings of 30% on Masterbatch and additive usage compared to their previously installed volumetric dosing system.

**RETURN ON INVESTMENT**
Process improvements achieved with the Blender and MGF paid for the investment within 8 months of installation.

**EXPANDED FACTORY AUTOMATION**
Labor costs reduced due to automation.

**EFFECTIVE MATERIALS CONTROL**
Effective materials control ensured proper insulation, while maintaining the dimensioning of the cable, minimizing overall materials usage.

**DOSING ACCURACY**
Feed accuracy kept between ± 0.2% of let-down ratio.

**REDUCED COLOR USAGE AND WASTE**
Precise measuring of additive fed directly into the machine throat, eliminating costly waste.

“Extruder rate controlled and automatically adjusted, providing accurate grams per meter on cable extruded.”