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On Site

- Home
- Search the Site
- Forum

News and Events

- Industry News
- Materials price changes
- PE & PP prices at the London Metal Exchange
- Archive
- Conferences & Exhibitions
- Quotations Wanted

Reference

- Directory
- Industry Links
- Techlink
- Currency Conversion

Back to the K2004 Index page

K2004 PREVIEW

K2004

EXTRUSION

This preview page will be updated steadily. To enable visitors to keep track of additions we are headlining each topic with links in the table below. Company name links take you to a contact page which will open in a new window to allow you to keep using this page.

Visitor information from the K2004 organiser.

TOPIC	PREVIEW NEWS	DATE POSTED

About British Plastics & Rubber

- **In The Latest Magazine**
- **Coming Soon**
- **Download A Back Issue**
- **Reader Registration**
- **Advertising Information**
  - ***Rates***
  - ***Circulation***
  - ***Special Features***
  - ***Mechanical Data***
- **Contact Us**

Film & sheet

Blown film	A host of improvements to Kiefel Kirion	September 6
	New extruders and film handling from Reifenhäuser	September 2
	Two layer PP plant from Indian manufacturer	August 30
	Righting wrongs in film thickness control	July 27
Bubble film	From pellets to bubble wrap	August 17
Cast film/sheet	Sheet line can feed a thermoformer or make sheet off-line	August 25
	Barrier edge trim can be reclaimed	August 24
	Coex line from Esde	August 11
Dies	Don't underestimate the importance of the air ring	September 3
	New compact and in-line adjustable dies from Reifenhäuser	September 2
	EDI cuts die downtime	August 29
	Blown and cast film dies from D-S	August 29
	Low profile die improves operation and melt flow	August 25
Film stretching	MD draw up to 4:1	August 25
Film winders	In-line slitter/winder for non-wovens	August 29

Foamed sheet	Twin screw is the way to go, says Berstorff	August 29
Rollers	Roll finish a speciality	August 17
Surface treatment	Sherman adds intellience to corona power supply	SWeptember 25
	New systems for blown and cast film production	August 27
Water-cooled film	Water-cooling gives more output with fewer disadvantages	August 17

Pipe & profile

Calibrators	Adjustable calibrators enable on-the fly product change	September 27
Corrugators	Pipe producer makes its own corrugators	August 30
	New corrugator is almost half as fast again	August 11
Dies	Easier production of multi-layer pipe	August 28
Fabricated pipes	Steel-reinforced spirally wound pipe	September 26
	Perforated pipe for rainwater percolation	August 30
Hole punching	50,000 km of irrigation pipe a year	August 11
Pipe and profile lines	Four components in a single profile	August 30
	Small diameter high tolerance tubes and profiles	August 29

	Off-the-shelf downstream and a new slant on drip irrigation	August 25
	Pipe lines for polyolefins and PVC and a bigger 'plug and play'	August 25
	Continuous glass reinforcement	August 24
	Complete lines for squeezable tubes	July 27
Saws, cutters and guillotines	Saw set-up simplified	August 25

Other topics

Control & instrumentation	Modular controller grows with the extrusion system	September 5
	Manual and automatic control are drawn into one system	September 4
	WindowsXP takes control	August 30
	Yield control system improved, but still relatively cheap	August 29
	Mid-range system with big system features	August 29
	Pressure sensor is less likely to break	August 28
Extruders	New single screw series from Boston Matthews	September 28
	Extruders through the ages	September 2

	US extruders designed for European use	August 29
	Extruders get longer at K-M	August 28
	More off-the-shelf extruders and new twin screws	August 25
	Less wear, less energy, more output	August 25
	Conical and parallel twin screws	July 27
Melt filtration	Rotary filter performance up, price down	August 28
	Autoscreen now for polystyrene	August 22
Mixing	Static mixer improves homogeneity	August 22
Rubber extrusion	Berstorff improves printing blanket and tyre tread production	August 30
Screws and barrels	More output in foam extrusion	July 27
Wood-filled extrusion	Dosing system for wood chips	September 27
	Higher speeds from Cincinnati line	August 25

FILM & SHEET - BLOWN FILM

A host of improvements to Kiefel Kirion: Improvements have been made to the Kirion brand blown film lines introduced at K2001 by Kiefel Extrusion.

The company will be showing a three-layer line on Stand

17 C42 with a new ultrasonic bubble control system which allows width control to be improved through an integration of the IBC control system and a servo motor-driven high speed fine adjustment unit.

The main improvements, however, are better cooling to increase output and give better film clarity and greater bubble stability; AC vector direct drives for the extruders making drive belts redundant, saving installation space, and making maintenance easier; and a nine layer die.

There is also a new haul-off designed particularly for large lay-flat widths up to 3·6 m, and a new 'cascade' width control system. A lay-flat package to produce film without bagging or necking is also now a part of the system, as well as a collapsing frame with NC adjustment and the use of brush rollers.

New extruders and film handling from Reifenhäuser: A three-layer blown film line to be demonstrated by Reifenhäuser [Stand 17 A21] uses the direct drive extruders which the company introduced as a concept at the last K. The REItorque has no gearbox, reducing its footprint and cutting noise and energy consumption. The machine is built up to 80 mm diameter, and the Filmtec 3 line at K will use one 80 mm and two 70 mm.

The line will be making 0·02 - 0·2 mm gauge film, 1,600 mm wide, at up to 500 kg/hr, 130 m/min. It will incorporate the company's new REIcofly Micropore non-contact turner bar system. This has microporous bars to lubricate the film with air. The film will be wound on a UFA III winder using a special technique for winding tacky films.

Reifenhäuser's plant at Troisdorf is close enough to Düsseldorf for the company to stage a parallel exhibition for K visitors with a number of lines running, both blown film and thermoforming sheet.

Two layer PP plant from Indian manufacturer: Rajoo will display a two layer tubular quenched downward extrusion PP film plant with an output of 160 kg/hour on Stand 3 D36. Homopolymer will form one layer and co-polymer the other.

Rajoo has installed two five layer blown film lines in Malaysia in the past 12 months, one to the largest flexible film producer in the ASEAN region, Daibochi Plastic and Packaging. It also says it has installed the largest output three layer plant in India, for Gujarat Cooperative Milk Marketing Federation, which has an output of 500 kg/hour. It is equipped with grooved feed universal barrier extruders, internal bubble cooling with ultrasonic sensor and width control from Dr Joseph, USA; gravimetric feeding system for layer thickness ratio and GSM control from Doteco, Italy; and Barber Colman-Eurotherm computerized control panel with touch screen console. At the heart of the plant is the stack die system with

horizontal melt flow paths - UCD (Universal Coextrusion Die) - developed by Rajoo. A fully automatic winder is another first in the country.

As well as blown film lines, Rajoo also builds gas-foamed PE sheet lines.

Righting wrongs in film thickness control: The concept of 'the weakest link' is at the heart of two film control developments by DR-PAck of Hungary. The company reasons that if a film has a fluctuating thickness, it is only going to be as strong as the thinnest point, and the thicker parts are no more than wasted material.

To reduce the thickness variation in a film DR-PAck has developed a design of rotating die which eliminates what it says are deficiencies in traditional rotating die design, and has improved film cooling.

The die deficiencies stem from the spiral channel distribution which DR-PAck says leads to inhomogeneity, poor concentricity and resulting variations in the die slit, and uneven thermal distribution. DR-PAck has designed a die which controls melt speed, does not cause frequent splitting and recombining of the melt, and gives a more constant melt temperature.

Conventional bubble cooling systems are restricted by the need to keep the bubble stable, which limits the air speed which can be used and therefore its cooling potential. The DR-PAck alternative is a turbulent cooling air feed. [Stand 17 C78].

FILM & SHEET - BUBBLE FILM

From pellets to bubble wrap: The two-layer Power Bubble plant running on the Torninova stand [17 A09] will be the latest model for the production of bubble film starting from PE pellets. It has a useful width of 1,600 mm and a production capacity of 400 kg/h. The plant can be equipped with a third layer unit and other options to customer requests. The machine will be driven by a Macchi Plastex extruder.

FILM & SHEET - CAST FILM/SHEET

Sheet line can feed a thermoformer or make sheet off-line: Battenfeld Gloucester's TSL (Thermoforming Sheet Line) is a roll stack to make sheet for thin and medium gauge applications like cups, trays, disposables, and small industrial parts. It can be integrated as an in-line unit with conventional thermoforming equipment or used off-line. Standard sheet widths are 1,000 and 1,500 mm, and the unit is typically used with Battenfeld

Gloucester's 120 mm 33:1 L/D Contracool extruder.

Design is straightforward: three primary rolls, hydraulic nip actuation, direct individual roll drives and precise gap adjustment. Sheet movement is controlled over a wide range of speeds by the use of independent AC flux-vector drives on each roll. The manually or electrically actuated gap adjustment can be made under full line pressure.

To meet the requirements for high output and cooling capacities, two additional cooling rolls have been integrated in the stack. Each roll has an individual drive, which allows adjustment for minimal shrinkage of the film. Cooling rolls are designed with double shells and spiral baffles to promote heat transfer.

Sister company Battenfeld Extrusion will be showing a modular polishing stack whose rolls can be interchanged with rolls of a different diameter, and which is built with facilities for mounting additional cooling rolls or retrofitting an air knife. [16 D22].

Barrier edge trim can be reclaimed: The Barriercast line developed by Gruppo Colines [Stand 16 C06] is a seven-layer development of the five-layer line built for its sister company B-Pack. This line incorporates an edge encapsulation system to reduce the waste of expensive materials. Colines says that the production of film with barrier materials such as PA and EVOH produces edge trim scrap that cannot be recovered in line as the barrier materials are not compatible with polyolefins. In plants without encapsulation, the trimmed edges must be scrapped.

The encapsulation system enables edge trim to be recovered in one of the film layers, reducing the waste to about 3 per cent - depending on the structure and the thickness of the film - which is the safety margin to prevent contamination.

Other recent developments from Colines include a coextruded breathable film line with a useful width of 2,400 mm. This new project now at the testing stage has in-line mixing and feeding of the $CaCO_3$ starting from powders and reduces raw materials costs by about 30 per cent.

Coex line from Esde: An integrated coextrusion line from Esde [Stand 16 F05] will use direct drive extruders, a single screw machine ESE 1-50-28 for the main extruder and as co-extruder, a single screw ESE 1-25-18. Both extruders are driven by water-cooled AC motors with integrated axial bearings.

The three-roll FL 800 polishing unit has deflection compensating polishing rolls for low film tolerances. Integrated in the polishing unit is the Esde film gauging system which is non-contact, material independent and uses no isotope or X-rays.

FILM & SHEET - DIES

Don't underestimate the importance of the air ring: The air ring can be overlooked in terms of not only output but also film quality, according to Plast-Control, which reckons that even today 80 per cent of blown film line outputs are limited by the cooling ring performance. With the improved die designs over the last 5 - 10 years more than half these lines would be able to achieve 30 - 40 per cent more output, says the company. Profile is also greatly effected by the air ring and is a factor in poor profile performance on many of today's high performance materials.

That said, it is not surprising that Plast-Control has introduced the K-UL series air ring to put right some of these shortcomings.

The K series' Magicflow lip works at high pressure and controls independently not only the secondary air but also the primary air. This, in combination with the optimised lip design and special blower configuration, is said to deliver high efficiency cooling with improved base profile tolerances. It has also increased effectiveness over the extrusion line's blow up ratio range and compared to existing dual lip air rings, profile can be enhanced.

Installations of the K series Magicflow by British film extruders have yielded output increases of 25 - 40 per cent over their existing dual lip air rings and base profile reductions of 10 - 15 per cent, says Plast-Control, and a number of lines have reached maximum extruder speed or melt pressure before reaching the maximum cooling rate. [Stand 10 J30].

New compact and in-line adjustable dies from Reifenhäuser: Reifenhäuser will introduce a new modular die in its HDS Compact series which has a height of 1,400 mm to the upper edge of the air ring. This will be a seven-layer die - the design is able to operate with 3 - 7 layers.

The company will also show the ISR II sheet die introduced a couple of years ago at Interplas, which has a roller bearing support for the sliding lip, enabling the gap to be adjusted in-line over 12 mm. In-line adjustment is also possible on the new five-layer REIcofeed II feedblock. Adjustment is available for individual layers, to compensate for different throughputs, and for individual layer gauge, again to compensate for different throughputs. The design can be used for 3 - 9 layers and has the option of edge encapsulation. [Stand 17 A21].

EDI cuts die downtime: Innovations in the way it makes its flat film dies will be introduced by Extrusion Dies Industries on Stand 16 E67.

The UltraLock boltless die has been made easier to maintain

with a new device for lifting the upper body that can be activated with a standard power drill. The boltless die has hydro-mechanical clamps positioned where the normal body bolts would be fitted. Instead of undoing all the bolts, the die can be separated for cleaning in less than a minute by flicking a switch to start the unclamping process - reassembly is a similar operation.

The new upper body lifting device removes the risk associated with lifting the upper die body with a hoist for access for cleaning. Alongside the lifting device, EDI is introducing a special cart that can be deployed in the extrusion line to facilitate splitting and cleaning without having to take the die off-line.

Another way of reducing downtime has come with a new coating technology for die lips. This extends the service life before having to strip down and resharpen the die lips by around eight times compared with standard chrome plating, says EDI. The technology, dubbed EverSharp, is based on a proprietary method developed by Praxair Surface Technologies of applying a tungsten carbide coating to wear-prone surfaces, augmented by an investment by EDI in special systems for grinding tungsten carbide. EverSharp die lips cost more than conventional die lips, but EDI says the cost is more than repaid by the reduced downtime.

Blown and cast film dies from D-S: The latest version of its Lo-Pak low profile coextrusion die and a WesJet AutoPro air ring will be shown by Davis-Standard on Stand 16 A43.

The 380 mm, three-layer Lo-Pak die has been designed to have reduced residence time and wetted surface area when compared to other dies. The design is also intended to control shear rates in the confluence area, improving gauge control accuracy and film consistency.

Die assembly is with a taper-lock construction with lapped seal surfaces to align components to eliminate leaks while minimising the number of mechanical seals required. Components are of heavy construction for steady heat transfer and thermal stability.

The die is designed for 200 - 270 bar inlet pressure to give overall and layer-to-layer thickness control - the die can handle up to nine layers - and the short flow distances from confluence to gap are said to improve tolerances for a variety of viscosities and polymer types.

All extruder transfer pipes enter at the same height for simplified maintenance and melt handling.

The WesJet AutoPro Air Ring gives auto-profile control using a segmented airflow system for gauge uniformity. The airflow is adjusted by a set of motorized actuators to control both thick and thin spots unlike heated die lip technology. Profile information is measured by a rotating thickness sensor and displayed in a conventional linear and polar graphic display and also in a tabular

format which includes maximum and minimum gauge deviation, 2-sigma variation and lay flat width and line speed.

Also on the stand will be the model 310A 4,800 mm automatic flex lip die for PP and PE cast films and hygienic films. Flexible control is actuated by 167 thermal expansion, push-pull bolts. Each bolt is fitted with thermocouple feedback control for adjustment of the die gap during product change and for regulating production.

The die has a coathanger flow channel and on dies with internal deckling, there is a combined T-channel/coathanger arrangement for improved flow.

Low profile die improves operation and melt flow: Processors running 9-layer blown film dies are still relatively few in number, says Battenfeld Gloucester, but that may be changing. The company says interest is growing in nine-layer dies for various reasons, notably the benefits they provide in producing high-barrier films at lower cost. Having nine layers to work with means processors can take 5- or 7-layer films and reduce the gauge of costly barrier materials and tie layers by adding less expensive materials to the structure. Since many of these are relatively thick films used in meat and dairy packaging or for thermoforming, the potential savings from downgauging can be significant.

Battenfeld has built both 9- and 11-layer versions of its Optiflow LP die. The Optiflow LP is a low profile die, standing about half the height of a conventional stack die. This increases the distance from the die to the nip centre line, which improves cooling and increases output and also makes thread-up easier. Its small size also means less heat builds up in the die. Extruder pipes enter the die at the same height, simplifying maintenance.

The die's low profile is achieved through a concentric mandrel design in which series of concentric mandrels, one for each layer, nest within each other, reducing die height and weight. After polymer is pumped into the bottom of the die, it moves in separate channels into a tapered block. Compared to a stack die, the Optiflow LP die combines resin layers for a relatively short period at the end of the flow path, so reducing interfacial instabilities. The improved flow characteristics also reduce the amount of polymer left in the die at changeover, minimizing downtime.

Other internal features also improve melt flow. Streamlined flow channel inserts are used within each mandrel feed port and all flow surfaces are nickel-plated in an electroless process to resist abrasion and corrosion. Die components are designed to achieve even heating and maximum deflection resistance and are machined from drop-forged, aircraft-grade, through-hardened alloy steel that has been uniformly stress-relieved. Battenfeld Gloucester's self-aligning, taper-lock die parts permit fast assembly and disassembly at a processor's plant.

The diameter and die gap of the Optiflow LP can be changed without changing the entire die. [Stand 16 D22].

FILM & SHEET - FILM STRETCHING

MD draw up to 4:1: The MDO machine direction orientation unit is a recent development from Battenfeld Gloucester for integration with a blown film line. It is initially being used to orient coextruded linear low-density or metallocene polyethylene stretch film but Battenfeld Gloucester is still evaluating different applications for the process.

A typical stretch film run on the MDO would be a three-layer web with an outside cling layer, a core strength layer, and a non-cling inside layer. Web widths of 1,971 mm can be accommodated.

The unit has draw ratios of 3:1 and 4:1. Rather than being wound after extrusion, film is fed into the MDO unit, pre-heated, and run through drawing rolls for orientation. The rollers that do the orientation revolve at different speeds to each other based on draw ratio. A 4:1 ratio means the first roller turns at a rate a quarter that of the second, which is orienting the film. The web is then fed through annealing and cooling rolls that set the film and relieve stress. The process increases the film to four or five times its original length.

The MDO unit has a movable frame that opens for easy threading, roll removal, and shaft insertion. The frame also provides access for maintenance. Roll pitch is adjustable, and preheating, annealing, and cooling rolls have release coatings to maintain process efficiency.

For safety reasons the unit is fully enclosed and has a variety of interlocks, pull cords, and e-stops at key points. Local and remote control panels are designed as much for safety as for convenience and flexibility. A processor can specify where a local control panel is mounted - on either side or at the front of the unit - based on safety considerations and plant-floor layout.

The MDO unit has a modular design that supports expansion or changing application requirements. The assembly is mounted on isolator levelling pads, which reduce vibration. [Stand 16 D22].

FILM & SHEET - FILM WINDERS

In-line slitter/winder for non-wovens: The Culisse winder from Davis-Standard [Stand 16 A43] is for use in-line with hygiene film and non-wovens, eliminating slitting and rewinding. It also has a scrapless transfer mechanism, making it a viable alternative to traditional turret winders.

The Culisse is capable of in-line slitting to widths of 75 mm across a 3,000 mm web at speeds up to 600 m/min. Its scrapless transfer improves yields by indexing the new core into a transfer position while the transfer is made without indexing the final roll. D-S says this is faster and more efficient than with standard turret winders which produce scrap during the index cycle of the full roll. There are options of automatic core feed and finished roll removal.

The winder at the show is designed for making rolls up to 1,000 mm in diameter.

FILM & SHEET - FOAMED SHEET

Twin screw is the way to go, says Berstorff: Improved performance is claimed for the latest generation of foamed sheet lines from Berstorff [Stand 15 A23]. The company makes lines for physical foaming of PE, PS or PP in both single- and tandem processes and has added a new line for the lower throughput range. It uses twin screw extruders as the primary stage in the two-stage process, for a number of reasons:

- Their segmented screw design gives flexibility in screw and barrel layout and enables changes for future processes.
- The variable screw speed gives process flexibility.
- The mixing effect of the co-rotating twinscrew.
- The self-cleaning effect of the intermeshing screws.
- Large numbers of components can be incorporated, including powders.
- Up to 20 per cent of blowing agent can be incorporated, including non- or partly-soluble blowing agents.

New second stage (cooling stage) screw geometry has been developed to cope with the high throughputs from the primary extruder which can deliver up to 2,000 kg/hr. For smaller throughputs up to 200 kg/hr Berstorff has also adopted the twin screw/single screw cooling extruder design in a new line for producing foam tubes and profiles in PE, foam sheet in PP, PE, PS and for the manufacture of EPP beads.

Berstorff previously built single-screw foam extruders for these application and these machines remain in the product range, but the twin screw/melt cooler design is said to bring better mixing from the use of a twinscrew, a more compact layout, the efficient use of CO_2 as a blowing agent and the ability to incorporate a high level of recycled material.

Alongside the extruder developments Berstorff has designed a new 'easy gap' sheet extrusion head for the manufacture of foam sheet with direct gassing. The adjustment of the gap is now done

from outside by turning two knurled screws to move the outer lip relative to the fixed inner lip. The setting of the sheet tolerances has similarly been simplified and is now done by tilting the outer lip by means of three pairs of push/pull bolts. The Easy Gap extrusion head is suitable for all physically foamed sheet in PS, PE and PP with product widths from 1 to 2 m and can be retrofitted to existing lines.

FILM & SHEET - ROLLERS

Roll finish a speciality: To demonstrate its abilities in roll finishing Leonhard Breitenbach will be showing a full-size calender roll on Stand 11 F49, which besides its high mirror finish - there is no visible machining track - also demonstrates the latest developments in matting of roll surfaces. Breitenbach makes calender rollers, mixing and smoothing rolls, coating and metering rolls, heat transfer and chill rolls in different types as well as idler and guide rolls. It also makes rollers of carbon fibre reinforced plastics.

FILM & SHEET - SURFACE TREATMENT

Sherman adds intellience to corona power supply: 'A quantum leap in technology' is how Sherman Treaters describes its ISIS - Intelligent Switchmode with Integrated Software - corona power supplies. The units - from 4 to 40 kW - have a menu-driven control system with all operator commands displayed on an LCD screen. The screen gives automatic control of watt density, wet start, skip treat, line speed measurement, date/time stamping, remote diagnostics, data event logging and splice function. At the other end of the scale Sherman will show a new compact 1, 2 and 3 kW corona power supply with an integral HT transformer.

Also on Stand 10 H45 will be the CR10-15 high speed double-sided covered roll treater station for blown film lines running at more than 200 m/min.

New systems for blown and cast film production: New corona treatment stations for blown and cast film lines will be introduced by Ferrarini & Benelli on Stand 10 G29.

The Poliplast Bikappa is for blown film lines and incorporates a vacuum electrode holder hood system, directly connected to an extraction fan to remove the ozone generated by the corona discharge and optimise electrode cooling. This allows the use of high power coefficients, needed for the high-speed treatment of extremely slippery materials, without creating deformation of the

electrode and thus modification of the air gap. The system has a special 'up-down' electrode permitting simple selection of the zones to be treated. The electrode has an external air gap adjustment system for easy setting of the electrode-roller gap when electrodes are replaced and/or to process materials of different thickness. The open design means that all the pneumatic components, safety sensors and rollers can be kept outside the ozone zone, removing the risk of oxidation.

For corona treatment on cast extrusion and extrusion coating lines, the company has introduced the Kappa Plus treatment station. This has a large electrode area with each group of electrodes able to provide a discharge over 15 cm. Groups of electrodes can be combined to give very large discharge areas for high-speed surface treatment and for processing materials which demand very high power coefficients.

The system can be equipped with aluminium electrodes for treatment of plastic films and paper and with ceramic electrodes for treating metallised films and conductive films in general. A new feature is that the electrode groups are interchangeable. The electrode can be equipped with an air gap adjustment system that acts on the electrode from the outside, meaning that it can be used even with the machine in operation. Adjustment is by means of a graded knob. Because of this the system can be used on thick products such as expanded materials.

FILM & SHEET - WATER-COOLED FILM

Water-cooling gives more output with fewer disadvantages: A way through what it describes as the advantages and disadvantages of both the blown and cast film processes has been found by Plamex [Stand 17 C59] - which uses water instead of air as the film cooling medium. The company sums up the two main film production processes as:

Cast film advantages: relatively good cooling; high productivity; good tolerance. Cast film disadvantages: edge trims; high investment; no reversing; only axially oriented; high manning requirement; relatively high material costs; curl.

Blown film advantages: reversing; low investment; lower manning requirements; no edge trims. Blown film disadvantages: bad cooling; high material costs; low productivity; only radial orientation; bad transparency; curl.

By using water instead of air to cool the molten film Plamex claims to have combined the advantages of both the cast and blown film processes.

Using chilled water to cool the melt immediately it comes out of the die prevents the film from becoming crystalline. Plamex says

there are no spherulites and agglomerates of microcrystals, which cause film opacity. The film stays amorphous. This has three major advantages: the film stays highly transparent and can be deep draw thermoformed with reduced loss of thickness; standard commodity plastics can be used instead of expensive materials - standard PA6 can be used instead of expensive copolyamides; and curl, especially in asymmetric films, is eliminated.

The Clear Chill Line process works with round dies, so there are no edge trims as with cast film. And wind up uses a reversing nip to achieve consistent roll geometry.

In addition, Plamex says throughput is far higher than from a normal blown film line. It compares a Clear Chill blown film line with a conventional blown film line equipped with complex air cooling rings and internal bubble cooling set at 600 mm double layflat, blow up ratio 1:2, 3 kg/circumferential cm giving an output of around 180 kg/h. The Clear Chill line, it says, can achieve 300 - 400 kg/h.

PIPE & PROFILE - CALIBRATORS

Adjustable calibrators enable on-the fly product change: Being able to change pipe dimensions without stopping and restarting the line has obvious benefits in production economics. Several systems on show at K2004 use on-line adjustment.

Krauss-Maffei will be showing its QuickSwitch system on Stand 15 C24/B24.

An adjustable calibrating basket gives infinitely variable adjustment of pipe diameters from 160 to 250 mm. It consists of a large tube whose walls consist of several hundred movable segments. The surfaces of the individual segments jointly form a smooth inner surface. The inside radius of this flexible cylinder can be changed steplessly by turning an external wheel.

A vacuum section - K-M calls it a bell - is installed between pipe die head and calibrator to expand the molten pipe once it has passed the maximum settable diameter of the die.

Rival makes adjustable calibrating sleeves which enable pressure classes to be changed during extrusion without production stops and without having to worry about different properties and shrinkages in material or start-up scrap.

The outer pipe diameter can be set with an accuracy of 0·01 mm, enabling very small adjustments of pipe diameters.

The inlet of the Rival adjustable calibrating sleeve has an adjustable water ring that makes it possible to add a thin water film between pipe and the sleeve to maintain extrusion speed. [Stand 16 F77].

iNOEX [Stand 10 D74] is also entering the non-stop diameter change arena with its Advantage system which can use existing die heads as the maximum regulating range is 1:2.

The system incorporates a guide chamber, calibration sleeve, sealing unit and master control by which all pipe parameters are controlled together, including the haul-off speed and extruder output. The guide chamber connects the die head with the calibration sleeve which is under vacuum. The passage of the melt through the chamber defines the pipe's exterior diameter and wall thickness. The successive calibration sleeve is located in the first vacuum tank. Water in the inlet zone intensely cools the pipe surface and simultaneously seals the tank.

The calibration sleeve is adjusted through its range of 1:2 by an expanding/contacting mesh around its circumference which modifies the sleeve's length and diameter and changes the pipe's diameter. The seals around the inlet and outlet zones of the vacuum and cooling tanks are corrugated to surround the pipe.

PIPE & PROFILE - CORRUGATORS

Pipe producer makes its own corrugators: Hegler Plastik makes corrugated pipes on its own design of corrugator. On Stand 14 A65 it will introduce a new patented inspection chamber made of a length of twin wall corrugated pipe into which are fitted injection moulded connection pieces which can be made to various specifications depending on the intended use.

New corrugator is almost half as fast again: Six patents were filed by Unicor during the development of its UC100 pipe corrugator to enable production speed to be increased by 45 per cent over the previous model - from 15 m/min to 22 m/min of 110 mm double-wall pipe.

Among the improvements are a rapid change of diameter with the 81 mould block pairs being changed in 10 minutes. All metal wear and tear parts have been replaced by plastic materials in order to reduce abrasion.

The most innovative features of the UC100 are the 'pneumatic muscle' that keeps the traction of the mould block chain constant and compensates for the thermal expansion of the mould blocks and a new corrugator curve geometry at the opening and at the end of the middle channel which reduces centrifugal force. [Stand 16 D59].

PIPE & PROFILE - DIES

Easier production of multi-layer pipe: A new pipe head to be shown by Krauss-Maffei on Stand 15 C24/B24 simplifies the extrusion of multi-layered pipes. The KM-3L RKW 54 QS pipe die head is capable of producing single-, double- or triple-layer pipes. Uniform melt distribution across the die orifice section is ensured by three concentrically intermeshing spirals. For pre-distribution of the central layer, a star-type distributor or a side-fed die can be used.

Flow-channels for the external and internal layer are supplied with melt through a ring-shaped distributor system. For the infeed K-M has developed a new design of adapter, with which the internal and external layers can be opened or closed infinitely variably. It is therefore possible to produce pipes of different layers without having to reposition the co-extruder.

The external layer can be centred independently, reducing material consumption. The die also has a new twin-streak adapter which allows streak pigmentation to be changed during extrusion. The second distribution system is brought into play during a colour-change, so that production can continue without extensive flushing of the channels.

PIPE & PROFILE - FABRICATED PIPES

Steel-reinforced spirally wound pipe: Krauss-Maffei and the Plastream division of Rib Loc Australia have signed an exclusive cooperation agreement to manufacture turnkey machinery for the production of steel reinforced plastic pipe, and will be introducing the technology on Stand 15 C24/B24. Along with very high stiffness, Plastream pipes are light in weight and very durable with a long service life. They are pitched at non-pressure drainage and storm water applications in diameters from 200 to 2,250 mm.

Plastream pipes are made from a continuous steel reinforced plastic profile that is spirally wound using a special winding machine. This process is said to be particularly flexible in production. Pipe diameters can be changed quickly by simply changing the pipe forming cage on the winding machine. One extrusion die can be used to produce profiles for pipes with diameters from 200 to 1,000 mm. Pipe ring stiffness can be matched for different applications by using different profiles reinforced with differently dimensioned steel bands.

The steel reinforced plastic pipe technology was developed and patented by Plastream and is currently being produced in Australia for the domestic pipe market. In the new partnership Krauss-Maffei will be the exclusive supplier for the complete extrusion line to produce the profile.

Perforated pipe for rainwater percolation: Increasing demand for methods of draining concrete areas and returning the water to the ground has led to a new machine from Bauku for producing pipes up to 2 m diameter. Bauku builds machines for winding extruded profile around a steel mandrel to form large diameter 6 m long pipe sections complete with socket and spigot for a rubber ring joint, or for extrusion or electro fusion welding. The machine consists of an extruder mounted on a rail which travels along the mandrel extruding profile which is wound in a spiral.

Most HDPE profile pipes are used in sewerage, but there is a growing demand in the field of drainage, such as to remove the leachate water and gas from landfills. These pipes are normally installed in smaller sizes only - 300 mm is a standard in German landfills.

In recent years there has been increased demand for percolation pipe and for this the 300 mm pipe is rather small, particularly in light of the heavy rains experienced in Europe. Bauku has produced systems for up to 1,200 mm diameter pipe, but even bigger diameters were called for. Hence the 2 m Profilline 2000 system it will be showing on Stand 8 C12.

A patented aspect of the Bauku process is the formation of the percolation holes in the pipe wall. Unlike other fabrication methods where the holes are drilled, Bauku runs a spiked wheel over the surface just after extrusion when the pipe is still hot. This wheel creates small grooves in the pipe wall and as the pipe cools these grooves open to form oval holes.

The first installation of the system was in the Netherlands, where 2 m pipe was produced at 8·9 m/hr with a weight of 83 kg/m.

PIPE & PROFILE - HOLE PUNCHING

50,000 km of irrigation pipe a year: Perforation, punching and profiling are possible in-line at high speed and at high frequency with a new laser unit from The Thomas Machines.

The equipment to be shown on Stand 12 C15 is designed to be part of an extrusion line making drip irrigation pipes. The valves which are injected during the extrusion process are welded inside the pipe and they have a water outlet section of 2·5 × 3·5 mm. Within this section a water outlet hole of 2 mm diameter is punched into the wall of the pipe. This punching is done approximately 20 m after the valve has been welded inside the pipe. As well as punching the hole, the machine optically checks the position of the punched hole relative to the dripper outlet. 100 per cent of the holes are checked.

Production speed is 150 m/min punching up to 1,200 holes/min (two holes simultaneously) with a diameter of 2 mm.

The Thomas Machines also makes equipment for feeding and inserting the drippers, and will show a new sorting and feeding system which runs three times as fast as conventional equipment. In the past, says the company, vibrating bowls or simple rotating feeders have been used, which were limited to a throughput of no more than 300/min. Its new machine can feed up to 1,000 drippers per minute and with an error rate of better than 1 to 10,000,000.

Faulty or out-of-tolerance drippers are rejected and extracted automatically from the process without stopping production, and the machine is designed to be self-rectifying should errors occur during the process.

The company says that combining this feeder with its laser puncher enables more than 50,000,000 m of drip irrigation pipe to be produced annually with a scrap rate of less than 1 per cent.

PIPE & PROFILE - PIPE AND PROFILE LINES

Four components in a single profile: A process for extruding composite profiles of foamed TPE, solid TPE, sponge rubber and steel reinforcement has been developed by Berstorff for making automotive weather seals.

These hybrid profiles bring together the low compression set and high elasticity of rubber with the advantages of TPEs such as weight reduction, colourability, and good 'feel'. Berstorff's process uses its recently-developed Hybrid Head with integral thermal separation in the head housing which prevents thermal problems during co-extrusion from the different processing temperatures (180 degC for TPE and 100 -110 degC for rubber).

The TPE is physically foamed, using water as the blowing agent, fed into the processing section of the extruder. [Stand 15 A23].

Small diameter high tolerance tubes and profiles: A medical star-lumen tubing line on the Davis-Standard Stand [16 A43] is designed for processing medical grade flexible PVC tubing with internal star-shaped profiles at outputs of 70 m/minute. System components are a 65 mm Euro Blue extruder, stainless steel die head and tooling, a vacuum cooling bath with pre-bath, OD wall measurement, haul-off, and winder with collapsible mandrels and guillotine.

The extruder has a barrier screw and twisted Maddox mixing section, four barrel zones, one clamp zone and two die zones, and a combined melt/temperature transducer for optimal mixing and heating uniformity.

The line's pre-bath enables vacuum sizing of the tube without blowing air, making it possible to achieve higher line speeds with

tighter tolerances. The haul-off has an AC motor with flux vector drive to maintain a rate of ±1 per cent of nominal maximum speed. The twin station winder is equipped with a microprocessor controller with a run-left and run-right reel switch, fast-run option, pause switch, and four-digit length setting counter with auto reel stop. The winder also has maximum and minimum speed potentiometers with a digital reel-out setting, a variable pitch traverse and dancer arm for variable speed control.

Davis-Standard says it is one of the few manufacturers to supply cotton swab stick extrusion systems. The line on show has a 60 mm extruder, stainless steel die, cooling tank and Betapack-Betafeed cutting and packing unit. It can extrude round, serrated tubes at speeds up to 4,000 sticks per minute. The Betapack-Betafeed machine has two servo drives which enable operators to change stick lengths instantly and maintain short start up and changeover times. Sticks are typically 72·5 mm long with an OD of 2·5 mm and can be manufactured with a smooth or perforated texture.

Also on the stand will be a tight-tolerance nylon, PU tubing system for making 3 to 25 mm diameter industrial profiles used in construction, automotive and household products. The primary advantage of this system, says D-S, is that it can run engineered materials such as Hytrel at tolerances of ±0·05 mm in wall thickness and an OD differential of ±0·1 mm. The line includes a 65 mm extruder with new MESA III control, a stainless steel extrusion head, vacuum calibration tank and cooling trough.

Off-the-shelf downstream and a new slant on drip irrigation: Pipe and profile package deals will be on show at Cincinnati Extrusion [Stand 16 D22].

Cincinnati has added a downstream package to its off-the-shelf Alpha extruder series. The Alpha Tubeline consists of an Alpha extruder plus downstream equipment to manufacture tubes of up to 63 mm diameter. A small PH die head is available for processing PVC pellets, whereas dies from the IRIS series are recommended for processing polyolefin and other materials. Further downstream is a 4 m vacuum tank and a 12 m water bath, a belt haul-off and a cutting device, which can be either a guillotine or a saw.

Alpha Profline is the downstream package for small, hard profiles that cannot be wound.

The other turnkey package on the stand will be a joint development with DRTS of the USA for making drip irrigation tubing. This is a lower cost alternative to the conventional way of making these tubes which involves inserting injection moulded drippers. The Cincinnati/DRTS line is based on a PE tape which is first extruded and then guided over an embossing roll. It then passes through a horizontal injection unit into the pipe, which is

also manufactured from PE, and then welded on to the pipe's interior surface.

The advantage of this process is said to be the precision in embossing the tape and positioning of the drip holes. Dispensing with injection moulding the drippers and the equipment for inserting them reduces capital investment costs.

Pipe lines for polyolefins and PVC and a bigger 'plug and play': A line for polyolefin pipe production will be shown by Battenfeld Extrusion on Stand 16 D22.

The new BEX 1-90-30 D single-screw extruder is from a range in which throughput has been increased without changing the screw diameter. The extruder's performance is boosted by more powerful motors and drives with higher torques. New barrier screw geometries, help push throughput up by an average of 25 per cent. The 90 mm machine on show reaches a maximum output between 750 and 850 kg/h, depending on material.

The extruder will be coupled to a PO 250/900 lattice basket die for pipes up to 250 mm diameter and a maximum throughput of 900 kg/h. This has a two-stage distributor consisting of a threaded preliminary distributor followed by a compact lattice basket for final melt dispersion. Battenfeld says this combines the advantages of spiral mandrel distributors, such as radial mixing of the melt, with the proven benefits of lattice baskets.

Battenfeld will also be showing a double spider PVC pipe die on a parallel twin screw extruder. The advantages of the double-spider mandrel are said to be a substantial increase in operating safety as well as ease of assembly and maintenance. The studs of the spider are arranged in a pattern which 'enhances their melt displacement performance to produce pipes of superior strength'.

The recently-introduced standardised winBEX line, developed to the same pattern as the miniBEX introduced a couple of years ago, consists of five components - a largely pre-assembled downstream package plus a choice of four twin-screw extruder models. These are the large, negative-flight conical BEX 2-72 C with a performance range from 40 to 250 kg/h, and three parallel extruders, the BEX 2-68-28 V for an output from 50 to 200 kg/h, the BEX 2-92-28 V for an output between 150 and 350 kg/h, and the BEX 2-110-28 V from 200 to 500 kg/h.

Because of their standardization, winBEX lines are sold at a competitive price and have extremely short delivery times. All that is needed on delivery is to connect to the electricity, compressed air and water supplies. The downstream package includes a calibration unit, a haul-off and a cutting device which can be either a saw or a set of heated knives. The calibration table, consisting of a 5·5 m frame with a water tank, four vacuum pumps and an integrated control cabinet, can be extended with additional 2 or

5·5 m segments. The haul-off with a contact length of 2,400 mm can be either a belt haul-off with a 230 mm belt or a caterpillar haul-off with a 240 mm wide caterpillar fitted with a quick-change system. Besides the electrical installations to control the haul-off, the integrated control cabinet also contains the control system of the cutting device with cut length gauging and a vacuum chip extraction unit. The line is connected to the power supply by simply plugging it in.

Continuous glass reinforcement: A process for extruding profiles with continuous glass fibre reinforcement has been developed by Rossi Stamp. The company says the reinforcement can be located where required to give the desired properties and offers the potential of up to 500 per cent increase in flexural stiffness over conventional plastic extrusions and a reduction in costs when compared to metallic or pultruded products. By eliminating the need for metal reinforcements, these profiles are also said to be ideal for use in environments where thermal conduction and corrosion are an issue.

Rossi Stamp will show samples of profiles on Stand 1 C02.

Complete lines for squeezable tubes: Bonmart Enterprise Co from Taiwan specialises in squeezable PE tubes and has sold more than 140 lines worldwide.

Components which can make up a line include equipment for extrusion and cutting; shuttle/rotation injection heading; computerized 4 - 6 colour printing, coating and drying; hot stamping; tube sealing; tube filling and sealing; tube drilling and capping; and tube head aluminium foil sealing. [Stand 12 A51-13].

PIPE & PROFILE - SAWS, CUTTERS AND GUILLOTINES

Saw set-up simplified: Battenfeld Extrusion has optimized its STU 125 planetary saw for cutting PE, PP and PVC pipes, which is suitable for both single- or double-side milling and cutting. Set-up times for dimensional adjustments have been cut by about 80 per cent, and the saw's footprint has also been reduced significantly. The saw has a maximum capacity of 16 cuts per minute for pipes up to 125 mm diameter and 40 mm wall thickness. A minimum cut length of 160 mm can be set to produce short lengths or samples.

The STU 125 is equipped with a pneumatic carriage and cuts lengths with an accuracy of ±1 mm at a line speed of 1 m/min.

OTHER TOPICS - CONTROL AND INSTRUMENTATION

Modular controller grows with the extrusion system: A newly-enhanced adaptive tuning control algorithm has been added to Watlow's PPC-2000 extrusion controller making it 'compatible with 98 per cent of extruders operating worldwide'.

The PPC-2000 is a modular, flexible control package which Watlow says provides faster start up due to easy PID set up with 'fill-in-the-blank' and pop-down menus. It has a touch screen panel with colour pictograms of the die, extruder, barrel and all control zones. With the touch screen option, users can switch from loop-to-loop to monitor and troubleshoot the process.

All the control loops can be viewed and edited from scrollable tables. No programming is necessary. Additionally, equipment can be linked to a central point, enabling users to control the process from the shop floor or from within a central office area.

The PPC-2000 offers processors complete production run documentation including features such as data communication, process monitoring and recipe storage. It also has auto tuning software for fast start-up and rapid response, screw speed control and pressure monitoring capabilities.

With the PPC-2000 a single controller can be customized to fit the application and control up to 48 temperature zones and process loops. Its modular structure enables it to grow with the extrusion system to allow various analogue and digital I/O modules and control loops to be centralized into one compact unit and programmed as an integrated system. The PPC-2000 supports 64 analogue inputs and hundreds of digital I/O modules allowing users to select field I/O devices to match specific application needs. [Stand 11 H06].

Manual and automatic control are drawn into one system: To enhance its line control systems Plast-Control has introduced an optional line management interface to its ACS Gravimetric line control system which also incorporates gravimetric dosing, on-line profile measurement and Pro-Con profile control air ring systems and width measurement/control.

Although all these functions are supplied in one complete line control package, this only automates the existing machine control panel. The new Navigator takes this a step further by potentially replacing the machine control panel and integrating it within its own automation system.

Navigator uses a large industrial standard touch screen system and is supplied in modular form adapted to suit the application. All manual control of the line such as extruder speeds, blower speeds, calibration basket settings, haul off speed setting, collapsing frame settings - in fact any drive associated with the line - can be manually adjusted by the system. Automatic functions are also activated by Navigator.

To enhance Navigator further Plast-Control has developed an integrated temperature control interface which can be supplied to link with existing temperature controllers or supplied with a temperature controller as a complete running package with solid state relays and power supplies. [Stand 10 J30].

WindowsXP takes control: Microsoft WindowsXP is the basis for new control systems from several manufacturers.

The EXcPRO-XP control from Cincinnati Extrusion offers all the advantages of the WindowsXP Professional Workstation.

As well as anti-virus protection, derived from storing system and programme data in a read-only flash memory, the system offers a standby mode to reduce computer start times to around 60 - 90 seconds; the ability to use plug and play hardware such as a USB mass storage device, modem, keyboard and mouse; and the ability to run without independent emergency power in the event of a voltage drop.

A CANopen extrusion interface allows plug and play exchangeability among extruders and downstream equipment of different brands, for maximum flexibility on the shop floor.

The control also enables remote diagnostics using Cincinnati's Teleservice facility. [Stand 16 D22].

Krauss-Maffei's new C5 system is made in two versions for ease of operation, one for control desk installation and the other as a rotating control terminal. It uses a 15 inch TFT-display and combined touch- and keyboard input.

Peripheral systems and downstream machinery can be connected through standardised interfaces, as can 'thin clients' such as for extended plant control. Service and diagnostic facilities round off the system. [Stand 15 C24/B24].

The latest Berstorff process control can be installed on complete extrusion lines, standard thermoforming lines, and so on. It uses an object orientated automation structure in which functional units of the machine are displayed as automation objects. An internal database contains all the machine configurations and possible options. This simplifies changing configurations and software maintenance.

The system has been constructed without forced ventilation - the flat machine panel has no fan, and fan-free processors are used, with CompactFlash as the mass storage device and standard interfaces such as Ethernet, USB, CAN and Profibus. Direct communication is enabled via OPC or an integrated web server and there are integral USB connections for external keyboards or memory sticks.

A touch screen and membrane keyboard are used for data

entry, each providing redundancy to the other as either can be used. The panel can be separated from the processing machine and can be used for single- or multi-station control. [Stand 15 A23].

Yield control system improved, but still relatively cheap: An extension to the Maguire Products LineMaster yield control software has linked the dosing precision of the company's Weigh Scale Blender used in standard systems with feedback from a loss-in-weight hopper. The result is the LineMaster AC control system which is only marginally more expensive than the standard LineMaster, itself better than half the price of systems from other suppliers, says the company.

LineMaster AC retrieves data on material consumption by the extruder at the rate of one update every 0·5 seconds. Maguire says that this response rate makes LineMaster AC suitable even for lines where there are frequent ramp down/up cycles, such as when changing film rolls, or where inconsistencies in extrusion rate pose a particular problem, such as in coextrusion.

The main difference between LineMaster and other systems is that other systems are based on loss in weight blenders and hoppers, with separate controllers being needed for each. LineMaster uses a gain in weight blender which sequentially dispenses ingredients, in targeted proportions, from separate bins into the weigh chamber. The blender batch is fed into a loss in weight hopper mounted at the extruder throat. The load cell in the hopper provides updates on material consumption every half second to the Weigh Scale Blender, which hosts the LineMaster yield control software and regulates extruder and haul off speeds accordingly. [Stand 10 A26].

Mid-range system with big system features: Davis-Standard's MESA III process control system, introduced earlier this year, is a mid-range system intended to control smaller lines with one or two extruders, with the features and flexibility of systems such as Davis-Standard's EPIC III.

MESA III is divided into three basic parts: the computer/HMI (Human Machine Interface), process controller and temperature control. The integrated computer/HMI contains Windows-based operating software, SCADA (System Control and Data Acquisition) foundation software and custom applications software. It uses an integral 15 inch colour LCD with touch-screen and functions as the main operator interface for controlling drives, pressures, and temperatures. The operator can implement control functions, make set-point changes, monitor line status, alarms and events, focus on specific process areas, create and download recipes, and conduct supervisory functions such as trending and reporting.

Choice of process controller depends on the application and is

based on either a Siemens or Allen-Bradley PLC. Davis-Standard supplies a custom process control applications program in standard PLC language.

Standard temperature control is maintained using discrete, sub panel-mounted temperature controllers linked to the HMI through the PLC. All temperature set points and alarms are entered and displayed through the HMI. Control options include a multi-loop controller or the system PLC control. When the latter control is selected, the PLC replaces the temperature controllers as the means of controlling and monitoring temperature points.

The MESA III controller is supplied with an ethernet port to allow extraction of line parameters to a host data collection system. [Stand 16 A43].

Pressure sensor is less likely to break: New diaphragm technology is used in the Gneuss Premium pressure sensor to give an accuracy of ±0·1 per cent. A patented sensor tip that can be heated allows the sensor to be removed even when the equipment is cold, reducing the risk of damaging the diaphragm or breaking a transducer. Risk of damage to the membrane caused by cooling and shrinking melt is also reduced, and Gneuss says that is no longer possible to break off the flexible capillary. [Stand 9 B37].

OTHER TOPICS - EXTRUDERS

New single screw series from Boston Matthews: A new range of single-screw extruders will be introduced by Boston Matthews on Stand 16 B77. The Logic range has been designed for energy efficiency. It is driven by an AC motor with encoder feedback together with a flux vector drive with forced ventilation. Intelligent electronics ensure that when certain systems of the extruder are not required they are automatically shut down to reduce energy consumption - such as the temperature sensor system shutting down the ventilation fans when not required.

Additional intelligent systems help to prevent possible damage to the extruder. A cold start interlock and over pressure protection are examples. The Logic range also has as standard the new Accutrol barrel temperature control system with improved response time and increased precision.

As well as energy efficiency the Logic has been designed for simplified maintenance to be fulfilled by operators without the need to call on a specialist service supervisor. All electrical components are fitted with plugs and sockets allowing operators to change thermocouples, heaters and fans without the need for an electrician. And the AC technology also provides drive interrogation and diagnostics for fault-finding.

Beyond the standard specification a number of options allow customisation. These include flanging arrangements to suit existing die head tooling and the new Smart control system which is capable of controlling the entire extrusion line and includes such features as recipe storage, data export direct into Windows, password protection, extruder diagnostics, remote production observation, and colour touch-screen control.

The Logic Range is available in 30, 38, 45 and 60 mm screw sizes, at a starting price of Eur 24,000 with a standard 60 mm extruder costing Eur 32,500.

Extruders through the ages: The direct drive extruder introduced by Reifenhäuser as a concept at K2001 is in production as the REItorque, and the company will contrast it with examples of earlier extruders going back to 1948. [Stand 17 A21].

US extruders designed for European use: The new Euro Blue extruder series from Davis-Standard is designed for the European market in profile and tubing processes and basic wire and cable and film applications with shipping two weeks from order. All four machine sizes - 50, 65, 75 and 90 mm - will be on Stand 16 A43. The Euro Blue is based on the American Super Blue extruder, but has been built 'to provide the best value and availability for the European market'.

The design incorporates a sloped front panel with full machine access; 400/3/50 voltage requirements; a low noise, high torque double-reduction gearbox; cast aluminium finned heaters bolted to the barrel for optimum barrel-to-heater contact; a brushless AC drive and motor; and a high capacity air cooling system.

The Euro Blue is assembled on a rigid base with structural steel construction. It has a wear-resistant bimetallic barrel designed for 700 bar operating pressure with a removable barrel flange, rupture disc and pressure transducer behind the front flange for operator safety. Various feedscrew designs for different thermoplastic materials are available.

Also to be shown by Davis-Standard is a 250 mm 30:1 extruder with a screw design suitable for processing a range of materials including HMW-HDPE, PET and PP. Because of its size, the machine is recommended for thick sheet or high output film applications. Its heavy-duty gearbox has an integrated thrust bearing for torques in excess of 85,000 Nm. The gearbox also has two input shafts for running two motors on one screw shaft. This machine is air-cooled with eight temperature control zones.

- Davis-Standard recently added torque motor availability for some of its high-speed extruders and will be showing one on a 90 mm machine.

The motor's compact size integrates into the extruder,

combining both gearbox and motor functions into one unit. Design advantages include a hollow shaft, water cooling, fewer mechanical components and high rigidity. Operating benefits include low machine noise, reduced maintenance, flexible installation, increased repeatability and a screw speed capacity between 200 and 300 RPM. The motor enables the screw to be removed from the rear of the extruder, avoiding disruption of downstream equipment.

Extruders get longer at K-M: A new series of twin screw extruders and improvements to existing twin and single screw machines will be shown by Krauss-Maffei on Stand 15 B24/C24.

The new twin screw is a twin-screw version of the established 'off-the-shelf' single-screw XS-range. The KMD XS/PXS/P-range has been developed for standard profile extrusion applications in the lower to middle output range and can be delivered within four to six weeks. The company will be showing a KMD 75 XS/P with 26:1 L/D-ratio screws.

K-M's existing KMD twin screw series can now be fitted with 32 D screws to increase their processing range, improve melt homogeneity and reduce wear. Screw torques have been increased with the extruders of the 32/P-range, and their pre-warming section has also been enlarged. Compared to the previous series, this has brought an approximately 20 per cent increase in specific output rate.

As well as increasing the length of the screws, the geometry of the 32D range has also been redesigned. Optimised temperature control of the screws improves melt homogeneity and the ratio of heating to shearing energy has been improved considerably. At identical output rate, the energy that goes into heating is almost twice as high with the KMD90-32/P on display than with extruders having screws of 26 D.

Even longer screws, 36 D, are used on K-M's new single screw range. The 36B series is built for pipe extrusion (36B/R) and film and sheet (36BV/PL).

The 36B is a development of the 30B range made possible by modern computer-aided layout methods and accumulated process engineering knowledge which has enabled K-M to increase the specific output and improve product homogeneity at low melt temperature levels.

Development of the 36BV for film and sheet in PS, PS-HI, ABS and PMMA involved improving venting performance, product homogeneity and optimising the machine for operation with a filter and melt pump.

The display machine will be a KME 90-36 B/R with two-component gravimetric and an additional masterbatch-metering unit. A KME 90-36 BV/PL screw assembly will also be on show.

More off-the-shelf extruders and new twin screws: Since its introduction at K 2001 Cincinnati Extrusion has sold more than 200 of its off-the-shelf Alpha range of extruders, and at this year's K is extending the range, and applying the Alpha principle to some of its other machines.

In addition to the two basic models Alpha 45-25B and Alpha 60-25B, two new machines have been added with barrels lengthened by 3 D and with options of coarse-grooved or fine-grooved feed zones. These Alpha 45-28F and Alpha 60-28F are particularly suited to processing soft materials such as TPE and TPU, while the Alpha 45-28G and Alpha 60-28G extruders with coarse-grooved feed zones are for manufacturing profiles and tubes from PP with or without filler.

Two machines have also been added to Cincinnati's Argos parallel twin screw range to be sold as Alpha models. The Argos 72 EA and Argos 93 EA (Edition Alpha) are intended for single-strand window profile extrusion, and are equipped with a specially designed processing unit plus the latest EXc-PRO-XP control system based on Windows XP. The Argos 72 EA on display reaches an output from 80 to 220 kg/h with screw speeds between 10 and 30 RPM, while the Argos 93 EA with screw speeds from 9 to 23 RPM is designed for an output ranging from 140 to 340 kg/h.

In recent months Cincinnati has also introduced a new series of conical twin-screw extruders, the Konos. As with the latest generation of parallel extruders, Cincinnati has been able to achieve a 20 per cent increase in performance by using sturdier, heavy-duty drives, and by lengthening the processing unit. At the same time the processing window of 20 to 300 kg/h for profile extrusion and 50 to 500 kg/h for pipe extrusion covered by the four models represents a substantial extension over the previous Titan series. [Stand 16 D22].

Less wear, less energy, more output: Battenfeld Extrusion will be showing [Stand 16 D22] twin screw extruders in both parallel and conical format.

The parallel twin-screws for PVC processing have been made more wear resistant and pushed for more output. A BEX 2-92-28 V has a barrel extended by 3 D compared to previous models. This series has what Battenfeld calls 'intelligent screw concepts designed to promote an extremely high output'. The machine on display reaches a maximum throughput of up to 750 kg/h. The improved wear resistance is in the shape of the BEXalit coating on the screw which is applied by a plasma powder hard-facing process, giving a claimed improvement over conventional nitrided screws of up to 100 per cent.

Since the introduction of its first conical extruder model BEX 2-

54 C just over two years ago, Battenfeld has added two further models. The smallest version, BEX 2-42 CC, with an output ranging from 10 to 70 kg/h, is designed for use as a co-extruder. The BEX 2-54 C, with an output between 20 and 130 kg/h, and the BEX 2-72 C (40 to 250 kg/h) are intended for profile extrusion, the biggest machine able to produce window main profiles at an average speed of up to 3 m/min.

Battenfeld has also further improved the performance and cost-efficiency of its film extrusion equipment. A particularly energy efficient extruder is being introduced at this year's K, with specific mechanical energy reduced by up to 20 per cent compared to previous models, depending on the material processed. Battenfeld says that in many cases, because of the adiabatic behaviour of the screw, external cooling of the barrel can be dispensed with.

Conical and parallel twin screws: The range of extruders to be shown by Theysohn [Stand 16 D21] includes both conical and parallel twin screws for standard applications and co-extrusion, and the Torque Master TTM series which are built for applications in PVC pipe or PVC profile.

OTHER TOPICS - MELT FILTRATION

Rotary filter performance up, price down: The latest rotary filtration system from Gneuss is the SFXmagnus which is based on the RSFgenius but has no integrated screen cleaning so is cheaper. It does, however, have new drive technology and an increased filtration performance.

The active filtration area is around 9,000 cm², it can withstand up to 800 bar melt pressure and 350 degC melt temperature, and filtration is down to 3 microns.

The RSFgenius has itself been improved. The active screen area has been increased to 3,000 cm² and automatic screen re-use has been pushed up to 400 times. Filtration has been lowered to 1 - 2 microns. Data monitoring enables more control and monitoring of the process, and fine tuning and servicing can be carried out without disturbing the process.

The RSFgenius can be used for all polymers, including those with corrosive fluorine or bromine additives. [Stand 9 B37].

Autoscreen now for polystyrene: A new version of the Process Developments Autoscreen continuous screen changer will be shown on Stand 9 C26. The new version - the Autoscreen has been in production since 1967 - is suitable for high friction materials like polystyrene. The company will also show new

controls, offering the choice of automatic screen replacement at a set constant rate, or at a rate adjusting according to the level of contamination.

OTHER TOPICS - MIXING

Static mixer improves homogeneity: Improved homogeneity is the claim for the Melt Blender SMB to be shown on Stand 9 B14 by StaMixco Technology. The Melt Blender is a static mixer consisting of a ring with a mixing grid, cast in one piece and so avoiding welded points or gaps between the element and the surrounding ring. It is used to mix and homogenise the melt at the die eliminating differences in temperature and homogeneity to give, says the company, reduced colorant and additive usage, a streak free product, improved quality when using regrind material, wall thickness and gauge control uniformity, foam size distribution uniformity, and improved surface quality and mechanical properties.

The melt blender SMB-R is available for use on extruders with screw diameters from 25 to 240 mm.

OTHER TOPICS - RUBBER EXTRUSION

Berstorff improves printing blanket and tyre tread production: A more economical and environmentally friendly process has been developed by Berstorff for making printing blankets. Conventional methods use large quantities of solvents which can only partially be reclaimed.

A printing blanket consists normally of three textile layers, a rubber covering layer, a foam rubber intermediate layer and a lower rubber layer. Conventionally all three layers are produced by spreading a rubber solution on to the textile carrier web. During this process, large quantities of solvent are given off to atmosphere and only about 80 to 90 per cent of this can be reclaimed.

A way to eliminate the problems of solvent emissions is to substitute the rubber solution by solid rubber compound and to use calender technology to produce the sheet products. Conventional calendering is, however, limited in respect of surface defects and cross-sectional tolerances.

Berstorff addressed this problem some 15 years ago by using the Roller Head principle, in which calender feeding is done by an extruder. This allows the calender to operate without a rolling material ball in the roll nip, which is the cause of defects and air entrapment in the product.

To remove the moisture and residual plasticizing agent vapour from the compound, the calender feed extruder is equipped with

evacuation on the processing section. The wide slot die, which forms part of the Roller Head system, distributes the rubber compound from the screw diameter of, say 200 mm to the blanket width of 2,500 mm.

Filtering out any foreign matter in the rubber, which might cause defects in the product, is done by an automatic screen changer, placed between the extruder and the slot die.

Initial lines of this design used a two-roll calender to produce the covering layer, but the sponge rubber intermediate layer and the lower layer continued to be made by the spreading process, so that the solvent problem was only partly removed.

The extrudate flows out of the lips of the slot die at a thickness of 5 mm and swells between die and calender nip to about 8 mm. It is not possible to reduce this down to the target thickness of 0·05 to 0·1 mm in one calender nip, without thermal damage and without the formation of a large rolling ball. So Berstorff has divided the process into two stages by using a three-roll calender.

The thickness is reduced in the first nip from 8 mm down to 0·5 mm and the middle roll then transfers the web to the upper nip, where the thickness is reduced from 0·5 to 0·05 or 0·1 mm. The reduction is firstly due to the narrowing nip and secondly by the higher speed of the upper roll. The middle roll also stabilises the temperature at 75 to 80 degC.

- In the extrusion of tyre tread profiles and sidewalls Berstorff has worked to meet demands for higher output through multiple extrusion threads. There is a trend towards double extrusion of treads and triple - or even quadruple - extrusion of sidewall profiles.

To do this has needed a fundamental reworking of the multiplex head concept to achieve the greater working width while maintaining sufficient stiffness to allow high hydraulic locking forces to counter the high pressures of the rubber compound at the increased throughput rates.

Up to now, standard heads have been designed for working widths of 500 to 600 mm and maximum stock pressures of 200 bar. The tyre industry is now calling for working widths of 850 to 1,000 mm at maximum pressures of 250 bar in all four flow channels.

Berstorff's new Quadroplex Head has closing and pre-tensioning forces up to 1,000 tonnes per head half and has nearly doubled in weight. The head can handle throughputs of up to 10 tonnes/hour. [Stand 15 A23].

OTHER TOPICS - SCREWS AND BARRELS

More output in foam extrusion: Plastic Engineering Associates Licensing will be showing how its Turbo-Screws foam feedscrew

technology can give an average 42·5 per cent throughput increase on polystyrene foam sheet and 62 per cent throughput increase on polystyrene foam insulation plank/board. The technology can be used with a variety of blowing agents, including CO_2, 134, 134a, 152a, 142b, pentane, butane and others. Stand 13 C47-15 (US Pavilion).

OTHER TOPICS - WOOD-FILLED EXTRUSION

Dosing system for wood chips: A system for the gravimetric dosing of wood chips will be shown by iNOEX on Stand 10 D74. The igs CF is equipped with a pulsating internal actuator for the processing of poorly flowing wood chips. Throughput ranges of 1 to 1,500 kg/h are covered. A two-component-dosing station and the saveomat control system complete this presentation during which the double-strand extrusion of window profiles will be simulated.

Higher speeds from Cincinnati line: Cincinnati Extrusion is showing a complete Fiberex wood extrusion line in full production on Stand 16 D22. It has shown wood-filled extrusion before, but says that this time is different, with a high line speed and reduced material costs combined with excellent product quality.

A complete line with a conical Fiberex T 58 twin screw extruder with an output of 120 kg/h and equipped with an innovative three-zone screw is on display. This line is also fitted with calibration and vacuum equipment in place of conventional air cooling, and completed with a water cooling bath and a cutting saw.

The water cooling and calibration technology are the main factors contributing to the increase in output of this extruder, giving a line speed of 3 m/min. The line is equipped with a gravimetric metering system for up to four components to promote direct processing of the wood flour instead of a costly, conventional separate material preparation step. The new one-step process cuts the cost of wood flour by about 40 per cent.

Cincinnati says this direct processing method is also kinder to the wood fibres and more economical in terms of machinery and energy costs.

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