World Class Automation & Blending Solutions for the Plastics Industry

Complete Blown Film Solutions

Gravimetric Blending & Extrusion Control

Bubble Stabilization & Frost Line Control

Automatic Bubble Profile Control

www.tsm-controls.com
There are many challenges facing Blown Film producers including energy and material costs, waste & scrap reduction, higher productivity, consistent quality and inventory management.

TSM are working with our customers to address these challenges and can offer a complete solution to producers in the Blown Film sector utilising our full range of products and over 35 years of expertise.

The Blown Film segment has always been a central focus for TSM and as a result TSM’s unique patents and product portfolio have evolved to address the requirements of the blown film segment and to support agile production and fast order changes.

Of primary importance to producers is the quality and uniformity of the final product. TSM’s overall solution; from computerised management of all recipe components through to Air ring, bubble cooling and gauge control systems, allows users to optimize the machine and cross direction properties of the film and also to increase the throughput of the total line.

1. Central Line Control System
2. Gravimetric Blending
3. Extrusion Control
4. Automatic Air Ring
5. Internal Bubble Cooling (IBC)
6. Frost line Control
7. Bubble Sizing Cage
8. Automatic Thickness (gauge) Control
9. Automatic Width Control
Complete Blown Film Solutions

TSM Benefits

- Improved process stability in both MD (machine direction) & CD (cross direction)
- Reduction in material COSTS/ INCREASED MATERIAL SAVINGS
- Increase production output by MIN. 10%
- Patented homogeneous mixing
- Uniform profile thickness
- Material usage statistics
- Traceability and reporting of all production data
- Single, intuitive user interface
- Multiple communication protocols.

Blending Technology

- Batch Blenders 50-3000 kg/hr or 110-6600 lb/hr
- Loss-in-weight blenders 100-800 kg/hr or 220-1760 lb/hr
- Material handling and inventory management
- Unique patented reverse flight auger mixing
- Control Algorithm allowing down gauging
- Ability to handle high percentage of regrind

Bubble Control Systems

- Automatic Air Ring
- Internal Bubble Cooling
- Bubble Sizing Cages
- Automatic Profile Control
- Thickness Measurement
- Die sizes 50 - 2500mm or 2” - 98” diameter
- Stationary and rotating dies
- Normal or long-neck bubbles
- Optimal retrofitting of gauge control system; VARIOcool
**Central Line Control System**

Central Overview and visualization of the extruder performance, including; blender recipes, throughputs, shift/daily reports, thickness profiles, layer ratios, alarm management, material tracking. The intuitive user friendly interface allows operators to see all critical machine parameters at a glance. Standard communication protocols available to ensure ease of data exchange among all control elements.

- Robust Design
- Layer ratios
- Touch Screen with intuitive graphics
- Recipe set up & management
- Blender overview, setup & visualization
- Single Window Visualization
- Management system – not just control!
- Remote diagnostics

**Extrusion Control**

TSM has continually invested in best in class extrusion control technologies for the Blown Film segment, which has allowed TSM to bring to market the fastest and most accurate control technologies available on the market. Incorporated as standard in the OPTI-EX extrusion control blender, producers can choose from: **Throughput Control** – varying the extruder speed to control output rate. **Weight per Length Control** – maintains product yield by adjusting Extruder or Extruder and/or Haul-off speeds simultaneously.

- Improved Quality
- Fast Start Up
- Reduce Material Usage
- Less waste
- Simple Intuitive Operator Interface
- Comprehensive Reporting
- Superior Algorithm
- Compensates for bulk density variations
- Tighter Tolerances achievable

**Gravimetric Blending**

OPTI-EX range of Extrusion Control blenders for Blown Film provide superior accuracies, blend ratios and mixing homogeneity. OPTI-EX blenders utilize TSM’s patented technologies in slide valve design and reverse flight auger mixing with continuous Loss-in-Weight measurement, result in ultra fast throughput measurement and control of the extrusion process. OPTI-EX range can accommodate throughputs up to 3000kg/hr (6600lbs/hr).

- Fast, accurate Control response
- High Accuracy Dispensing to 0.01% of batch
- Fast throughput Measurement
- Instantaneous response to process disturbances
- Superior weighing and patented mixing
- Throughput and weight/length extrusion control options
- Material usage /Inventory statistics
- Control accuracy up to +/- 0.5% of target setpoint
### Automatic Air Ring

One of the most critical factors for the film quality and performance of blown-film extrusion lines is the air ring. Therefore, **TSM-Kdesign** has developed the high-performance **KARAT** air ring, which has been delivering production and quality efficiencies on several hundred lines, worldwide, each day. The profile is measured using either a contact or non-contact thickness measurement sensor. Capacitive or Radioactive thickness sensors are available.

The development of the **KARAT** air ring is based on substantial fluidic studies and thorough practical tests, along with significant input from our customers.

- Highest cooling rate
- Improved film tolerances
- Absolute even air distribution
- Excellent bubble stability
- Maximum air flow, minimum pressure drop
- Easy handling
- Die sizes 50 - 2500mm or 2" - 98" diameter
- Stationary and rotating die heads
- Normal or long-neck bubble
- Optimal retrofitting of gauge control system VARIOcool

### Internal Bubble Cooling (IBC)

**TSM-Kdesign** IBC systems are designed to increase cooling efficiency and as a result, achieve production increases of up to 25% and minimum width tolerances. IBC systems can be installed on new mono and co-extrusion lines and can also be retrofitted to existing lines thus controlling exactly the correct exchange of hot and cool air. **TSM-Kdesign** utilizes a non contact ultrasonic IBC control system which provides continuous monitoring of the bubble maintaining precise lay flat control and can be operated in manual or automatic.

- Easy retrofitting to any existing bubble cage systems
- Almost maintenance-free
- Non-contact
- Width tolerances < ± 2 mm
- To be used for interior supply air and exit air
- Ultrasonic sensor: 1, 2, 3 or 4 sensors possible
- Control Panel: Air Pressure, Bubble Distance and Bubble Filling controls available

### Frost line Control

**TSM-Kdesign** provide a unique Frost line control system to maintain an optimum height, improving the overall quality of the finished product. The film temperature at the frost line is measured by non-contact infrared sensors and maintained at desired setpoint by the bubble cooling control system.

- Maintains the frost line in a fixed position
- Thickness, width, shrinkage and optical tolerances are kept constant
- Display and control of the film temperature available
- Alarm activation when limits are exceeded
- Integration into existing line control and calibration strategies
- Stand alone or integrated (into VARIOcool) versions available

### Sizing Cage Systems

In the blown film process, the sizing cage is used to stabilize the blown film bubble directly over the die and air ring. Maintaining a stable bubble over the die and air ring improves film quality by ensuring the air ring and internal bubble cooling effects are uniformly applied to the entire circumference of the bubble. We offer highly engineered, reliable solutions for your film calibration systems. These ranging from long-term studies and thorough practical tests, along with significant input from our customers.

- Fixes and centres bubbles of any size
- No marking of film
- Individual control of each arm
- Guarantees maximum output and quality
- Digital display of bubble diameter and cage height
- Wide adjustment range
- Keeps the line clean
- Various roll surfaces available

### Automatic Thickness (gauge) Control

The **Automatic Gauge Control System**, VARIOcool, alters the volume of cooling air to provide a uniform thickness around the bubble. **TSM-Kdesign** VarioCool ensures uniformity in machine and cross directions of the extruded film. The profile is measured using either a contact or non-contact thickness measurement sensor. Capacitive or Radioactive thickness sensors are available. The system maps the bubble to specific control zones on the air ring; any deviation in film thickness is corrected by automatic adjustment of these control zones.

- Increased Output (25-60%)
- Uniform Cross Direction Thickness profile
- Fast Return on Investment (ROI)
- Contact and Non-Contact profile measurement systems
- Remote Diagnostics

### Automatic Width Control

The **TSM** Automatic Width Control System gives you, the customer, several options for maintaining a specific bubble size during normal operation. These options are ideal for managing on-the-fly size changes, reducing the time it takes to get the bubble on size and also minimizing changes in lay-flat due to temperature conditions or film stretch. **TSM** can also provide systems particularly suited for gusseted film. The lay-flat width scanner is coated in a hard wearing, low friction proprietary PTFE coating, incorporating infrared edge sensors that are unaffected by film color or ambient light. Status indicators of both width and limit sensors are included for diagnostic purposes.

- Simple to install and operate
- Measures 0 - 10m or 0 - 393.7" 
- Lay flat or Ultrasonic measurement available
- Measurement resolution 0.004"
- Suitable for all film types and color
- Display resolution 0.04"
- Displays instantaneous width and average width
- Readily expandable and upgradeable
- Automatic monitor and failsafe alarm

### Automatic Monitor and Failsafe Alarm

**Automatic Monitor and Failsafe Alarm** are a key component of the **KARAT** air ring. These sensors are included for diagnostic purposes.
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