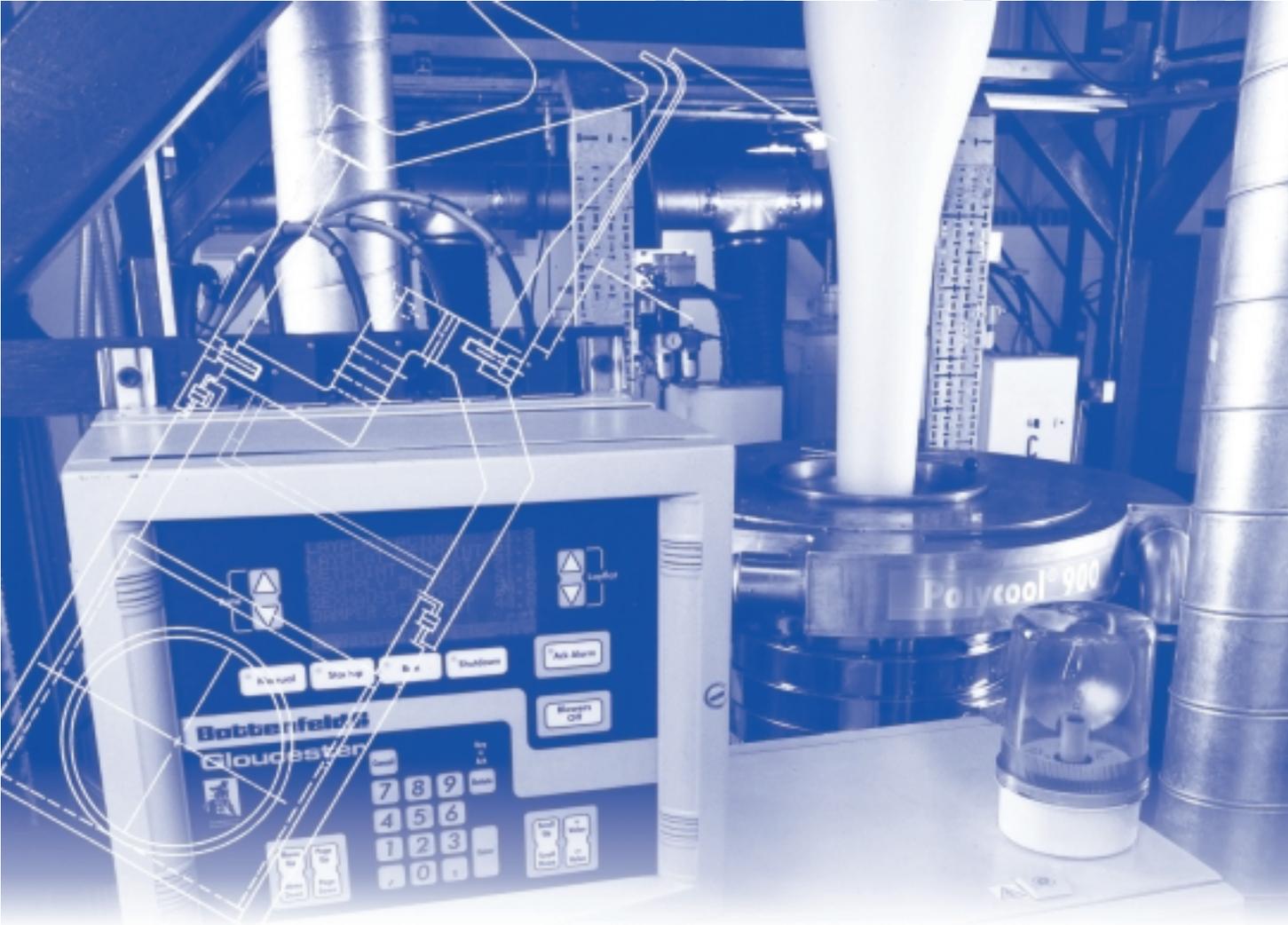


High Density Blown Film Systems

HD Blown



Battenfeld 
Gloucester
Tradition of Excellence

Growing Use of High Density Film Demands Greater Quality, Higher Rates

Demand for High Molecular Weight High Density Polyethylene (HMWHDPE) film continues to grow as new applications require ever-higher volumes. Once relegated to less demanding applications in favor of more expensive, higher performance materials, today's high stalk films have the strength and uniformity to handle more difficult jobs.

Higher molecular weights and the availability of multi-layer films permit use of HDPE in industrial applications requiring high strength and durability, in food packaging applications requiring excellent barrier and heat sealing properties, even in hygienic films used in disposable baby diapers and adult protection products.

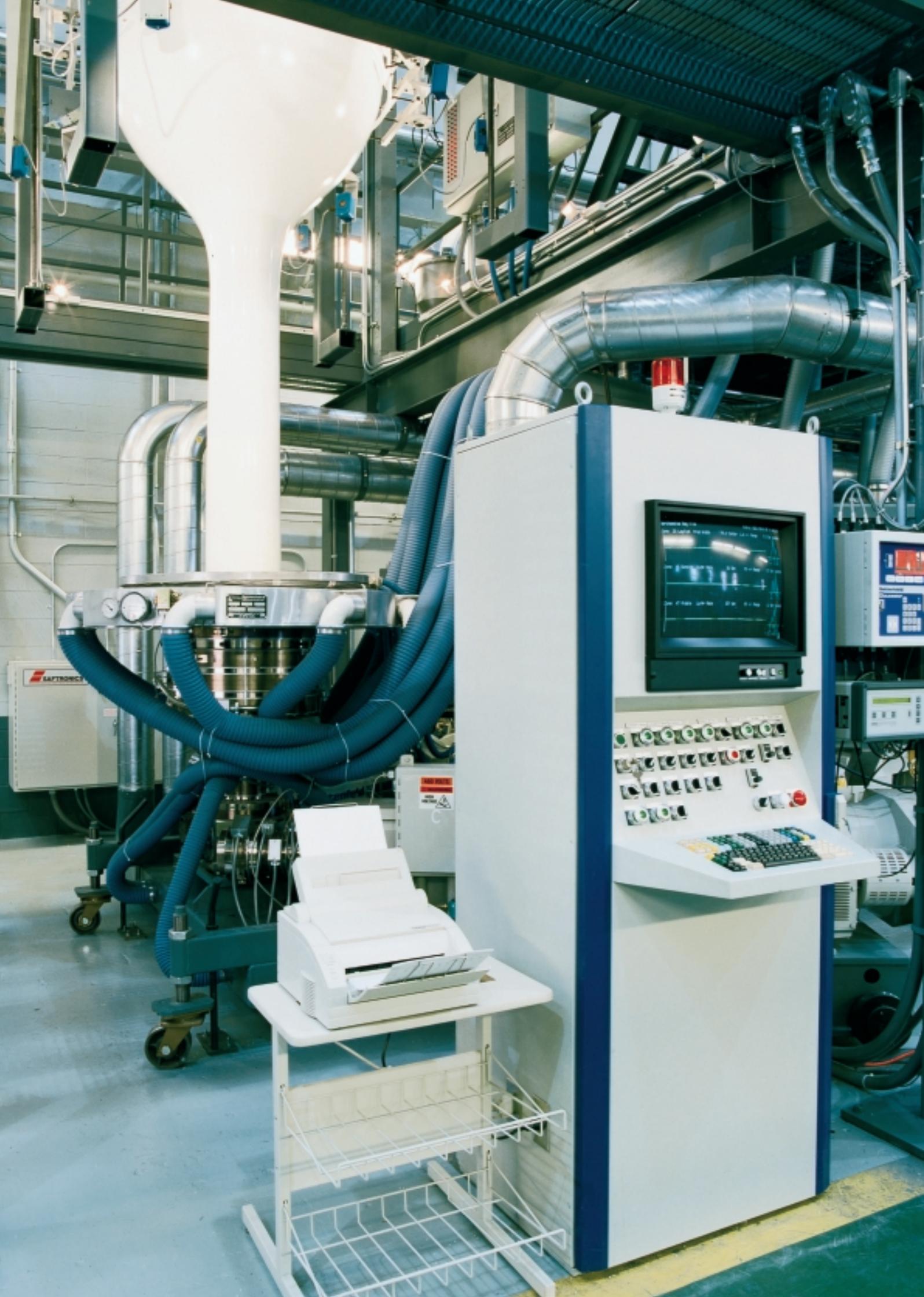
At the same time, these improved properties of HDPE have also made it more attractive for less demanding applications because it permits downgauging without sacrificing performance. In order to achieve these properties, however, the blown film system used to produce it must provide absolute consistency and high reliability while operating at today's higher production speeds.

Battenfeld Gloucester has responded to this challenge by integrating individually outstanding components such as extruders, dies, hauloff systems and winders into a highly efficient production system. By optimizing the performance of every component of the system, we are able to assure you of high volume, top quality output, day after day.

Battenfeld Gloucester offers a unique combination of technological leadership and blown film industry experience that makes us uniquely qualified to offer an outstanding production system. Whether your product is a simple mono-layer or complex multilayer construction, we will fully

integrate our reliable, high performance equipment with a process control system designed by extrusion experts for extrusion applications. The result will be a reliable, easy to use system that will provide you with years of productivity.





An Integrated Approach To Blown Film Production

From initial concept through engineering, construction, assembly and startup, your Battenfeld Gloucester blown film system is a fully integrated system that will provide you with years of trouble-free, profitable operation.

Gloucester engineers have years of experience with blown HDPE film — including the newer, higher performance grades — and truly understand not only every processing variable, but also the way individual components function together and affect both each other and the process itself.

As a result, not only do individual components of the system utilize the most advanced technology, but the entire line is optimized for long life and low maintenance.

Gloucester engineers set up your line using a proven two-part strategy.

System Engineering

Using rigorous systems engineering techniques, Gloucester engineers integrate the most advanced, fully proven innovations in feeding, extrusion, dies, bubble control and cooling, hauloff, winding and total process control to maximize production of the highest quality blown film.

Profit Engineering

Using proven project management techniques, Gloucester engineers bring the system on line rapidly, maximizing uptime and life cycle, minimizing maintenance requirements, and assuring top quality and high yield for maximum profitability.

Every Type of Final Product

The following are only a few examples of the kinds of final products that are currently being produced on Gloucester lines:

- Merchandising bags
- Industrial bags
- Clothing bags
- Retail bags
- Grocery sacks
- Multilayer food packaging
- Hygienic films
- Agricultural film
- Reclaim and PCR films
- And many, many more.

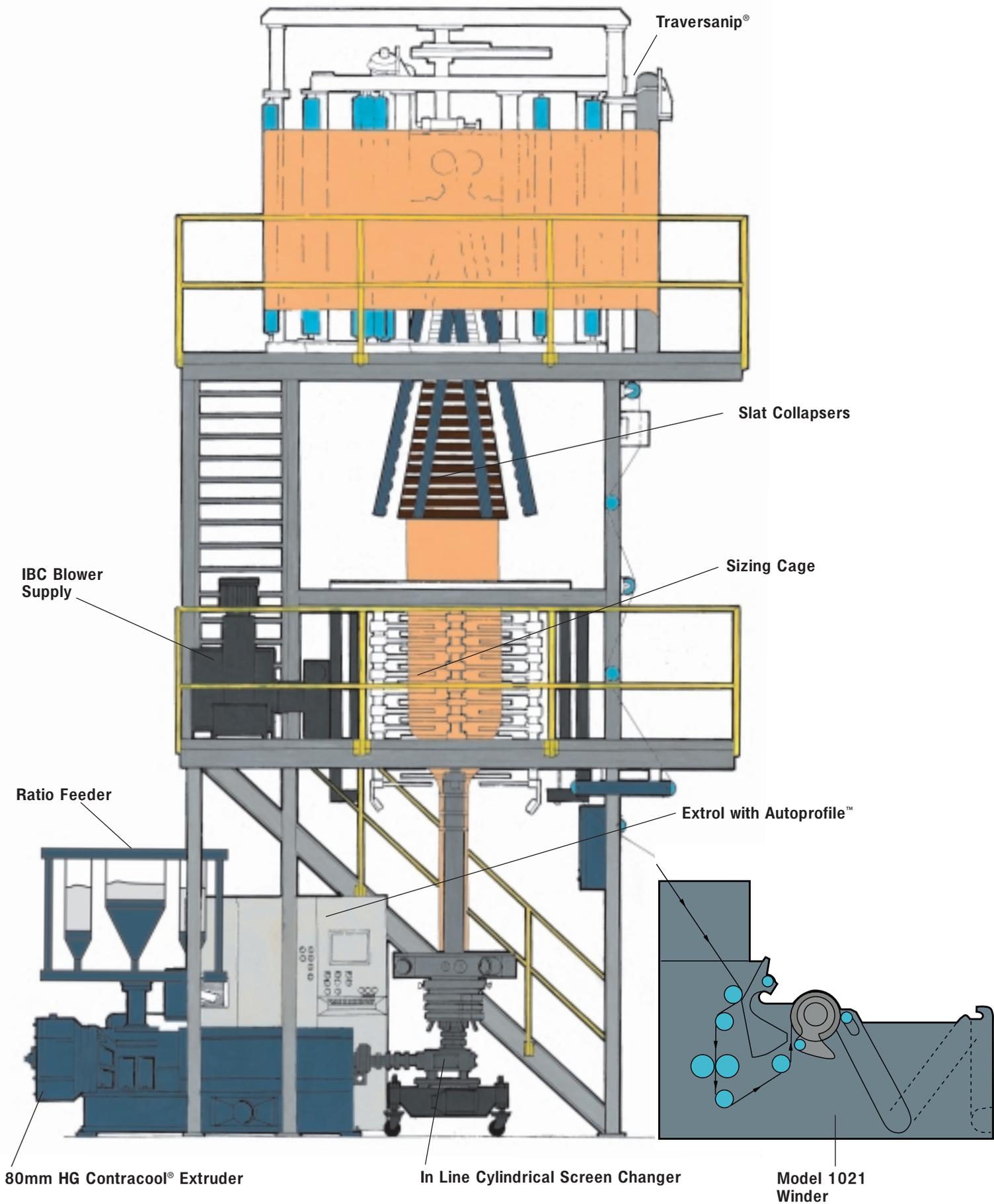
Systems are currently being commissioned and installed to run special materials and film structures. Others are being adapted to meet the special needs of new high density applications.

A Team Approach to Implementing Blown High Density Film Technology

Like the production line itself, Gloucester's team of experienced specialists is completely integrated. Design engineers, technicians, process engineers, system consultants, service specialists and support personnel all work closely together to assume complete single source responsibility for selection and installation of:

- Gravimetric or volumetric feeding and blending systems
- Extruders and screws
- Precise barrel temperature control systems
- Specially designed screen packs
- Minimum resistance HD-specific dies
- Gauge control with Internal Bubble Cooling (IBC)
- Layflat, collapsing, oscillating hauloff
- Comprehensive process control
- Large diameter, high speed winders

Before and during installation, Gloucester specialists not only apply their extensive, highly practical knowledge of blown HD film to your production line, but also teach it to you and your staff. Even after installation, they remain available for training, consultation, and problem solving.

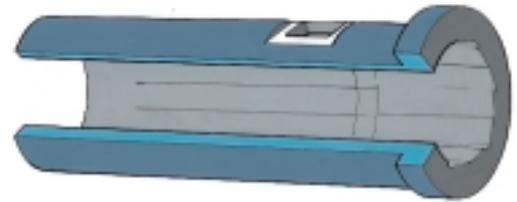


HIGH DENSITY BLOWN FILM SYSTEM

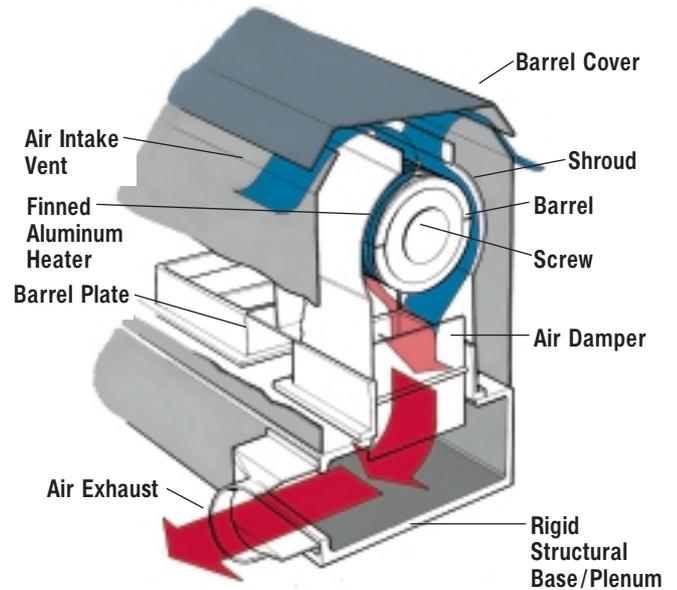
Superior HDPE Film Begins With Superior Extrusion

Production of high quality HDPE film requires the extruder to feed a constant melt at a high volume against high head pressure. To assure this, we use our exclusive Variable Lead Barrier (VLB IV) screw, which separates the molten polymer from the pellets as melting proceeds to

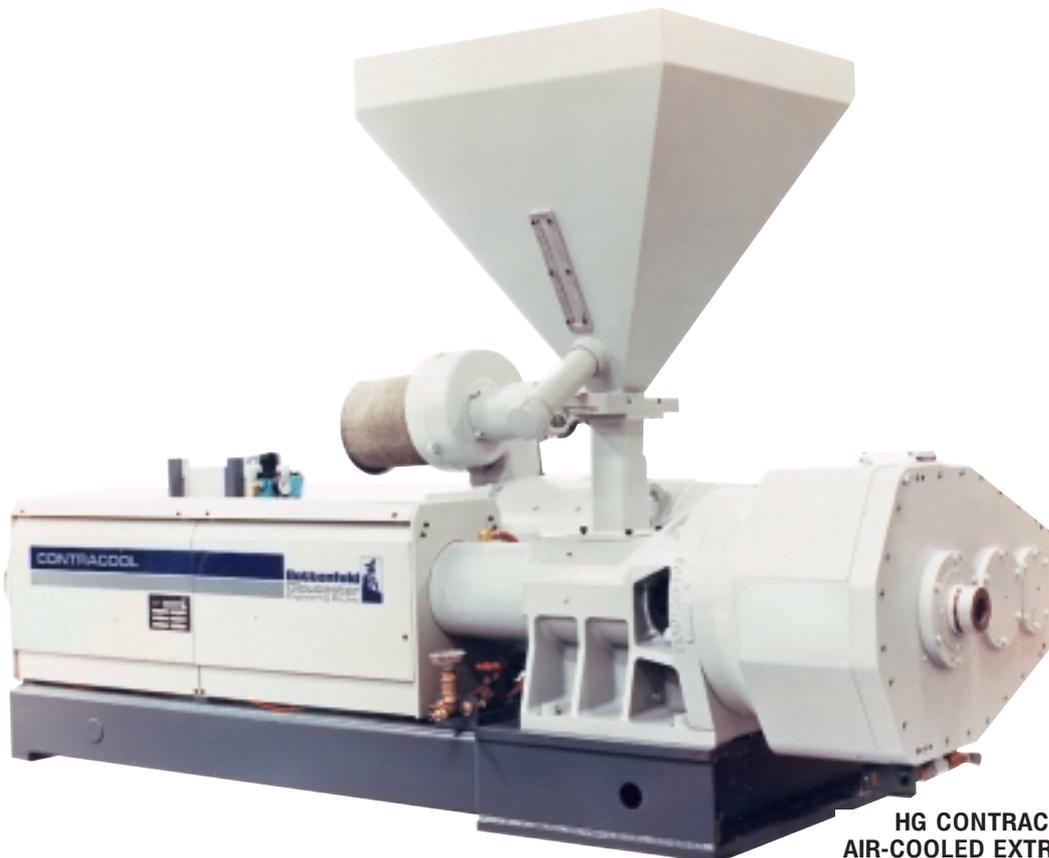
maximize efficiency and reduce screw wear. In combination with a uniquely grooved proprietary alloy feed liner, the VLB IV screw provides the required high output and, together with precise temperature controls, maintains a stable, consistent melt.



HG FEED SECTION

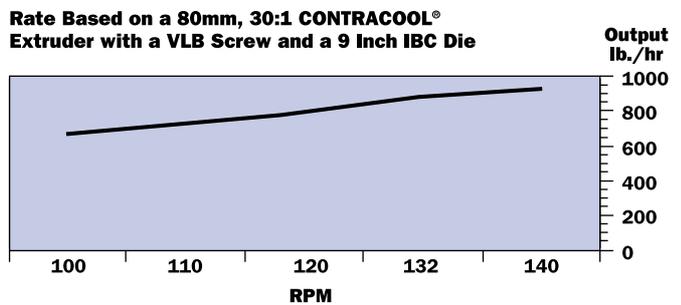
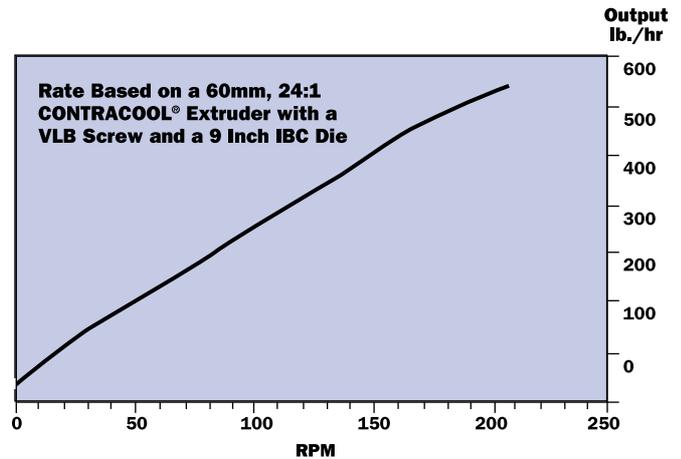
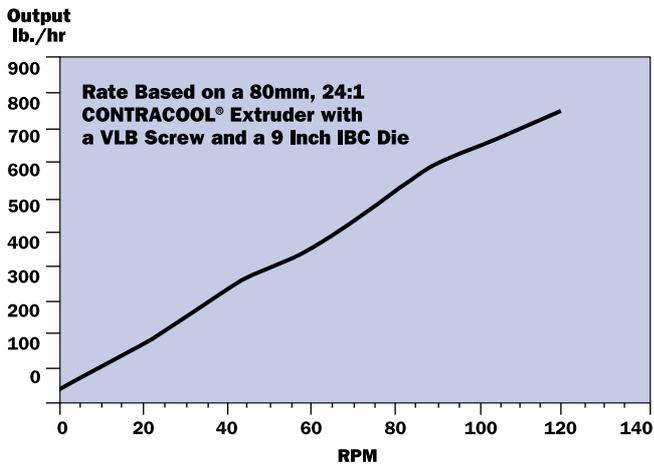


CONTRACOOl® EXTRUDER COOLING SYSTEM



HG CONTRACOOl®
AIR-COOLED EXTRUDER

Because of their long experience with blown film systems, Battenfeld Gloucester engineers know that heated air vented from the extruder can cause fluctuations in the temperature around the bubble that can, in turn, cause gauge bands in the film. To prevent this, the innovative design of our Contracool® Extruders directs heated air away from rather than toward the bubble.



RPM	PRESSURE (PSI)	MELT TEMP (F)	lb/hr	pph/rpm
100	6750	432	667	6.67
110	6910	434	729	6.60
120	7130	436	780	6.50
132	7400	444	850	6.43
140	7390	457	907	6.47

Longevity and Reliability

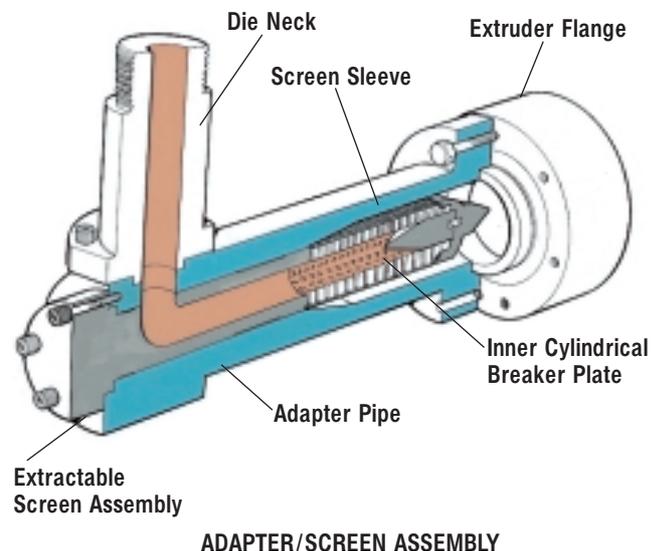
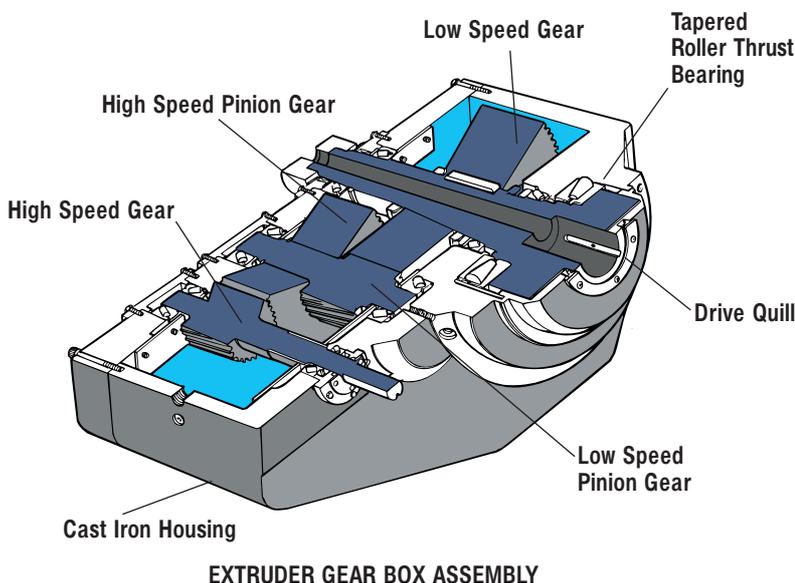
Because longevity and reliability are critical considerations, the massive gearbox is designed for years of reliable operation. Hardened gears and high capacity thrust bearings that meet the torque requirements of HDPE serve to reduce operating noise.

Unique Screen Pack Permits Thinner Gauge

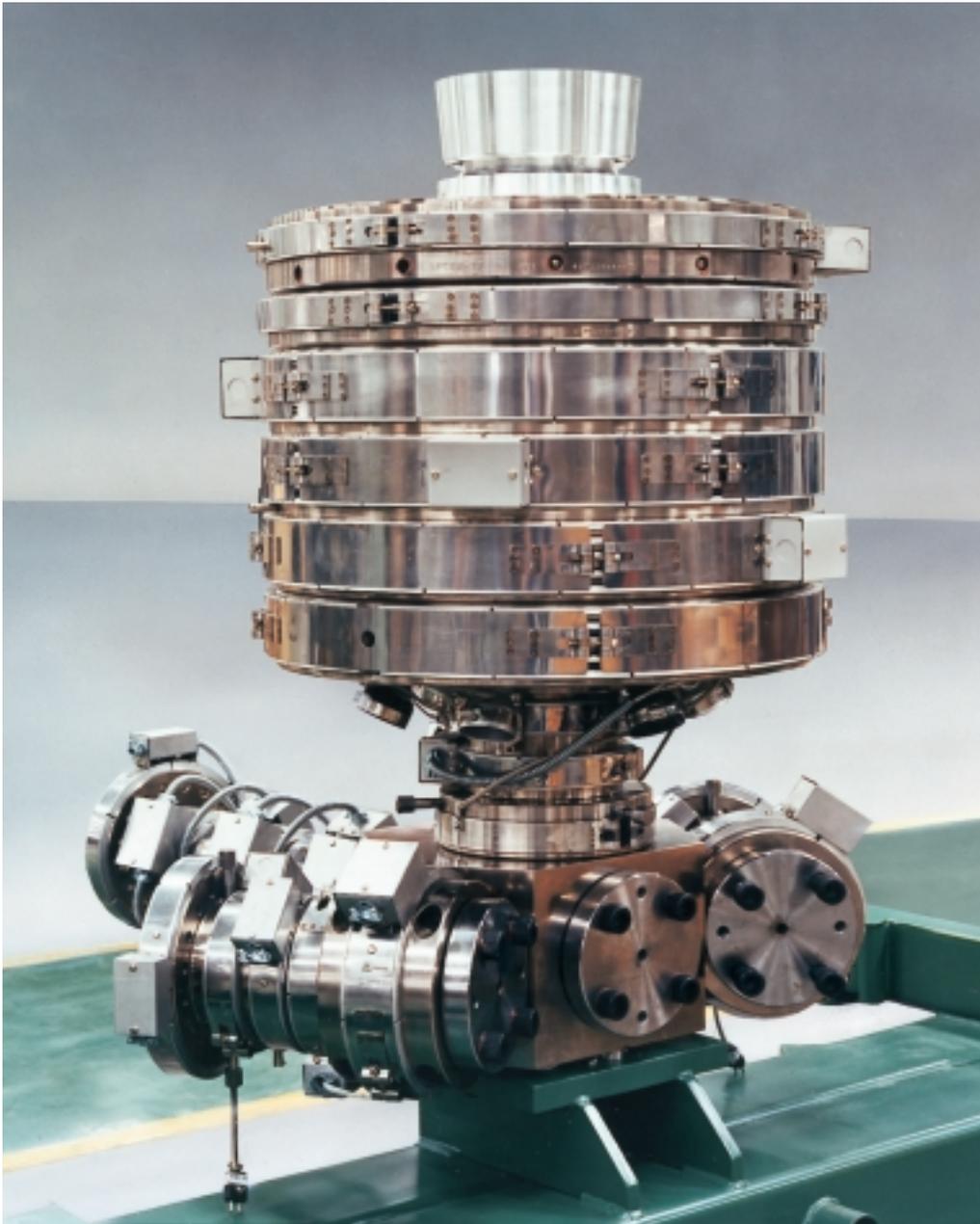
Because of its superior strength compared with lower density polymers, HDPE is frequently extruded in thinner gauges. To accom-

plish this, the material must be thoroughly filtered, yet maintain maximum homogeneity to prevent gauge variations. The Gloucester cylindrical in-line screen pack provides over five times the filter surface area of conventional screen packs while simultaneously homogenizing the melt. These innovative screen units are also carefully designed for minimum residence time to prevent polymer degradation. The block and adapter are machined alloy steel forgings with electroless nickel-plated flow surfaces.

For maximum uptime, the pack is easily accessible for cleaning.



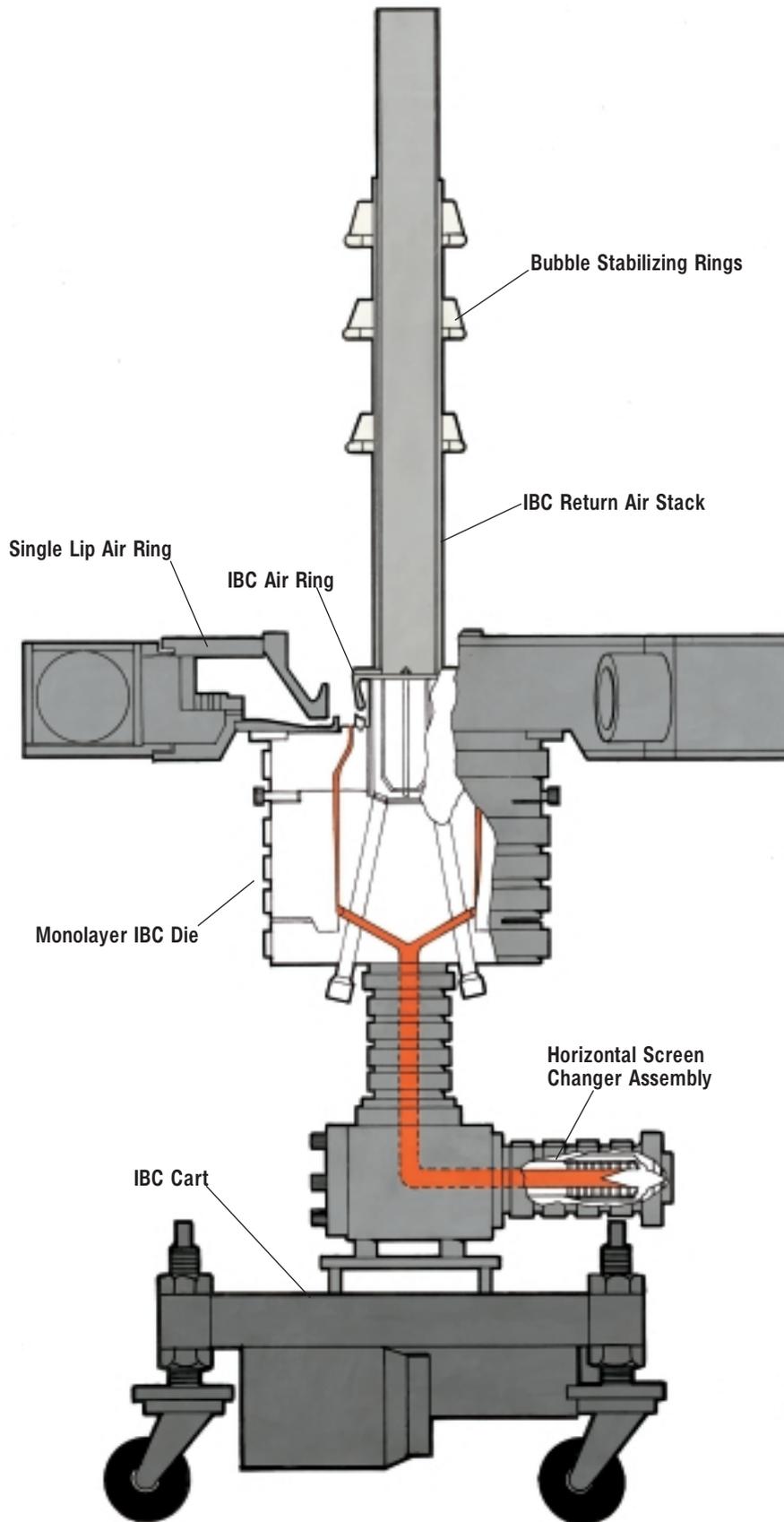
Precision Dies Designed Specifically for HDPE



Three-layer die has single-level material entrances for easy extruder placement.

Battenfeld Gloucester's stationary HDPE dies are specifically designed to handle high density materials. Computer determined spiral flow channels with port inserts minimize residence time to prevent polymer degradation. They also maintain a high shear rate that prevents gel buildup and speeds product changeovers.

The mass of each component of the die is optimized to provide thermal homogeneity and maximum deflection resistance throughout the die for dimensional stability yielding exceptionally uniform flow rate and consistent gauge control.



MONOLAYER HDPE IBC DIE/AIR RING ASSEMBLY

Die parts are machined from drop-forged, through-hardened, stress-relieved steel with precise uniformity to prevent warping during heating and cooling cycles. All flow surfaces, including feed port passages, are electroless nickel-plated to resist abrasion and corrosion. Other flow surface treatments are optional.

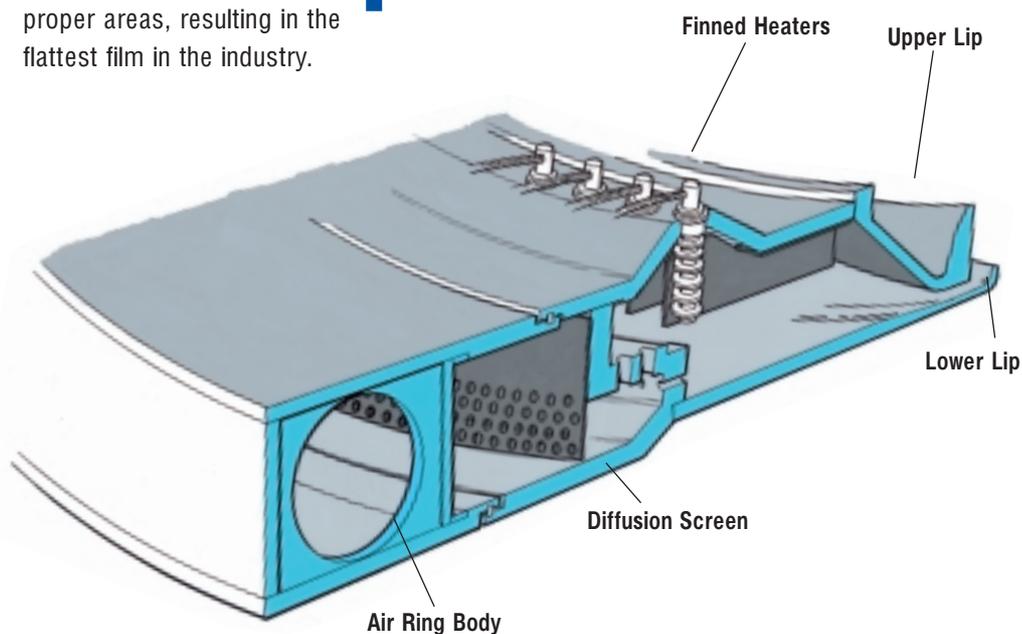
For maximum uptime, Gloucester's innovative taper-lock self-aligning die parts can be assembled and disassembled quickly and easily, and the die diameter can be changed without changing the entire die.



A Cool, Stable Bubble Assures Smooth Operation

To assure maximum bubble stability with minimum operator intervention, Gloucester utilizes a unique Internal Bubble Cooling (IBC) system. The patented Digisonic non-contact ultrasonic sensor system accurately controls bubble diameter. Cooling rate and layflat are manipulated with a simple touch of the keypad. Smoothly flowing air guides the polymer stalk, cooling it from the inside in its most critical area. Additional film orientation is provided by a multiple internal ring structure. As the film is blown, the bubble diameter is controlled through the exhaust blower and damper. This arrangement immunizes the IBC from the effects of normal bubble sway or atmospheric conditions and allows it to hold a consistent diameter for improved layflat control.

Gloucester's latest **Polycool® 900 Series Air Ring** and **Autoprofile™ System** provide additional stabilization of the bubble. The air ring precisely controls air flow to eliminate film chatter and provide sufficiently high air volume to support the requirements of high density films. The Autoprofile™ system uses standard film thickness measuring devices and the Extrol microcomputer to eliminate thickness variations by directing thermally corrected airflow to the proper areas, resulting in the flattest film in the industry.



POLYCOOL® 900 AUTOPROFILE™ AIR RING

An Integrated Systems Approach To Flatter and Smoother Film

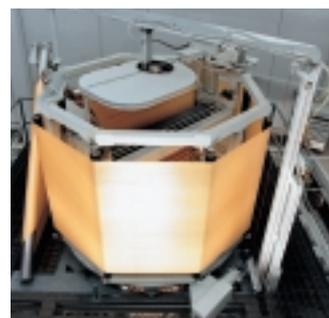
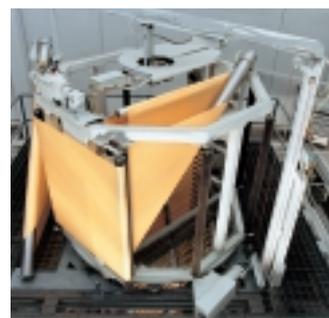
While a cool, stable bubble is critical to producing smooth, flat film, your Battenfeld Gloucester blown film system includes several other subsystems that bring unprecedented precision to the collapsing, flattening and hauloff needed for smooth film winding.

Automatic Layflat Control (ALC)

The patented Digisonic™ IBC control uses highly accurate electronic sensors to constantly measure the true diameter of the blown tube. It immediately compensates for even the slightest deviation from your setpoint by adjusting blower speeds and air flow. Since there are no major layflat variations, edges can be trimmed closer to the final web width for minimal scrap and reclaim.

Slat Collapsing Frame

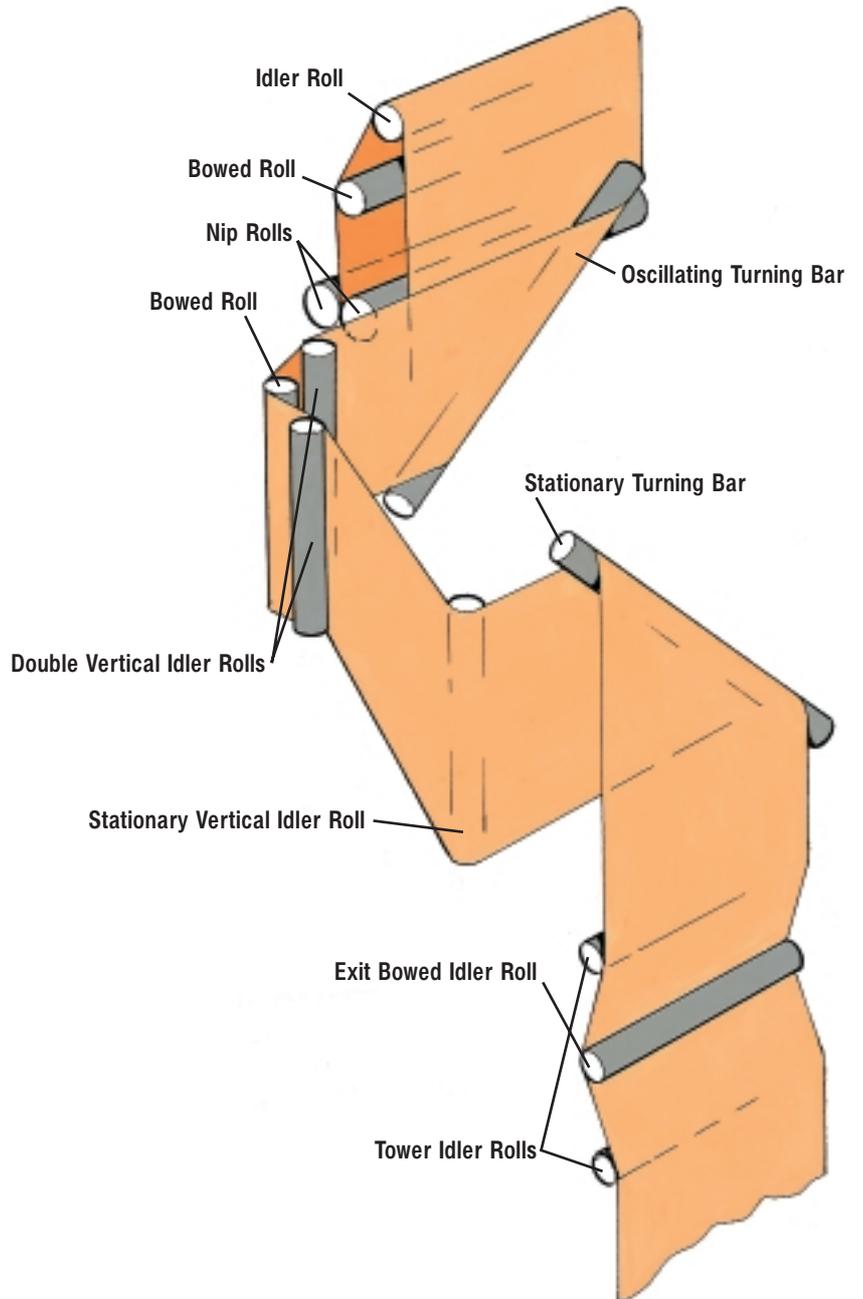
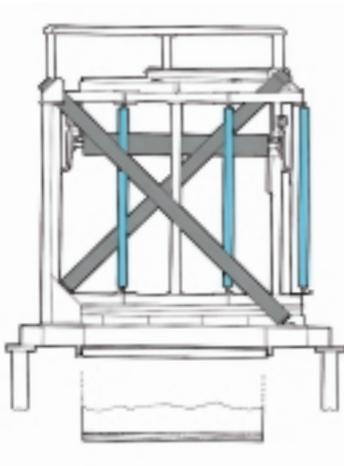
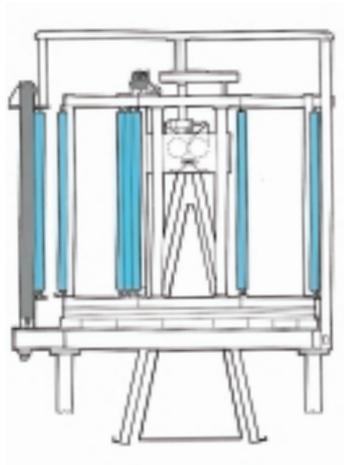
The interlacing side guides of Gloucester's Slat Collapsing Frame provide the proper geometry to collapse non-extensible high molecular weight films without wrinkles or creases. To further reduce drag and resulting bagginess, a low friction plastic slat cover is available. Segmented roller and airboard collapsers are also available for special applications.



The Traversanip® Oscillating Hauloff shown eliminates the need for rotating dies.

**Traversanip®
Oscillating Hauloff**

This proprietary hauloff system provides 100 percent randomization of gauge bands through its continuous 720° oscillation. It assures ultra-smooth, randomized film that can be easily wound into large diameter rolls that make high speed converting profitable. It also eliminates the expense and maintenance requirements of rotating dies, and the floor space needed for special extruder platforms.

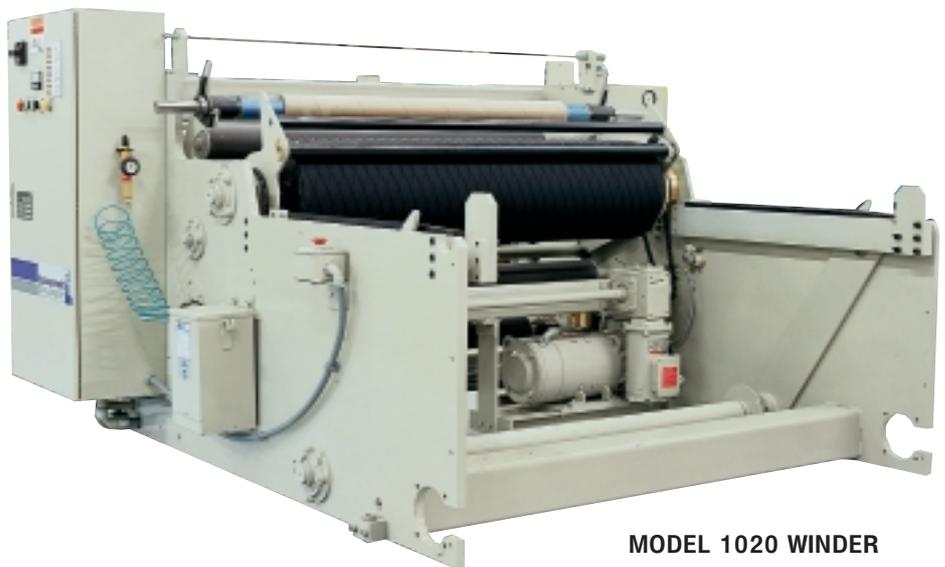


Converter Quality Winders Produce High Quality Rolls

Battenfeld Gloucester Series 1000 Winders offer virtually every configuration you will ever need, including single and multiple rolls up to 60" in diameter. More importantly, they are specifically designed to produce smooth, uniform rolls of HDPE film.

Strong and Stable

Series 1000 Winders feature solid, durable construction and heavy, solid frames. This provides not only mechanical stability and reduced vibration for higher quality rolls with clean slit film edges, but also lower maintenance and a longer life cycle.



MODEL 1020 WINDER



MODEL 1021 WINDER

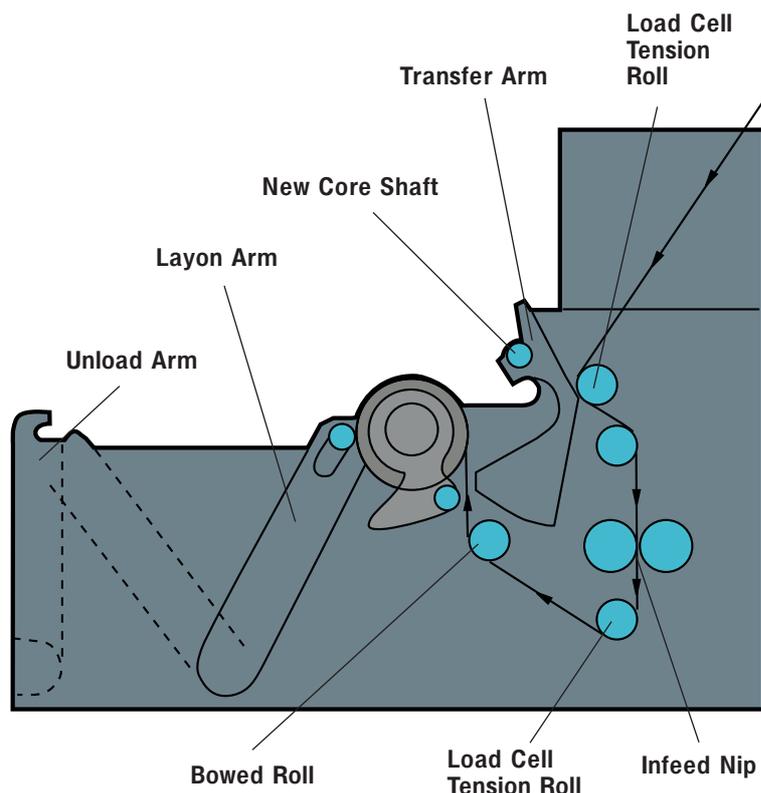
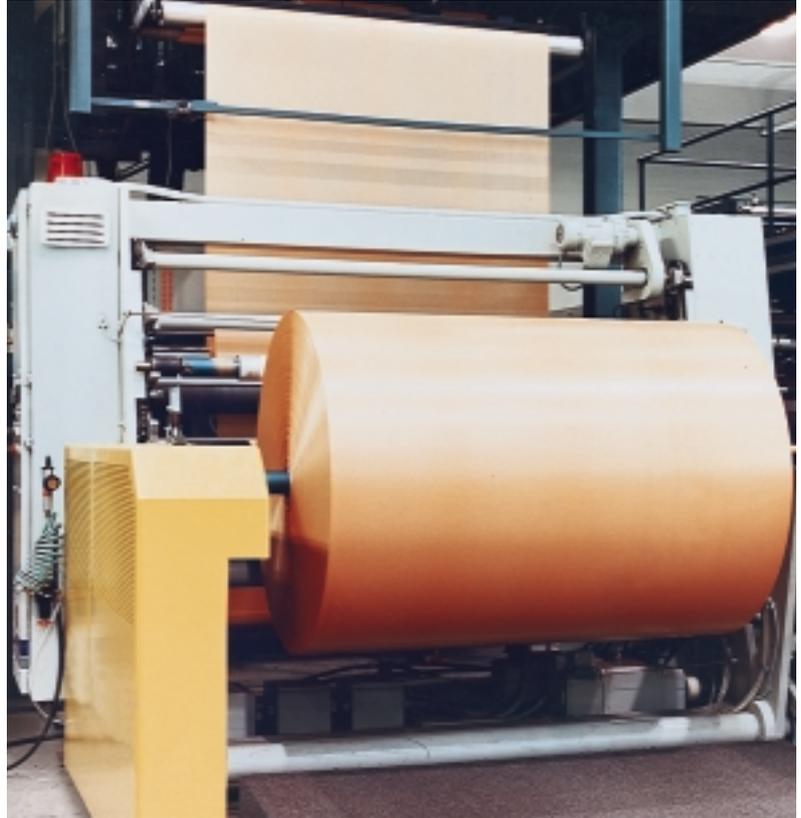
Precise Control

Battenfeld Gloucester builds programmable logic control into all Series 1000 Winders. Roll quality is monitored at every moment using preset control points and alarms to maintain consistency and high yield over long production runs. Series 1000 Winders can also be integrated into the blown film system's overall scheme. As an added bonus, the software based controls can be easily customized to your specific application and just as easily reprogrammed to accommodate different applications.

Series 1000 Winders

All Gloucester Series 1000 Winders offer the following features:

- Roll diameters up to 60 inches
- Load cell tension monitoring and control
- Electronic taper tension
- Floating layon roll
- AC flux vector drives



Complexity of HD Blown Film Production Requires Highly Intelligent Process Control

The large number of complex processes that take place during HDPE blown film production, the speed at which they occur, and the unique requirements of high density film make process control a critical part of the overall operation. That's why Battenfeld Gloucester HDPE blown film systems incorporate the Extrol 6000 Integrated Process Control System, the control system designed for extrusion processes by extrusion experts. It gives you single point control of every process function from feeding and blending through extrusion and blowing to hauloff and winding.

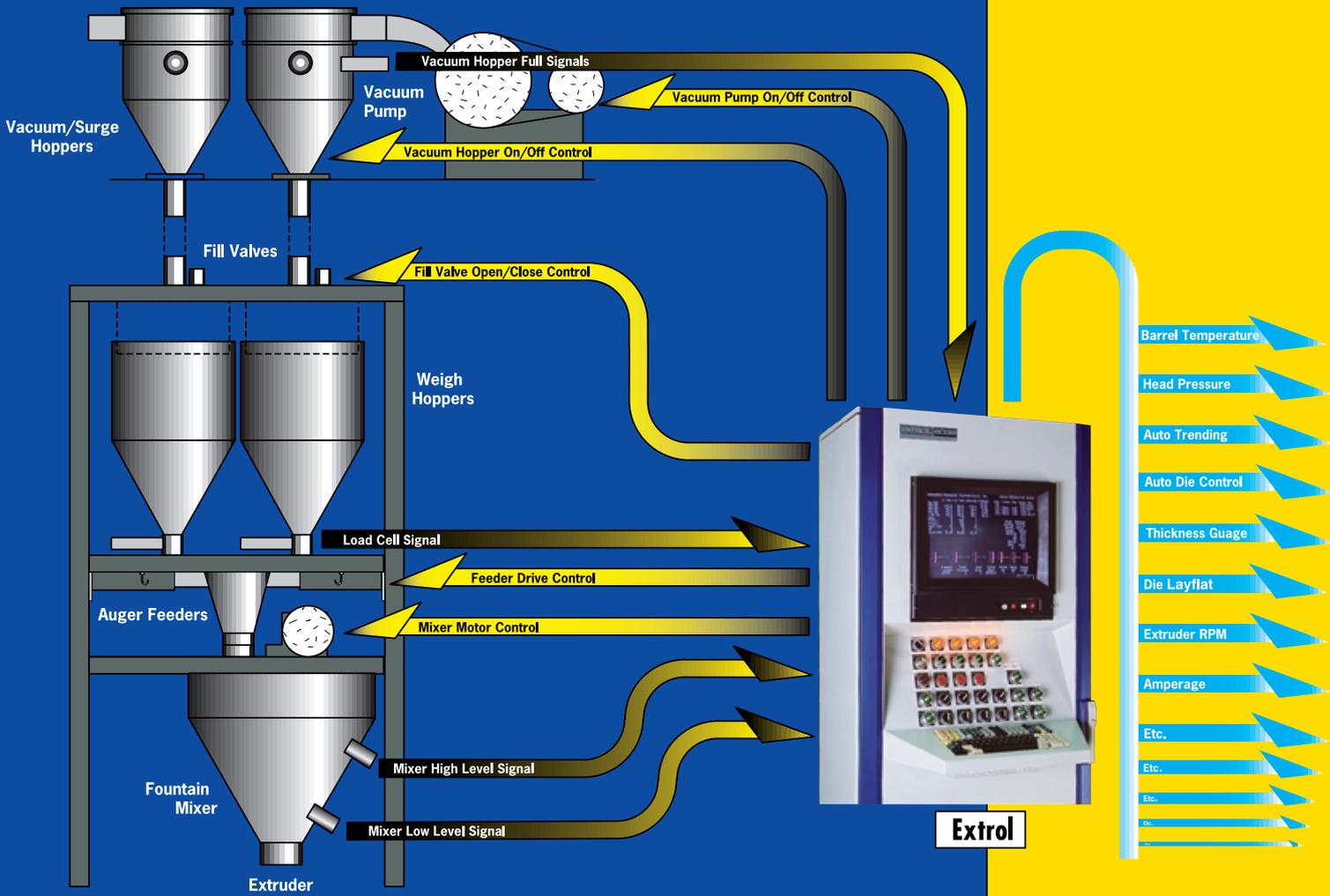
The Extrol microprocessor-based control system is incredibly fast, and easy to learn and operate. It constantly monitors every system variable and ceaselessly manages all of your set points and parameters, including:



- Gravimetric blending and feeding
- Autoprofile™ gauge control
- Drives and temperature zones
- Auto-trending of melt and barrel temperature, melt pressure, drive RPM and amperage
- Alarm and event data logging
- Data links to other computers
- Automated orderly shutdown procedures
- Automatic ramping of every drive (significant in coextrusion)
- On-demand SPC/SQC data and reports
- Sophisticated safety logic

Extrol Process Control puts you in absolute and total control of the profitability designed into your Gloucester high density blown film system.

Acurablend™





Unique Features of Gloucester High Density Blown Film Systems

Designed specifically for high-volume, round-the-clock production of high density HDPE film, Battenfeld Gloucester blown film processing lines feature:

- Gravimetric blending, feeding, scrap reclaim system
- Superior extruder and screw design
- Extended life dies
- Unique screen pack assembly
- Automatic layflat control
- Traversanip® oscillating hauloff
- Highly intelligent Extrol process control
- Internal Bubble Cooling (IBC)
- Slat collapsing frame
- Converter quality winders
- Full support and service

Outstanding Service and Superior Support

Your Battenfeld Gloucester high density blown film system includes the most reliable and advanced technology available. Our service and support are equally advanced. Gloucester is your single source for all technical and maintenance expertise, in addition to the process experience that frees you to concentrate on the end product. Support includes:

- Fully inclusive process consultation
- Comprehensive engineering services
- Use of Gloucester's dedicated Technical Center for material and equipment testing
- Gloucester's worldwide network of skilled, knowledgeable service engineers
- Our extensive inventory of parts and supplies.



Each Gloucester film line is supported by a computer monitored multi-million dollar parts inventory

Battenfeld Gloucester Engineering

From its headquarters in Gloucester, Massachusetts, USA, Battenfeld Gloucester Engineering is a worldwide leader in extrusion based plastics production systems. Gloucester supplies production lines, including integrated microcomputer control systems, for blown film, cast film, foam sheet, rigid sheet, extrusion coating, bag making and reclaim processing.



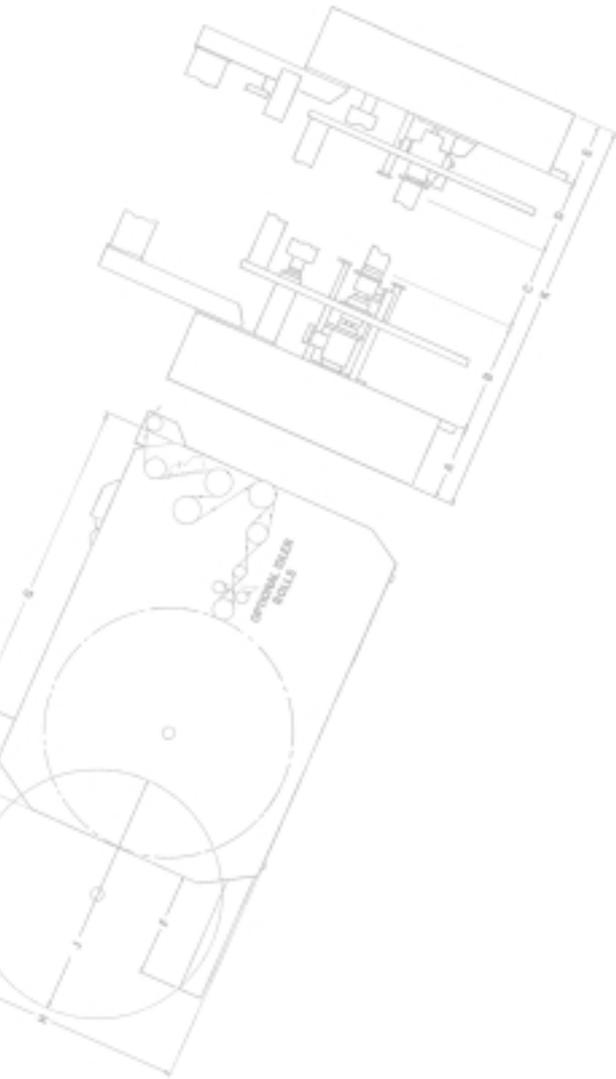
Battenfeld Gloucester Europe • UK



Battenfeld Gloucester • USA

A member of the Battenfeld Group, a leading worldwide supplier of plastics processing systems, Gloucester has led in the development, engineering, manufacture and support of individual production components and complete extrusion lines since 1961.

Total production facilities of almost 360,000 square feet include CAD/CAM/CAE and CNC equipment for precision manufacturing of components such as extrusion screws and dies. Complete integration of design and engineering enable Battenfeld Gloucester to stay at the forefront of the latest technologies.



Battenfeld Gloucester

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