



Evolution™ Sheet Take-Offs





Welex is the world's leading supplier of complete sheet extrusion lines.

Our Evolution line represents the culmination of over 50 years' experience.

With all the features and options you need for profitable production and high quality output.

Welex extruders and gear pumps work long and hard to give you the most output for your investment.

Welex sheet extrusion dies produce the highest quality sheet with minimal operator attention.

Welex Evolution sheet take-off systems cool the output, impart the desired surface finish, and accumulate the sheet in uniform rolls or flat stacks.

Welex offers all of the above in a full range of sizes, for any desired polymer structure, output capacity, sheet width, or thickness range.

Our goal is the absolute best performance possible.

We don't take shortcuts. We won't accept compromise. You can be certain that your

Welex systems will operate profitably for years because of the way we design them, build them, and back them up.

First, we design our products for long life. Components are selected solely on the basis of performance and suitability—not cost.

Second, we design with your operator in mind. Our top management and engineering staff often provide the operator training and start-up service, so you can be sure that we understand the operator's needs in detail.

Third, we design for quick and easy servicing and routine maintenance. Everything is accessible. We offer the most complete spare parts inventory in the industry. Whenever possible, we use standard components that, in a pinch, you may be able to obtain locally.

And finally, we give you clear drawings and complete parts lists with your machines. If you have questions you can always call us. You'll get immediate answers from our competent technical staff.

Single utility drop installation.

Welex Evolution sheet take-offs are supplied completely prewired, prepiped with built-in roll temperature control systems, all fully tested under load. Smaller lines are usually shipped fully assembled in a single piece. Wider lines require simple field assembly of a few match-marked components.



Welex rolls: The key to perfect sheet finish.

Welex sheet take-off rolls are computer designed to achieve maximum heat transfer with minimal roll deflection under pressure.

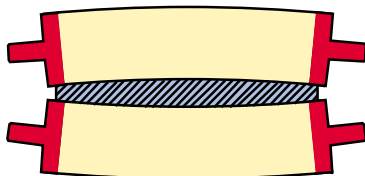
The rolls have a double shell construction, with multiple spiral baffles to assure high cooling fluid velocity for uniform roll temperatures. A heavy rigid inner shell supports the shrunk-fit outer shell.

To prevent indentation from high sheet pressure, rolls are constructed with a thick, hard stainless steel overlay. Typical hardness range is Rockwell C 55-60 (Brinell 550-600 kg/mm², DIN 50351). The overlay is ground, hard chrome plated and then polished to a flawless (under 1 rms) mirror finish.

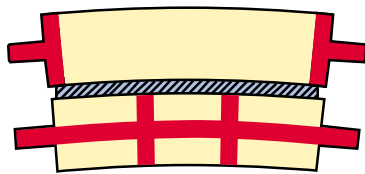
At assembly, all rolls are carefully gap matched to ensure precise fit.

ContraBend® rolls (optional)

Our ContraBend® rolls offer an almost perfect compensation for roll deflection under high loads. Running full width sheet, tolerances are improved dramatically.



Typical rolls



ContraBend® rolls

Rigid frame construction

Welex heavy steel plate frames assure accurate alignment of all rolls. Our frames are Blanchard ground and computer jig bored in pairs to assure absolute parallelism. Direct-acting heavy steel bearing housings eliminate deflection of the critical roll gap setting.

Roll bearing assembly

Welex uses high precision bearings to minimize play and deflection. Bearings are selected to ensure long, trouble-free service life.

Motor drives

Welex uses only high precision digital AC vector drives on all sheet take-offs. Regenerative braking capability is essential so that roll speed is not affected by tension between sections or by winder pull.

Roll arrangement

Sheet take-off roll stands are built in a variety of arrangements to suit different requirements.

Sheet take-offs with downstack orientation are best suited for most applications.

Upstack orientation is preferable for thick or embossed sheet.

We also offer inclined and offset roll stands for specialized applications.

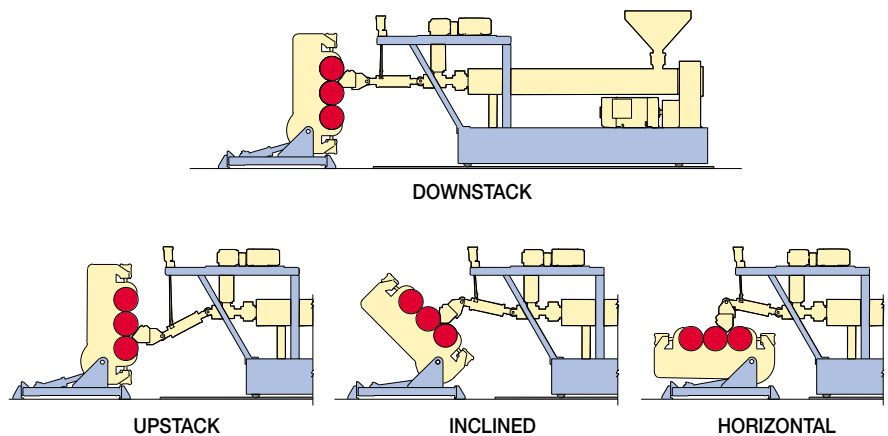
Details on these arrangements are illustrated on the back cover of this catalog.

Unistack®

For total flexibility of operation in all positions, we offer our patented Unistack® system (see below).

Engraved rolls

In addition to the standard mirror finished rolls, a variety of matte, textured, or engraved embossing rolls can be provided to impart any desired pattern to the extruded sheet. The complete range of prismatic and lighting diffuser products and decorative patterns is included. Rubber or other resilient rolls are recommended for certain applications.



Welex sheet extrusion dies assure superior quality, uniform sheet—with minimal operator attention.

Welex has dies for all polymers, in all widths and thickness ranges, in your choice of manual or automatic adjustment control. All Welex sheet dies are suitable for Welex coextrusion feed blocks without modification.

Flexible lip dies offer the best performance for most applications. They are easily adjustable, highly streamlined, and have a minimum number of moving parts to eliminate leakage.

Fast Gap®: All dies are available with Fast Gap® thickness control. A single bolt adjusts the entire lower lip over a range of up to .200" (5 mm), for a total opening range of up to .300" (7.5 mm).

Construction: Welex sheet dies are precision ground to avoid leakage, then hardened, chrome plated and mirror polished for perfect sheet surface.

Integral cartridge heaters assure efficient, uniform heating and long heater life. Completely prewired in rigid protective cages with single plug connectors.

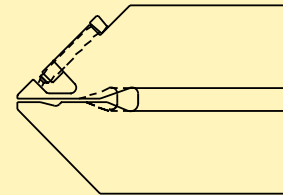
Deckles are available to reduce the die opening width. These are easily installed and adjusted, and have no effect on uniformity of sheet thickness (even with coextrusion).

Maintenance: Welex sheet dies are easily disassembled for cleaning without removing heaters or disturbing wiring.

Welex has the right die for your application:

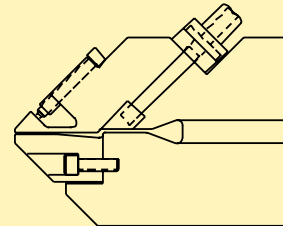
Flexible lip (H) dies

- Most economical and simplest to run
- Most streamlined, hence cleanest running
- Limited thickness range, typically up to .080" (2 mm)
- Suitable for thin sheet, up to .080" (2 mm) and extremely heat sensitive polymers
- Manual adjustment



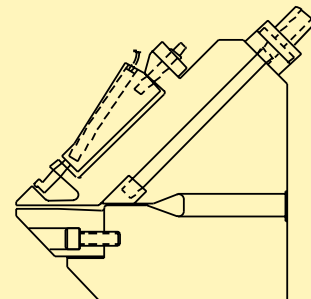
Flexible lip with restrictor bar (R) dies

- Unlimited thickness range is available by addition of restrictor bar for flow control
- Shimmable and interchangeable lips with appropriate die land lengths to cover thickness extremes
- Manual adjustment



Welex patented Autoflex® automatic dies

- A Welex Autoflex® automatic profile control die will improve your sheet tolerances by an order of magnitude
- Invented by Welex
- Computer control eliminates need for human judgment (and error)
- Available with or without restrictor bar

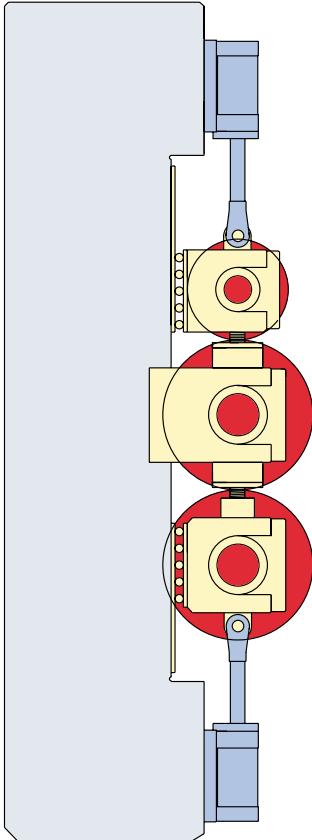


Roll actuation

Precise roll gap setting and maintenance under all conditions is an essential function of a sheet take-off.

The new Evolution design provides a unique means of setting and maintaining precise roll gap while allowing rolls to float automatically with sheet thickness when required. Roll closing pressures are continuously adjustable from near zero to virtually any desired pressure by means of our accumulator-backed air-over-oil loading system.

Thin sheet, below 0.010" (250 microns), often requires the roll gap to float so as to follow minute thickness variations without creating a ripple in the sheet. Thicker sheet is best run with rigidly set roll gaps.



Hydraulic or air

Air loading is adequate for many applications and has the advantage of allowing roll flotation beyond the set pressure.

Hydraulic systems facilitate higher closing pressures but permit no yield, except with an air-over-oil system, which we use exclusively.

Roll gap adjustment

We provide either precision manual or digital motorized adjustment. Motorized is recommended for hydraulic systems because of the high effort required for roll adjustment.

Maintaining roll gap

The Welex Evolution system rigidly maintains the set roll gap even at the highest pressures because the adjusting blocks are located directly between the roll bearing blocks. Consequently, frame and arm deflection doesn't enter into the equation, as it does in most other designs.

Automatic roll gap control

We offer a variety of automatic feedback roll gap control systems, depending on the application. Our latest system provides gap and/or nip pressure control.

Quick roll change

Embossed or special textured sheet requires appropriately engraved middle rolls. If these must be changed frequently, our quick roll change option can save a lot of downtime and maintenance. This is provided by split housing bearings with one or two retaining bolts. Self sealing quick disconnects for the water lines are a further help. Quick roll change is standard equipment on most Welex sheet take-offs.

Closed loop temperature control system

A built-in closed loop pressurized water system with large-volume circulating pumps provides accurate and uniform control of all roll temperatures (optional free-standing side-mounted systems are also available). Temperature gradients are usually about 1° across a roll at full output. Welex has pioneered the use of the Victaulic® piping system which completely eliminates leakage and greatly simplifies serviceability.

Modulating valves precisely control the temperature of each roll, without the damaging pulsations produced by solenoid valves.

An eight-point digital temperature indicator shows all roll and circulating system inlet and outlet temperatures.

The Welex unique, continuous flow heat exchanger system eliminates water hardness build-up. All system components are laid out for easy access and simple maintenance.

Our standard system operates up to 230°F (110°C). For operation up to 400°F (200°C), special high pressure water and thermal fluid systems are available.

The Welex system has proven itself so well in use that many of our customers have installed it on their older non-Welex lines.



Welex roll drive systems

Welex builds sheet take-off stands with three distinctly different roll drive arrangements. Each of these provides specific advantages for particular applications and your choice will depend on your intended use. No drive system is perfect for all applications. Since we offer all types of drives, we can give you our unbiased recommendation on which type will serve you best.



Individual roll drive

- A separate motor drives each roll
- Each roll can be run at a different speed
- Best for high quality optical sheet and thicker sheet
- Rolls can differ in diameter
- Most expensive
- Most complex to operate
- Most complex to maintain
- High power transmission capability for calendering
- Hydraulic roll closing
- Complete freedom of roll speed differential
- Quick roll change is standard, but more difficult than with gear drive
- Lowest possible chatter
- Potential for roll damage if rolls touch each other
- Best for low to medium speeds

Recommended for

Packaging sheet
Roll stock
Optical quality sheet
Thick sheet
Very wide sheet

Less suitable for

High speed operation
Small diameter polishing rolls
Frequent roll changes

Helical gear drive

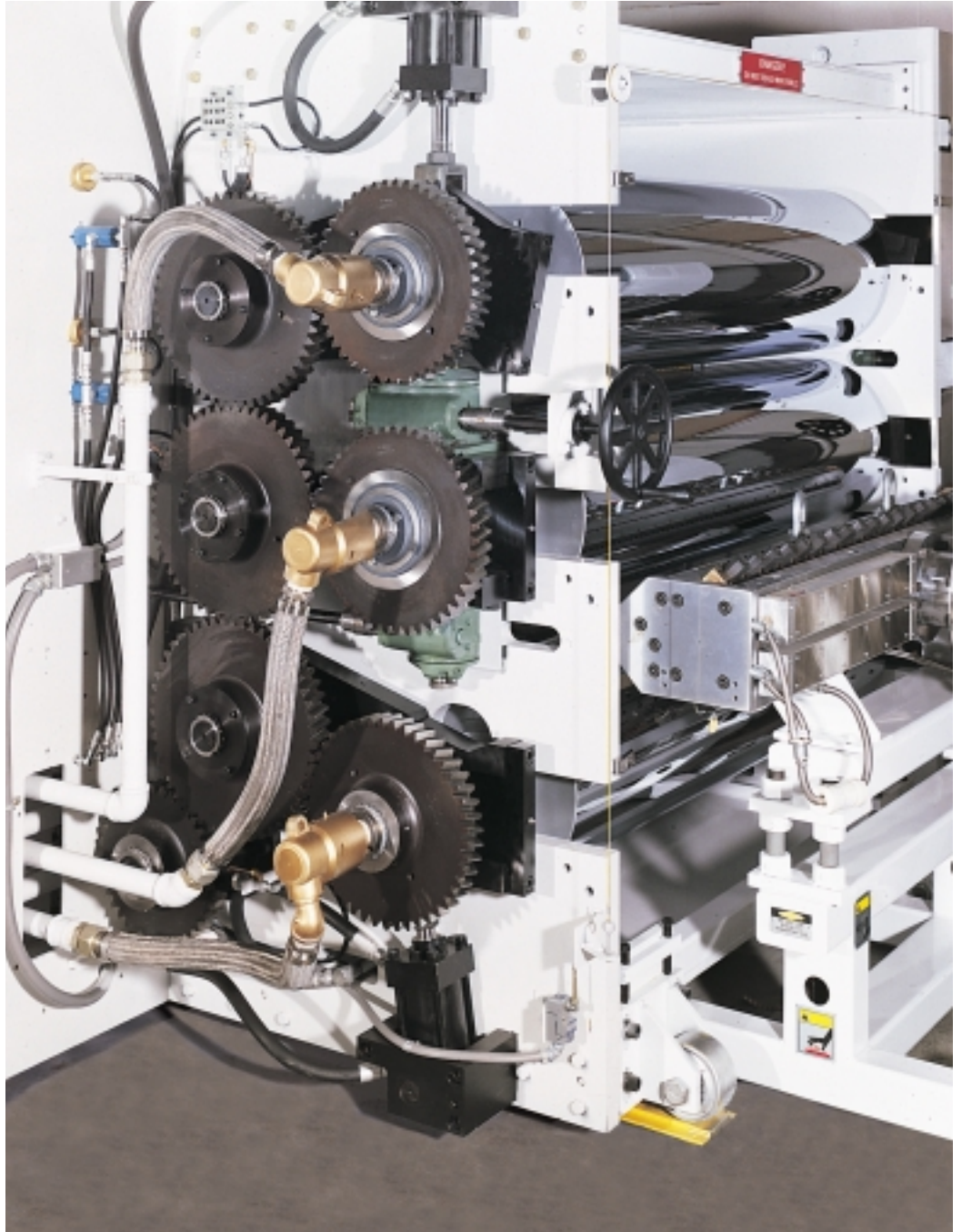
- One motor drives all rolls
- All rolls run at the same speed
- Best for thick industrial sheet—particularly HDPE & PP
- All rolls must have the same diameter
- Medium cost
- Easy to operate
- More complex to maintain
- High power transmission capability for calendering
- Hydraulic roll closing
- Limited differential slip clutch on last roll
- Quick roll change is standard
- Minimal chatter
- Best for low to medium speeds
- Vertical roll arrangement

Recommended for

Thick sheet
Wide sheet
Industrial sheet
Some optical quality sheet

Less suitable for

Packaging sheet
High speed operation
Small diameter polishing rolls





Chain drive

- One motor drives all rolls
- All rolls run at the same speed
- Best for all-round use and for high speeds
- Lowest cost
- Available with equal or mixed roll diameters
- Easiest to operate
- Limited power transmission
- Not suitable for calendering
- Pneumatic roll closing
- Limited differential slip drive on last roll
- Quick roll change optional
- May develop chatter marks if improperly used or maintained
- Vertical roll arrangement

Recommended for

Packaging sheet
 Roll stock
 Some industrial sheet
 Frequent roll changes

Less suitable for

Optical quality sheet
 Thick sheet
 Wide sheet

Optional equipment

Slitters

For applications where sheet must be edge trimmed or slit into multiple widths, we provide specially designed razor slitters. These assemblies can be moved to the best locations on the idler conveyor section. Heated slitters are available for very thick sheet, and other types, such as rotary slitters, can be provided where needed. For sheet used in-house, every effort is made to avoid the need for wasteful trimming.

Anti-stat or silicone coating bath

A Welex anti-stat bath is recommended when surface application of a slip-agent is called for to aid product de-nesting, or when you want to surface treat the sheet with an anti-static solution to protect against static dust pick-up.

Our system fits any Welex sheet line, and can treat one side of the sheet or

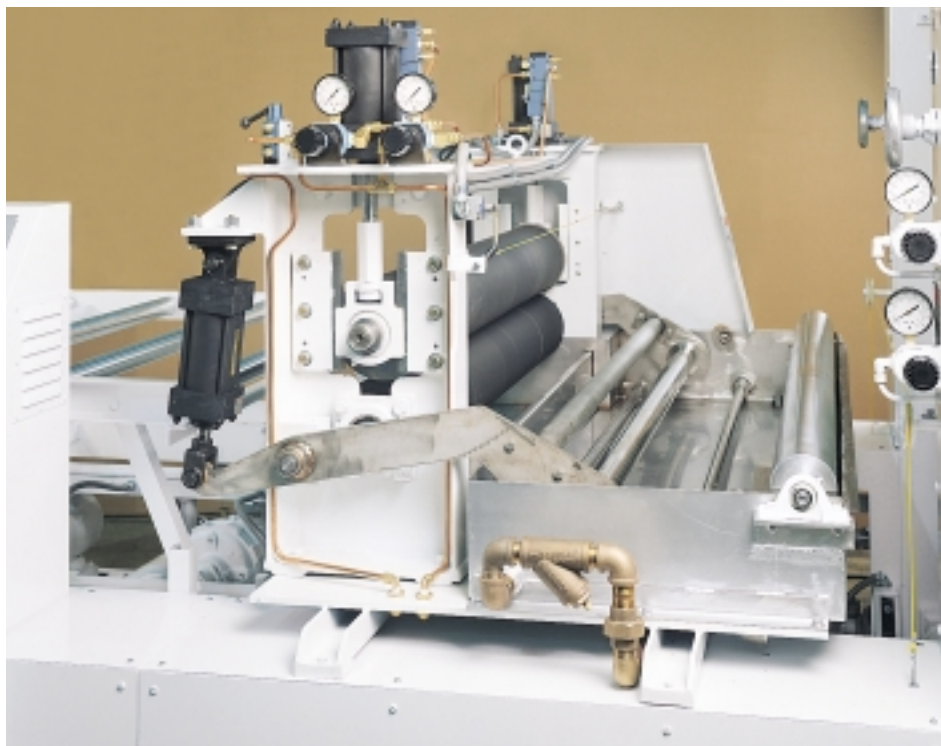
both. It has a pneumatically operated dip roll for easy threading, and ultra-soft polyurethane squeegee rolls to remove excess liquid. For extra cooling, it is located adjacent to the polishing rolls. It is equipped with a circulating pump and heat exchanger to maintain optimum bath temperature for high capacity lines. Easily removed from the line when it's not required for thick sheet.

Automatic lubrication system

An optional automatic lubrication system is available for lines where rolls run at high speeds. It periodically applies grease from a central reservoir to all roll bearings, chains, idlers, and other points that need it.



Slitter assembly



Anti-static bath (guard removed to show detail)

Process control

If purchased as part of a line, your take-off can be equipped with a Welex Ultima process control system. The Ultima's task-specific software is preprogrammed by Welex to assure precise, repeatable, central control of even the most complex sheet extrusion system.

Gauging equipment

Welex offers integrated gauging systems from selected suppliers. Provision can also be made to accommodate customer supplied gauging systems.

Additional cooling rolls

For special applications where additional cooling is required, we can supply additional cooling rolls. These are designed for close contact wrapping and highest possible heat transfer. Two or three rolls are usual. These can be driven by the same motor as the primary rolls, or by an individual drive to allow for sheet contraction. Each roll can be supplied with its own individual temperature control system.

Laminating pay-off

For laminating other films and webs to the product being extruded, we offer one or more optional laminating pay-off stations.

Lamination can be accomplished by either feeding the film in at the die nip or by use of a heat-resistant rubber pressure roll against the middle take-off roll. The pay-off stations maintain the laminating film under adjustable tension, and can be provided with lateral adjustment. They can be mounted in whatever location the application requires.

Retractable air knife

A Welex retractable air knife enables you to produce thin polypropylene sheet on your conventional Welex sheet take-off. The air knife is designed to quickly position into (shown) and retract out of the open upper roll gap of the three roll take-off. Micrometer type adjustments permit optimization of the air position and impingement angle, making the sheet conform to the middle roll for uniform cooling.



Additional cooling rolls
Laminating pay-off



Retractable air knife

Winders

A complete range of fixed shaft, cantilever, and turret winders is available from Welex for making roll stock. The best tension control can be obtained with a build-up ratio not exceeding 6:1, from core diameter to finished roll size. Thus, a 3" (75 mm) core is best suited for rolls not exceeding 18" (450 mm) diameter. Cores with 6" (150 mm) diameters are suitable for rolls up to 36" (900 mm), while 8" (200 mm) cores should preferably be used for rolls up to 48" (1200 mm) diameter. Square shafts with inflatable quick-release pneumatic core chucks are standard.

Fixed shaft winders

These are the least expensive and most widely used winders. We build them in two- and three-shaft models, with diameter capabilities up to 48" (1200 mm). To have an empty shaft for changeover, be sure to specify one more shaft than the number of web widths to be wound. For more than two widths, the winder can be supplied in staggered configuration. Each shaft has its own adjustable tension drive.

Jumbo roll winders

This system permits winding rolls up to 6 ft. (1800 mm) or more in diameter. The rolls are stored on the mobile winding cart and taken to the thermoformer (or other subsequent process) for long uninterrupted runs. Two winding positions, with an overhead feed system, permit easy changeover at high speeds. The winders are powered by plug-in hydraulic motors which remain suspended from the overhead frame. Single or dual width systems can be supplied. This is the least expensive, and currently the favorite system for in-house use of rolls. Removable roll carts can be supplied for production of standard rolls. Sheet up to 3/8" thickness (9 mm) can be rolled on special versions of this winder.



Triple fixed shaft winder



Removable and fixed shaft winding carts for jumbo roll winding system



Jumbo roll winding system

Turret winders

Turret winders are used on the highest speed lines. They facilitate roll changeover by indexing prior to change, so that no loose ends are handled. Automatic transfer is available for thin sheet at very high speeds. Maximum roll diameter is usually 48" (1200 mm).



Turret winder

Cut-offs

In addition to winders, Welex offers a full range of sheet cut-offs to suit your cut sheet needs.

Cut-off shears (guillotines)

Thicker sheet is usually cut to length. Welex offers a complete range of cut-off shears for non-brittle polymers. The shears differ in speed, thickness capability, and accuracy of cut, and we will be glad to make a recommendation as to which will meet your requirements best.

All shears are automatically precision-controlled by our digital-set cut-off length control. It can be set quickly and accurately, for lengths up to 99.99 inches, or 9999 mm.

Shears are supplied on casters to fit the take-off track, and include humped conveyors for accumulating sheet during the cutting cycle.

Cut-off saws

Cut-off saws sever brittle sheet and usually travel along with the sheet during the cutting cycle. They cut very clean edges, but are dusty and noisy. Hot knife cut-offs are rapidly replacing them in most applications.

Hot knife cut-offs

Heated steel rule dies cut through most of the sheet thickness. Then the thin residual web is broken by a subsequent bending of the sheet. Hot knives are clean and quiet, but they sometimes make a slightly rounded edge, which may not always be acceptable.

In-line systems for thermoformers

High volume thermoforming benefits greatly from direct coupling of the sheet extruder to the thermoformer, or in-line processing.

Advantages and efficiencies include:

- Uniformity of feed to thermoformer
- Immediate detection of sheet defects
- 10-15% material savings through reduced waste, and elimination of edge trimming
- Energy conservation by reducing re-heating requirements
- Elimination of roll storage and handling
- Reduced labor costs
- Improved overall product quality and productivity

Welex offers a variety of different in-line systems to suit all applications. Each is well proven, and widely used by major packaging and disposables manufacturers, all over the world.

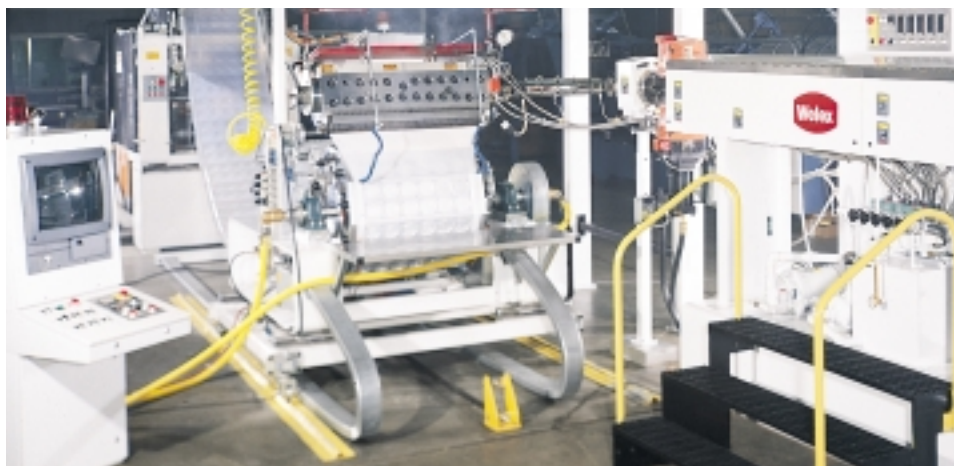
If you are a high volume thermoformer, a Welex in-line system will improve your overall product quality and productivity.



Compact tandem in-line



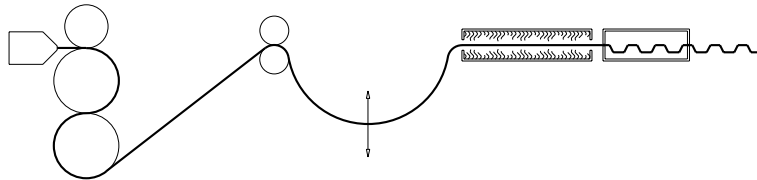
Hot in-line



Rotary in-line

Tandem in-line

A Welex tandem in-line system combines a complete conventional sheet extrusion line with a complete conventional thermoformer. A free hanging loop of sheet serves as the accumulator during the thermoforming cycle. The two machines are synchronized by a loop detection system, which advances the thermoformer each time the required amount of sheet is accumulated.



Some heat is conserved in the sheet, but it is cooled sufficiently to maintain its strength in the free hanging accumulator loop.

Where longitudinal floor space is limited, Welex offers a special compact sheet take-off option. This features a shortened take-off,

with the roll temperature control system located in an attached, side mounted vertical structure.

Welex tandem in-line systems are suitable for all polymers and capacities.

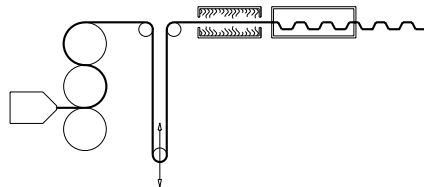
This is the only process useable for clear polypropylene, which requires rapid quenching to avoid crystallization (and consequent loss of clarity).

Hot in-line

Our hot in-line system uses a minimal cooling capacity three roll stand to polish and surface cool the sheet, followed by a driven hot sheet accumulator that is directly coupled to the thermoformer transport chain. The two machines are synchronized by a mechanical interconnection of the accumulator drive and the thermoformer chain. Completion of the accumulator stroke initiates the thermoforming cycle.

This provides maximum energy savings because the

sheet is maintained as hot as possible, reducing re-heating requirements. With large thermoformers, re-heating cannot be totally eliminated due to the dwell time in the accumulator stage, which causes a temperature gradient along the sheet.



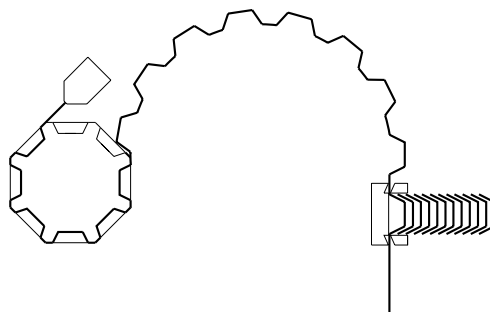
Hot in-line systems are ideal for large capacity production of polystyrene and PET cups, tubs, and containers, and are best suited for sheet capacities above one ton/hour.

The hot in-line system cannot be used for clear polypropylene products, because they require rapid quenching to maintain clarity. This system is also not suitable for small thermoformers or thin sheet (such as lidding) because of the inability to maintain hot sheet under those conditions.

Rotary in-line

For lids and other thin, shallow draft items, we offer in-line rotary thermoforming systems. These cast hot sheet directly onto a vacuum forming drum and completely eliminate the sheet take-off and any need for re-heating the sheet.

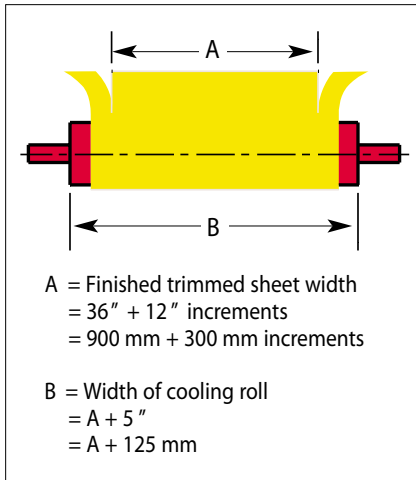
This process is not suitable for deep draw items since these cannot be removed from the drum after forming.



We also offer rotary forming systems up to 10 ft. (3 meters) wide for reticulated water-stop sheet.



Polishing roll diameters



Welex service and support
Welex sheet extrusion systems are backed by a worldwide sales and service organization that you can call on for help at any time. We employ the most qualified field service staff and maintain the largest spare parts inventory in the industry, so that we can supply whatever is needed for any Welex extrusion system ever made.

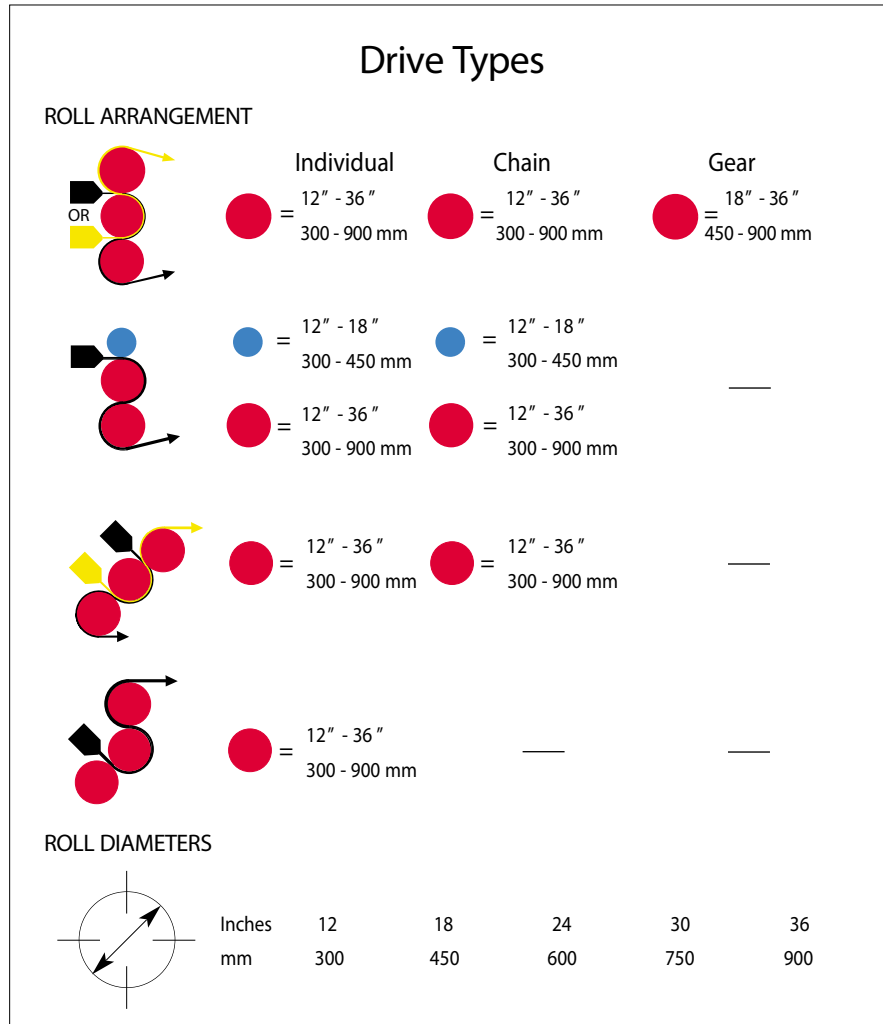
Whether you're near us or half a world away, we understand your needs, and we'd like to work with you to meet them. In your language and measurement system. Our equipment meets the CEANSI and NFPA standards – plus other certifications upon request.

Call your local Welex representative (listed on our home page on the Internet), or contact us directly.

Proper cooling requires the appropriate roll diameter. If the rolls are too small, the line capacity will be limited. If the rolls are too large, the sheet may not lie flat after cooling or there can be

excessive sheet sagging between the die and the roll nip.

We will use our vast experience to recommend the best roll diameters and arrangements for your requirements.



Welex Incorporated
1600 Union Meeting Road, Blue Bell, PA 19422 U.S.A.
www.welex.com • E-mail: welex@welex.com
Tel: 215-542-8000 • Fax: 215-542-9841

Evolution is a trademark of Welex Incorporated.