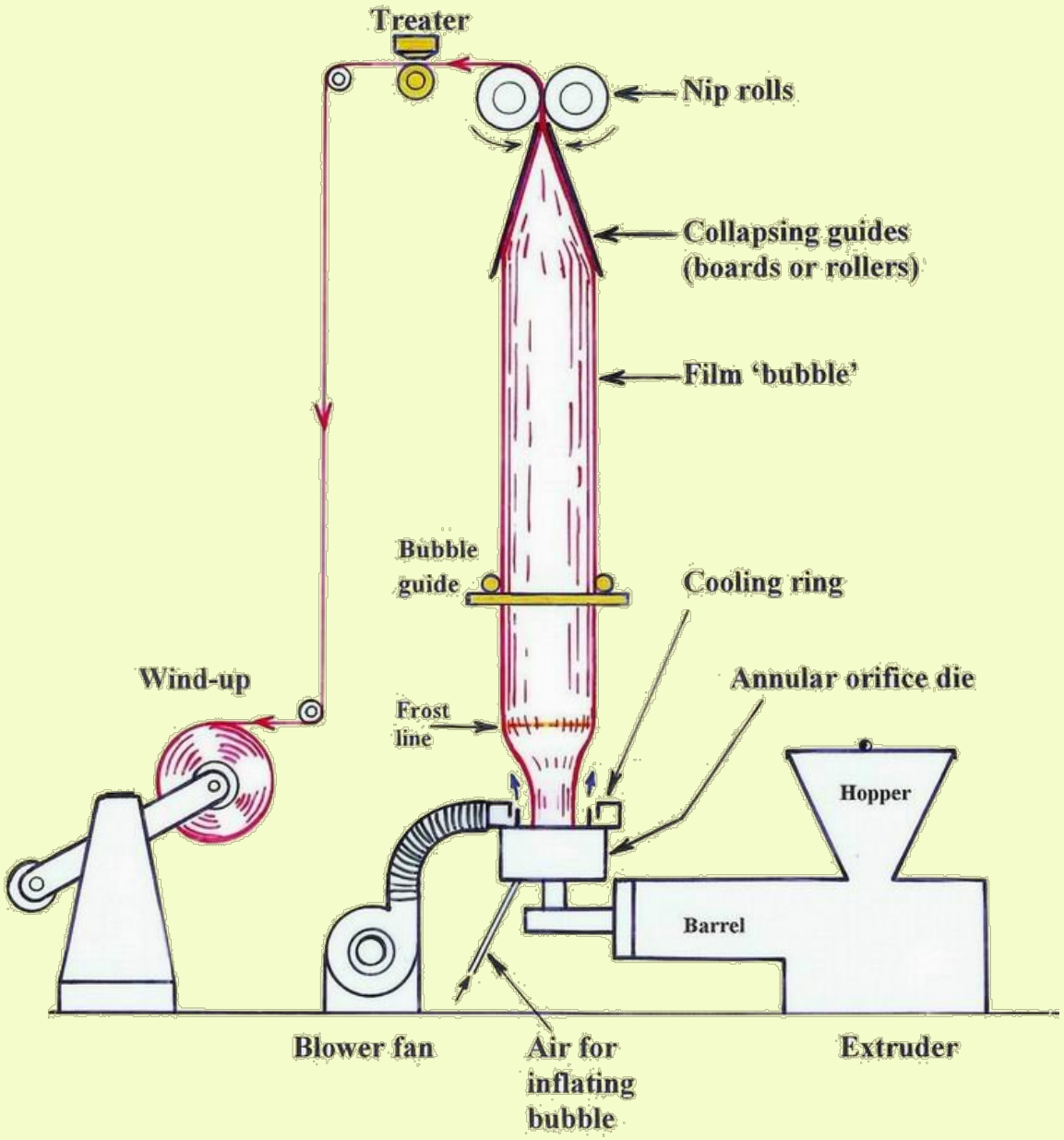
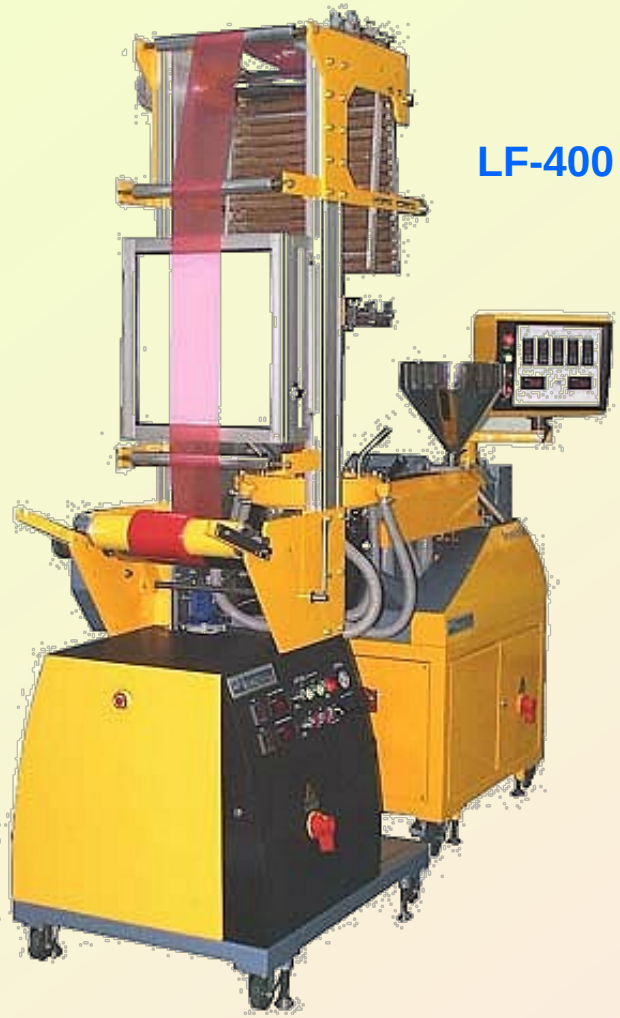


The Blown Film Extrusion Process

LAB TECH ENGINEERING COMPANY LTD

Labtech Blown Film Attachment



LF-400

Attached to a 25 mm single-screw extruder

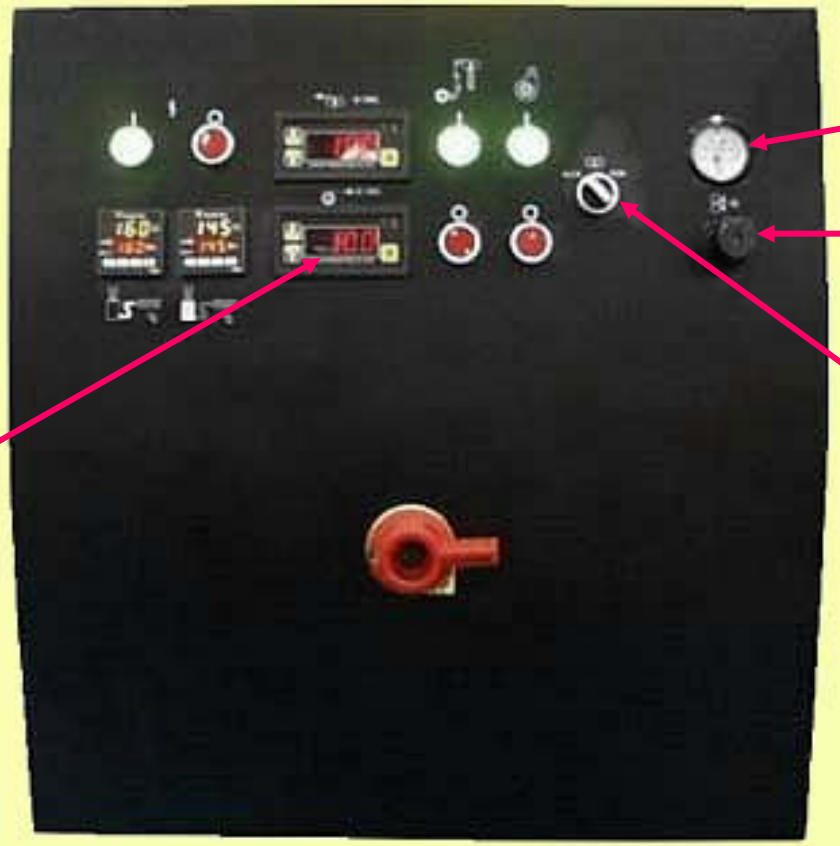
LF-250

Attached to a benchtop single-screw extruder

LAB TECH ENGINEERING COMPANY LTD

Features of the Labtech Blown Film Attachment (LF-250 and LF-400):

- **Nip rolls:**
  - **Pneumatically operated**
  - **Infinitely variable speed – using frequency inverter**
  - **Nip roll open/close switch on control panel,**



Nip roll pressure gauge

Nip roll pressure control valve

Nip rolls open and close selector switch

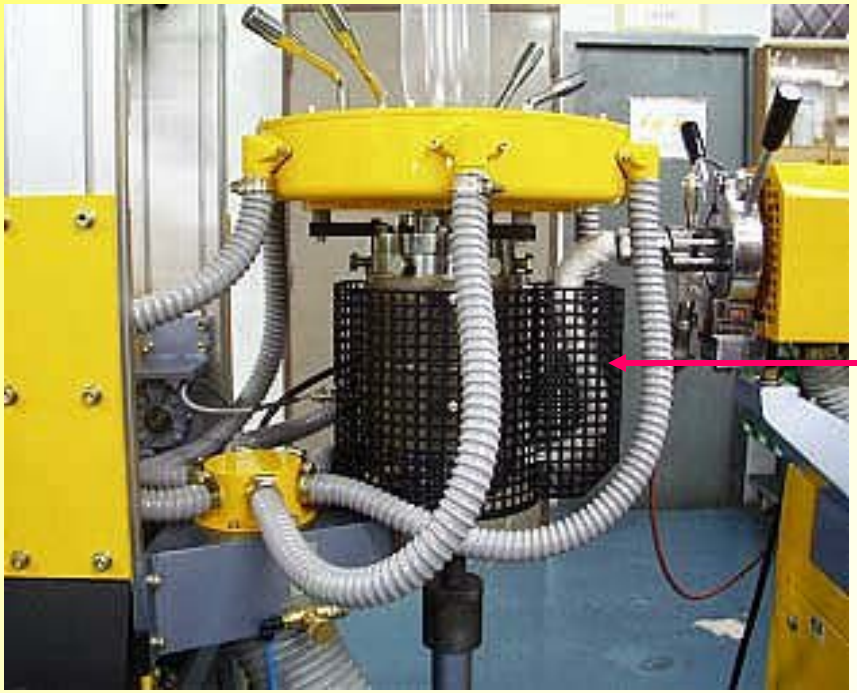
Nip roll speed controller

LAB TECH ENGINEERING COMPANY LTD

- **Nip rolls and guide rolls: 400 mm wide (LF-400) and 250 mm wide (LF-250)**
  Layflat film width: 350 mm max (LF-400) and 200 mm max (LF-250)

- **Tower height: 2.4 m (LF-400) and 2.05 m (LF-250)**
  Height is manually adjustable

- **Horizontal die adaptor (LF-250) or S-shaped adaptor (LF-400),**



S-shaped adaptor *(from LE25 extruder to die)*

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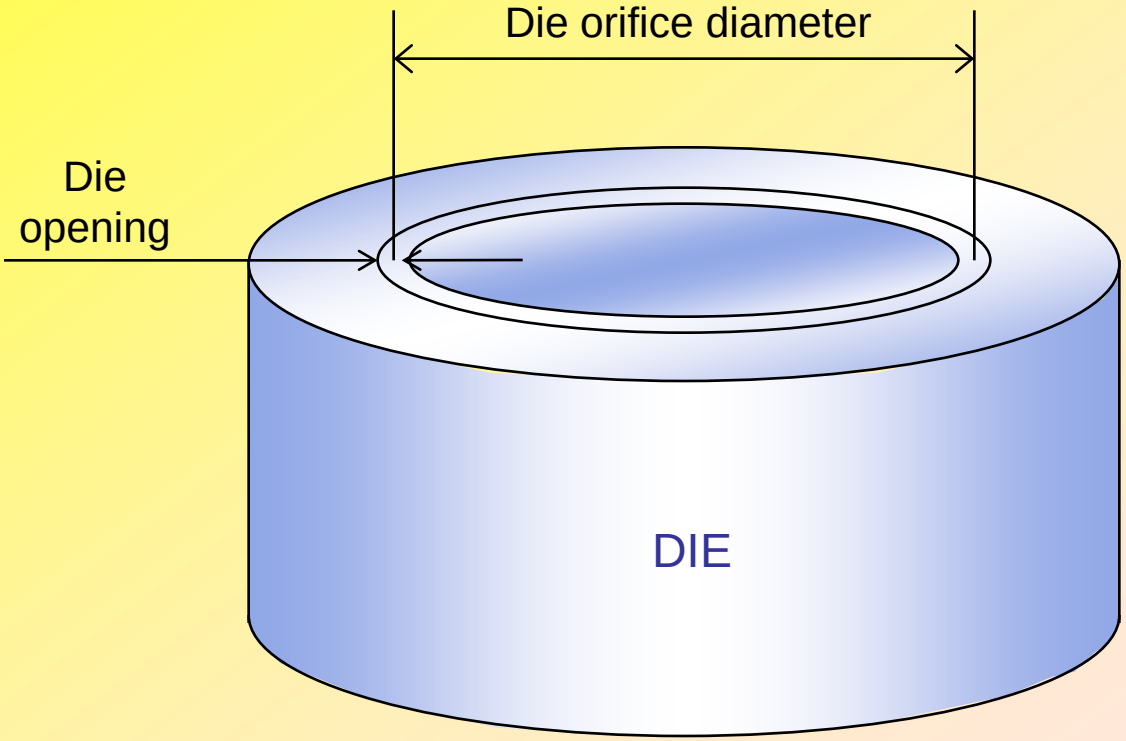
- **Die orifice: 50 mm diameter (std) (LF-400)**
  30 mm or 40 mm (LF-250)
- **Die opening: 0.8 mm (std) (LF-400 and LF-250)**



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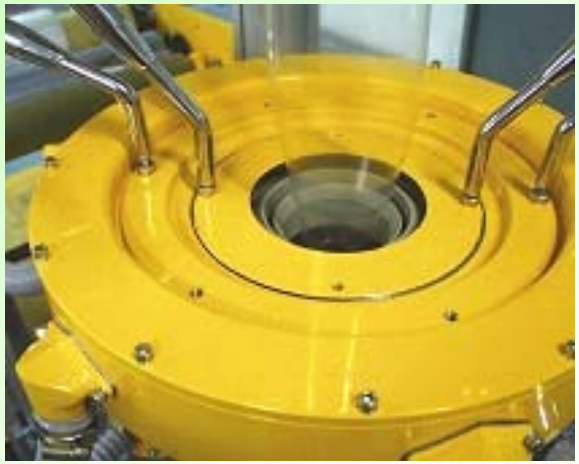
- **Guide frame and collapsing frame uses polished teak slats,**

Adjustable guide cage (frame)

Synchronously adjustable collapsing frame (‘tent’)

- **Three guide rollers on the down-side of the tower**
- **Dual channel air ring,**



Adjustable lips.
1 HP blower.

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- **Inspection cabinet,**

- **Friction clutch for adjusting windup tension,**

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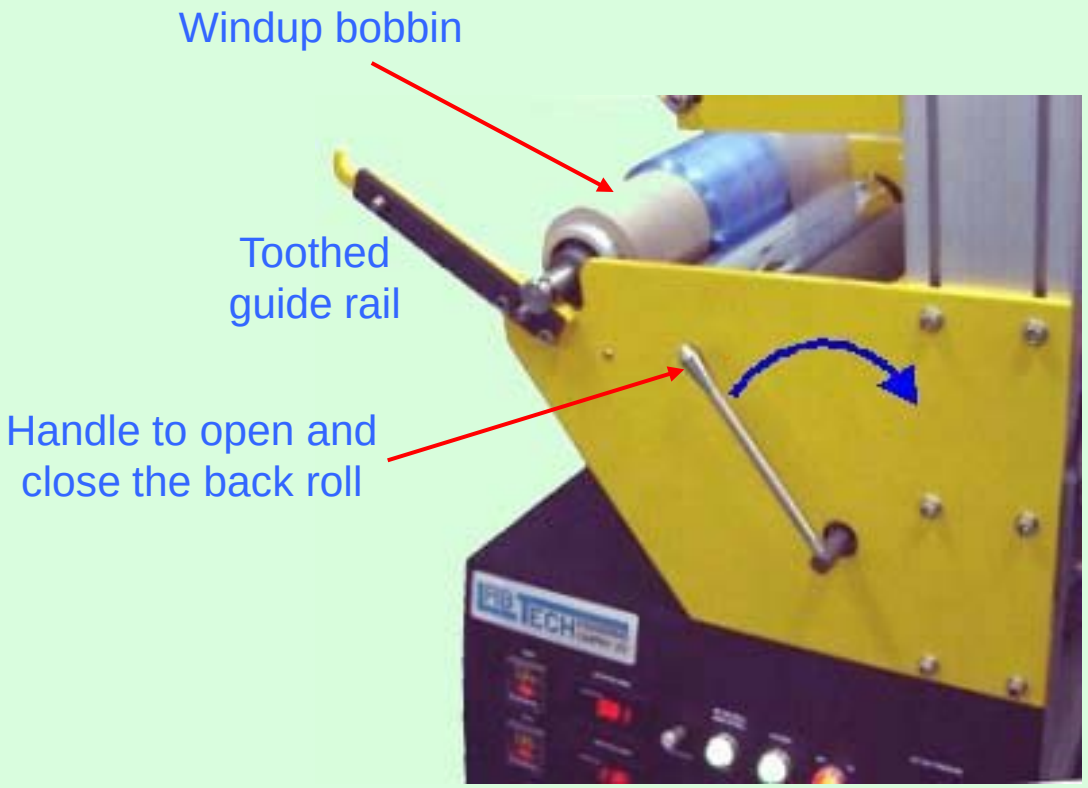
- **Windup using easily removable bobbins.**

  Bobbin shaft ‘floats’ on toothed guide rails,



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Options for the blown film attachment:

- **Variable speed blower:**
  - ☆ Uses frequency inverter – infinitely variable speed.
  - ☆ Air flow rate adjusting knob is on the control panel.

- LE-20 and LE-30 extruders can also be used with LF-400
  (LE-25 and LE-30 also available in vented versions)
- 'Pancake' die available as an option for the LF-400 attachment

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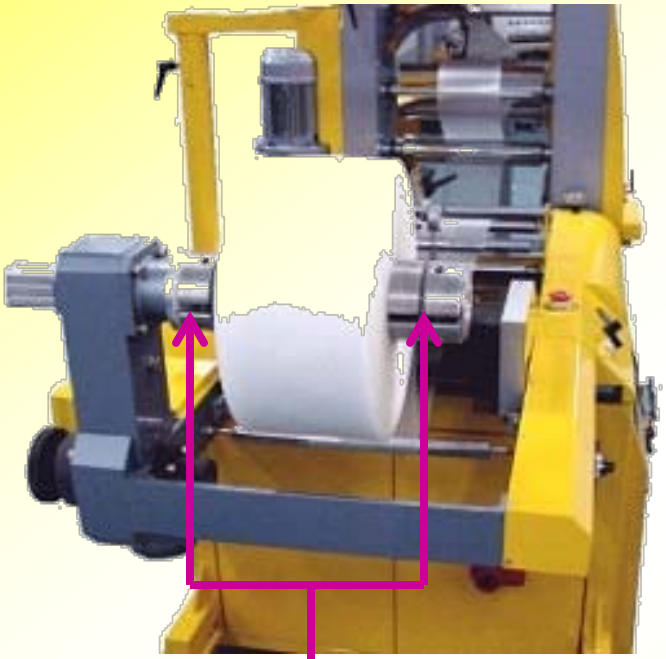
- **<u>Motorized</u> tower height adjustment:**
  - ☆ **Increases height from 2.4 m to 3.5 m**
  - ☆ **Tower up/down switch is on the control panel**

Tower in lowest position

Tower in highest position

LAB TECH ENGINEERING COMPANY LTD

- **Bobbin-free pneumatic expansion windup shaft,**



Spring-loaded (for collapsing the shaft), pneumatically expandable shaft

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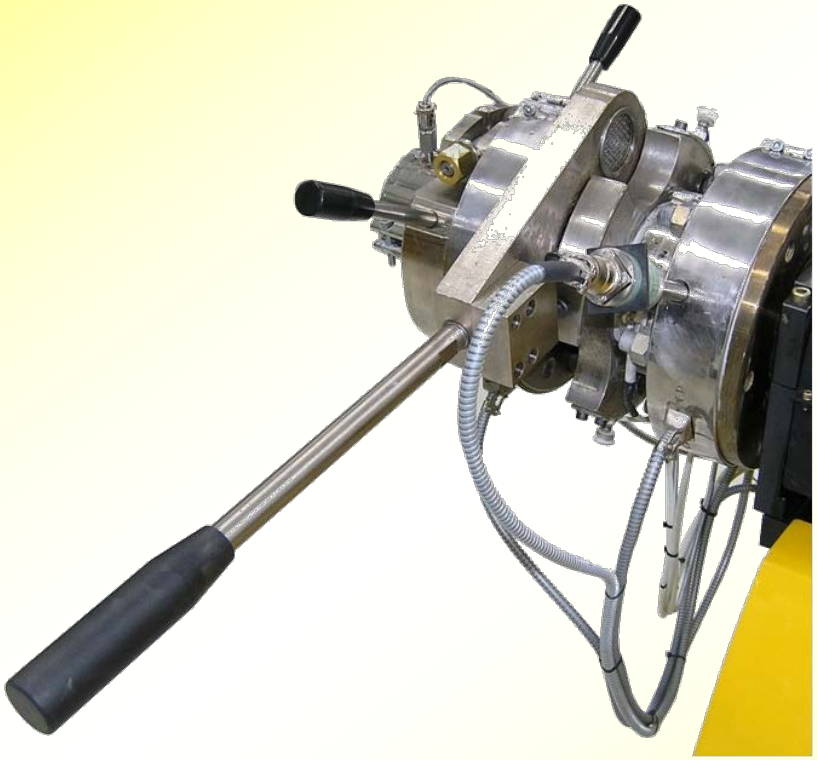
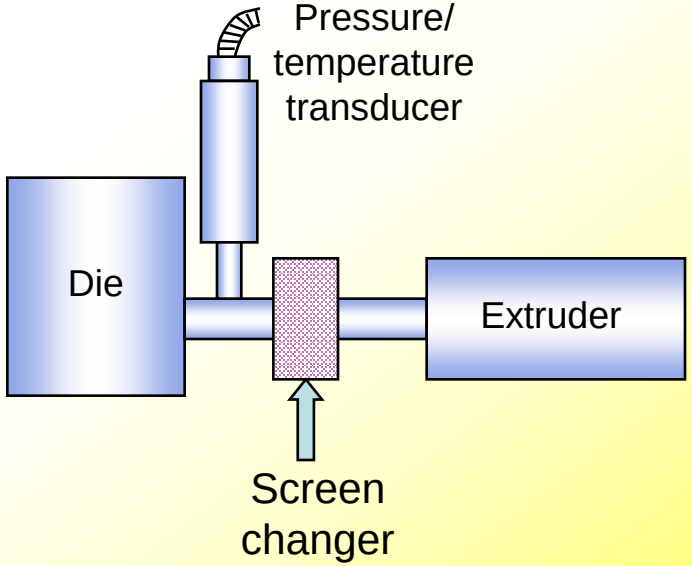
Closed-loop control

Maintains a constant pressure of melt going to the die, therefore a constant flow rate of melt

Useful when a screen changer is being used





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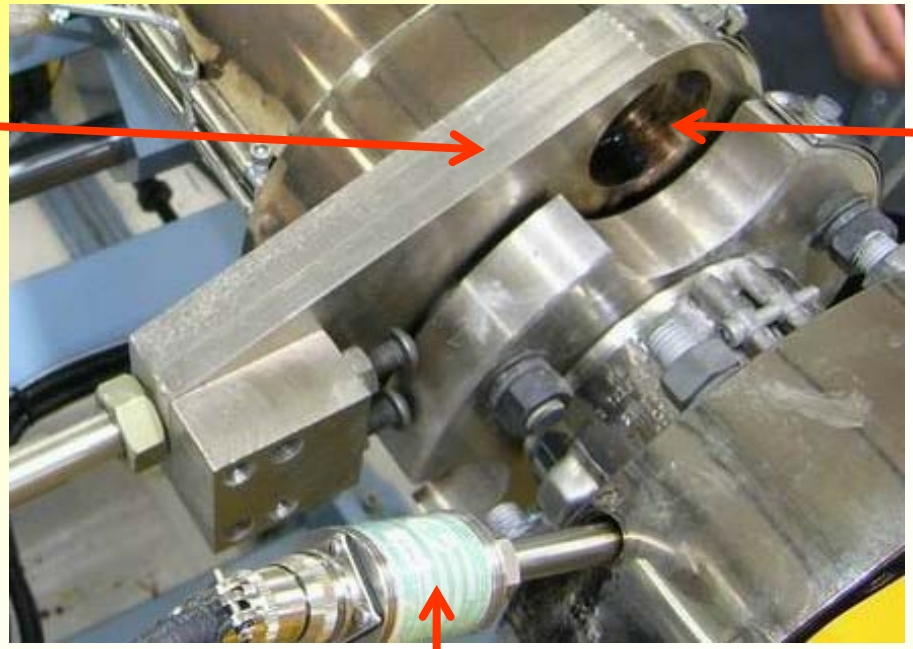
Pressure and melt temperature transducer for screen changer

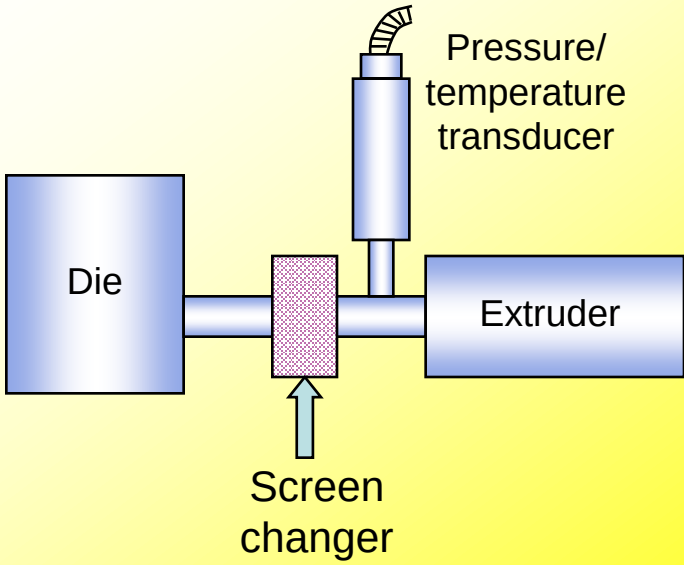
Screen changer



Recess for placing new screen

Pressure and melt temperature transducer

(When a preset pressure is reached an alarm will sound for changing the screen)



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Blown Film Lines for Higher Output

(e.g. 40 to 50 kg/hr)

Uses

- either **LF-400** or **LF-600** blown film attachment
- either **LE-30** or **LE-45** single-screw extruders

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Blown Film Lines for Higher Output

- Similar basic features to the LF-400 + LE-25 blown film line
- Motorized tower height adjustment is standard
- Single channel cooling ring is standard
  (Dual flow air ring optional)
- Nip rolls and guide rolls: 400 mm wide (LF-400) and 600 mm wide (LF-600)
  Layflat film width: 350 mm max (LF-400) and 550 mm max (LF-600)
- Die orifice: 40 mm to 80 mm diameter
- Die opening: 0.8 mm (std) (other sizes available)
- Nip rolls (top of tower) can be water cooled (option)

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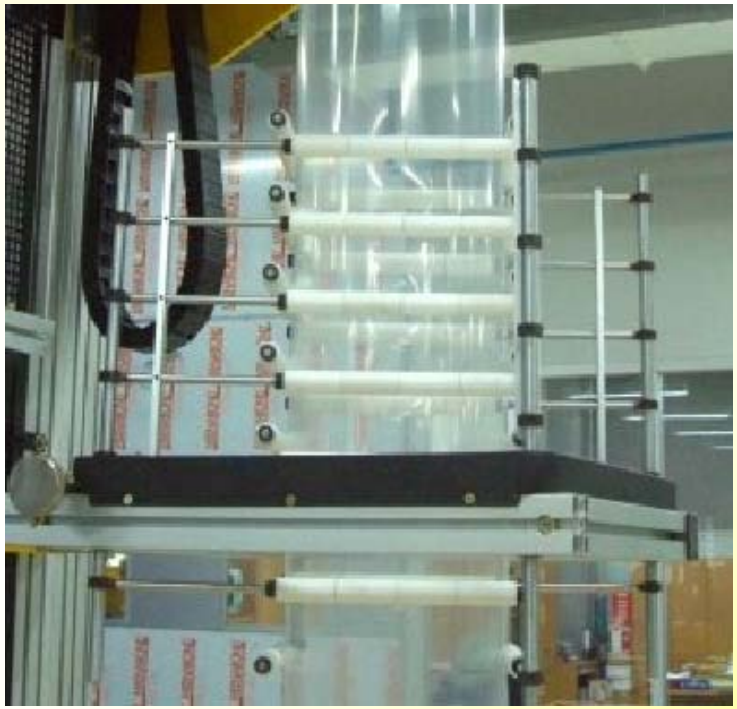
Blown Film Lines for Higher Output

Air ring. Air supplied by a 1 HP turbo blower. Infinitely variable speed air flow.

(standard – single channel)



Guide (stabilizing) cage with Teflon rollers – simultaneous quick adjustment feature

(optional)

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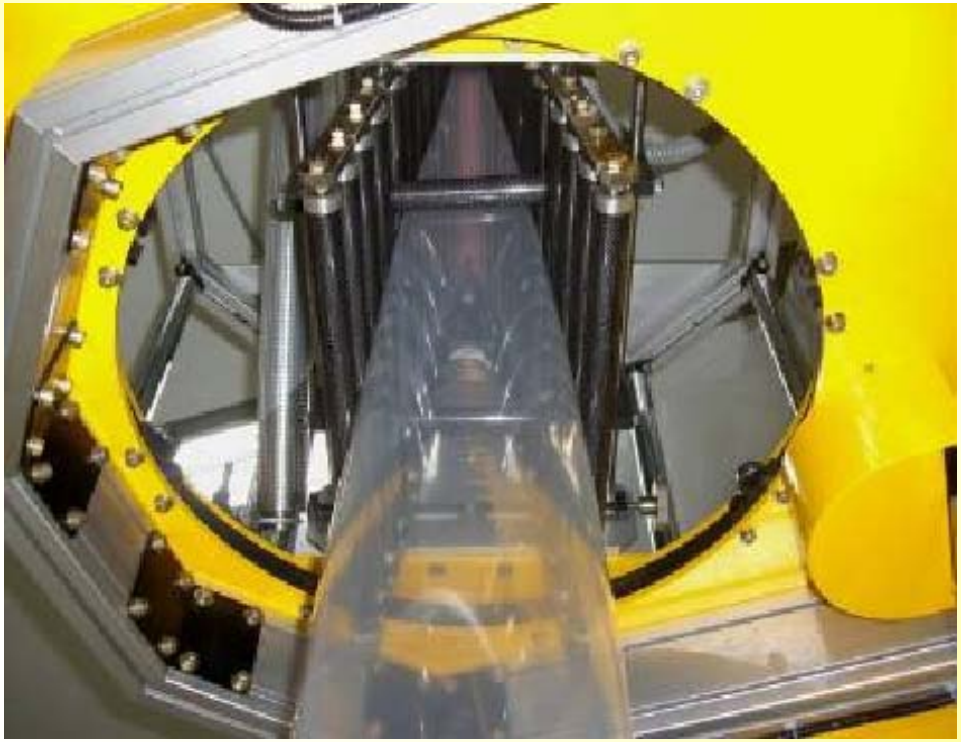
Blown Film Lines for Higher Output

Other machine options:

- **Collapsing frame (‘tent’) can be made with carbon fibre rollers instead of polished teak – for minimum friction**



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Blown Film Lines for Higher Output

Other machine options:

- **Oscillating (360º) haul-off at top of tower**

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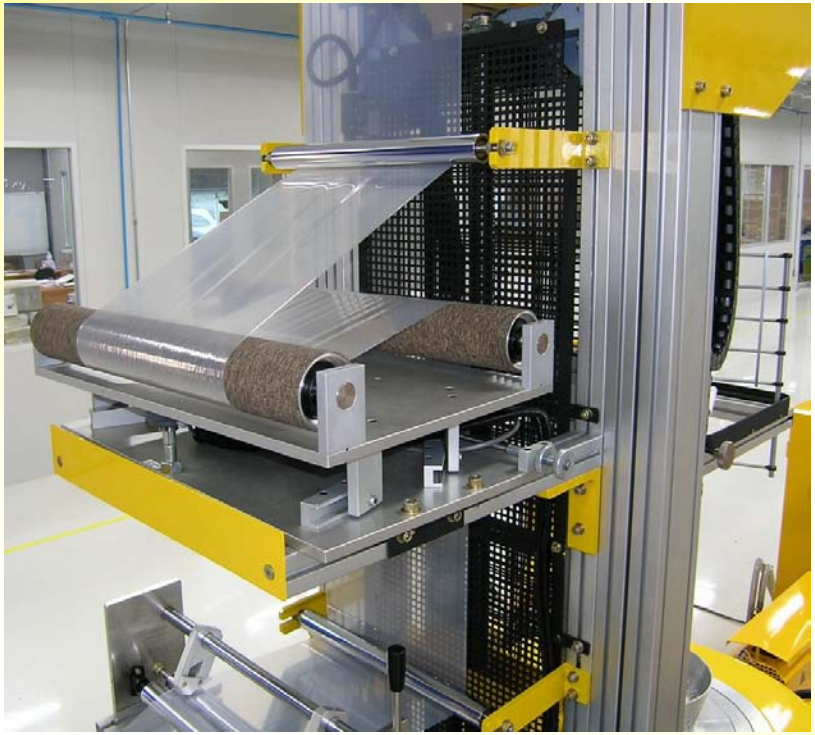
Blown Film Lines for Higher Output

Other machine options:

- **Automatic web guiding (centering) system**



A sensor sends signals for the take-off platform (shown here) to turn if the film web moves off-centre

Control panel for unit

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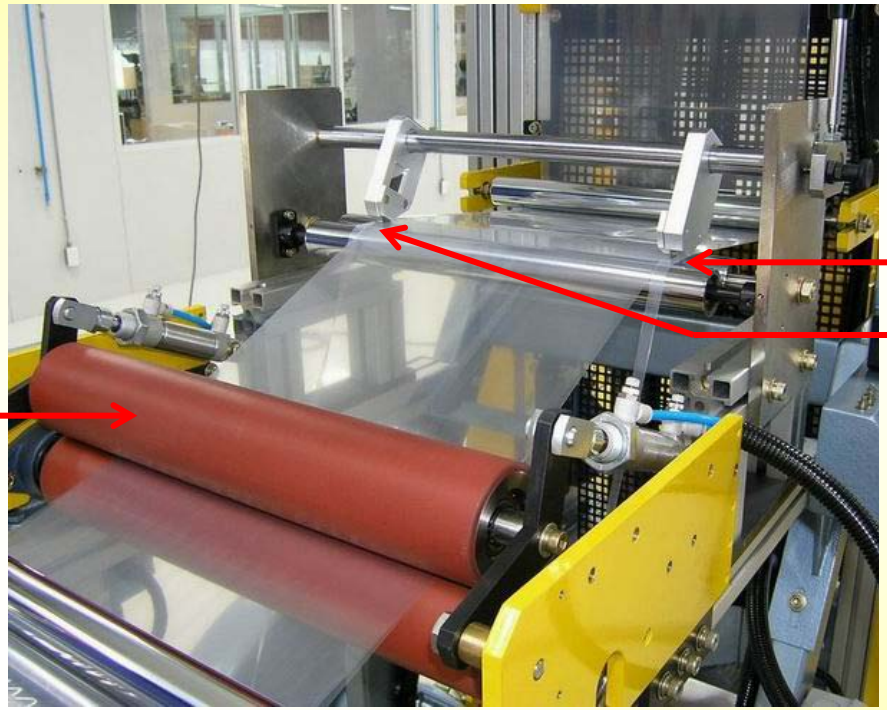
Blown Film Lines for Higher Output

Other machine options:

- **Film edge trimming – for making two single layers of film**

Nip rolls to provide web tension (adjustable speed)



Edge trimmer cutting blades

Edge trimmings are would up on two separate cassettes

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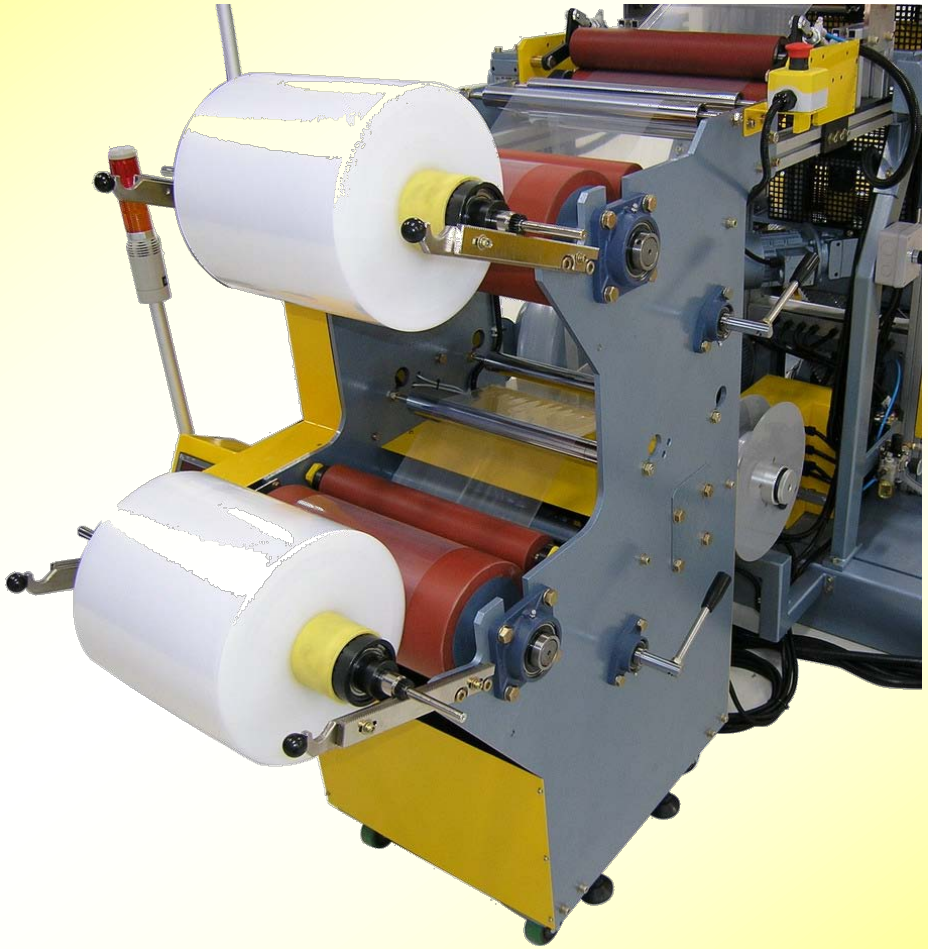
Blown Film Lines for Higher Output

Other machine options:

- **Two-station windup unit for the edge trimmed film**



Optional:

Digital film meter counters for each roll

Reset buttons

Flashing light and buzzer to alert operator that set film length is reached

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Blown Film Lines for Higher Output

Other machine options:

- **Constant film tension windup system**

  For either single-station windup or two-station windup

  A sensor detects the film roll diameter and adjusts the torque drive accordingly

  Film windup tension is constant at all roll diameters

  Roll diameter up to a maximum of 600 mm

  Pneumatic grippers for easy changing of bobbins

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Blown Film Lines for Higher Output

Standard height LE45-30 single-screw extruder

‘Low boy’ LE45-30 single-screw extruder

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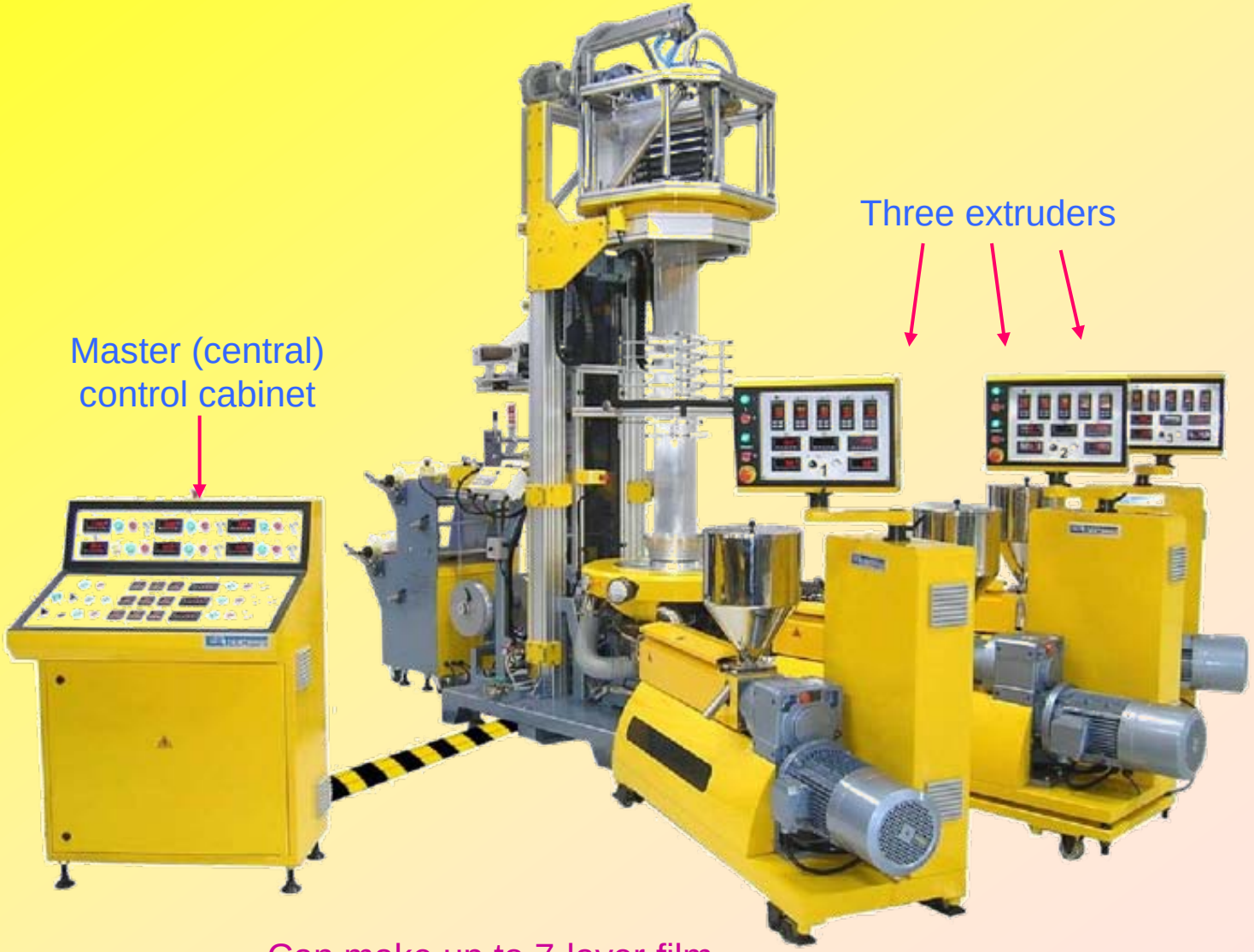
Multilayer Blown Film Extrusion



Can make up to 7-layer film

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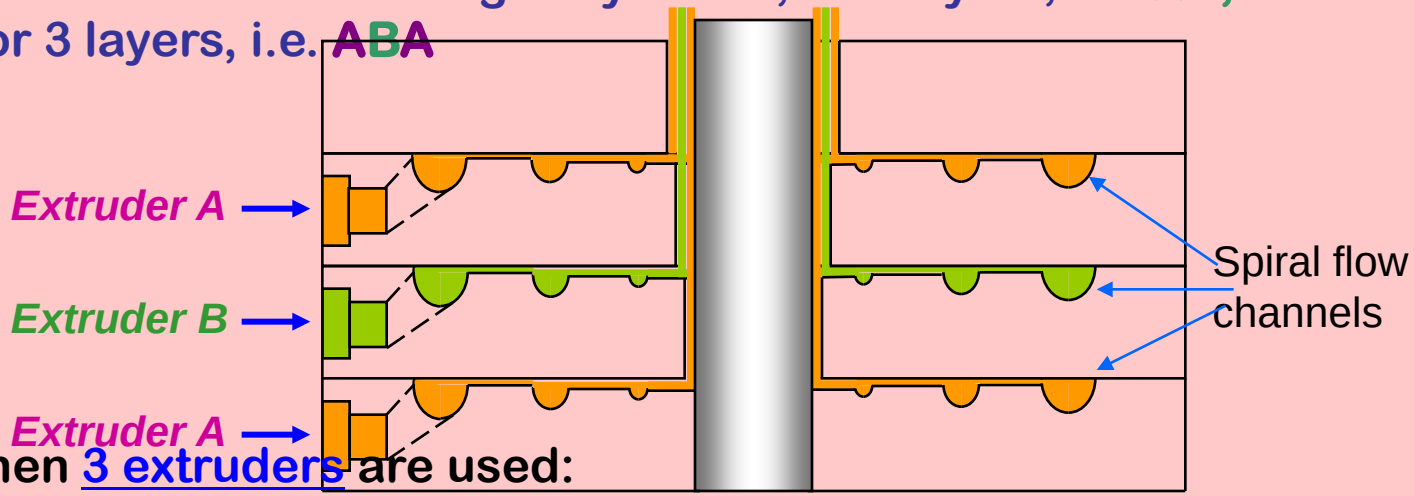
When 2 extruders are used:

☆ ●⅝‰ᴺʟ ⅞ᑕᴿ¹Nº ¹—⅝ ⅝₦ᴺʟᑕᴿᵛᵀ⅜⅝ᑕᴿ €ᴸꜰ ⅛⅓‰‰⅝⅜ “

●⅝‰ᴺʟ ⅞ᑕᴿ¹Nº ᴺʟ℗⅝ ¹ᴺʟ℗⅝ᑕᴿ ⅝₦ᴺʟᑕᴿᵛᵀ⅜⅝ᑕᴿ €ᴸꜰ ⅛⅓‰‰⅝⅜ –

Possible to have a single layer film, or 2 layers, i.e. AB, or 3 layers, i.e. ABA



When 3 extruders are used:

☆ ●⅝‰ᴺʟ ⅞ᑕᴿ¹Nº ¹—⅝ ⅝₦ᴺʟᑕᴿᵛᵀ⅜⅝ᑕᴿ €ᴸꜰ ⅛⅓‰‰⅝⅜ “

●⅝‰ᴺʟ ⅞ᑕᴿ¹Nº ⅓—¹ᴺʟ℗⅝ᑕᴿ ⅝₦ᴺʟᑕᴿᵛᵀ⅜⅝ᑕᴿ €ᴸꜰ ⅛⅓‰‰⅝⅜ –

●⅝‰ᴺʟ ⅞ᑕᴿ¹Nº ᴺʟ℗⅝ ᴺʟ℗€ᑕᴿ⅜ ⅝₦ᴺʟᑕᴿᵛᵀ⅜⅝ᑕᴿ €ᴸꜰ ⅛⅓‰‰⅝⅜ —

Possible to have a 3 layer film, a 4 layer film, or a 5 layer film, e.g. ABC and ABCBA.

When 4 extruders are used:

- ●⅝‰ᴺʟ ⅞ᴄʀ¹Nº ¹—⅝ ⅝₦ᴺʟᴄʀᵛᴛ⅜⅝ᴄʀ €ʟꜰ ⅛⅓‰‰⅝⅜ “
- ●⅝‰ᴺʟ ⅞ᴄʀ¹Nº ⅓—¹ᴺʟ℗⅝ᴄʀ ⅝₦ᴺʟᴄʀᵛᴛ⅜⅝ᴄʀ €ʟꜰ ⅛⅓‰‰⅝⅜ –
- ●⅝‰ᴺʟ ⅞ᴄʀ¹Nº ᴺʟ℗⅝ ᴺʟ℗€ᴄʀ⅜ ⅝₦ᴺʟᴄʀᵛᴛ⅜⅝ᴄʀ €ʟꜰ ⅛⅓‰‰⅝⅜ —
- ●⅝‰ᴺʟ ⅞ᴄʀ¹Nº ᴺʟ℗⅝ ᴺʟ℗€ᴄʀ⅜ ⅝₦ᴺʟᴄʀᵛᴛ⅜⅝ᴄʀ €ʟꜰ ⅛⅓‰‰⅝⅜ ‹

Possible to have a 4 layer film, a 5 layer film, a 6 layer film, or a 7 layer film

Examples:

A four layer film with different material for each layer:

ABCD

A seven layer film:

ABCDCBA

D could be a ‘barrier’ material

B could be a low cost ‘structural’ (supporting) material

C could be ‘tie’ layers (to bond the B layers to the D layer)

A could be a good printable or sealable material

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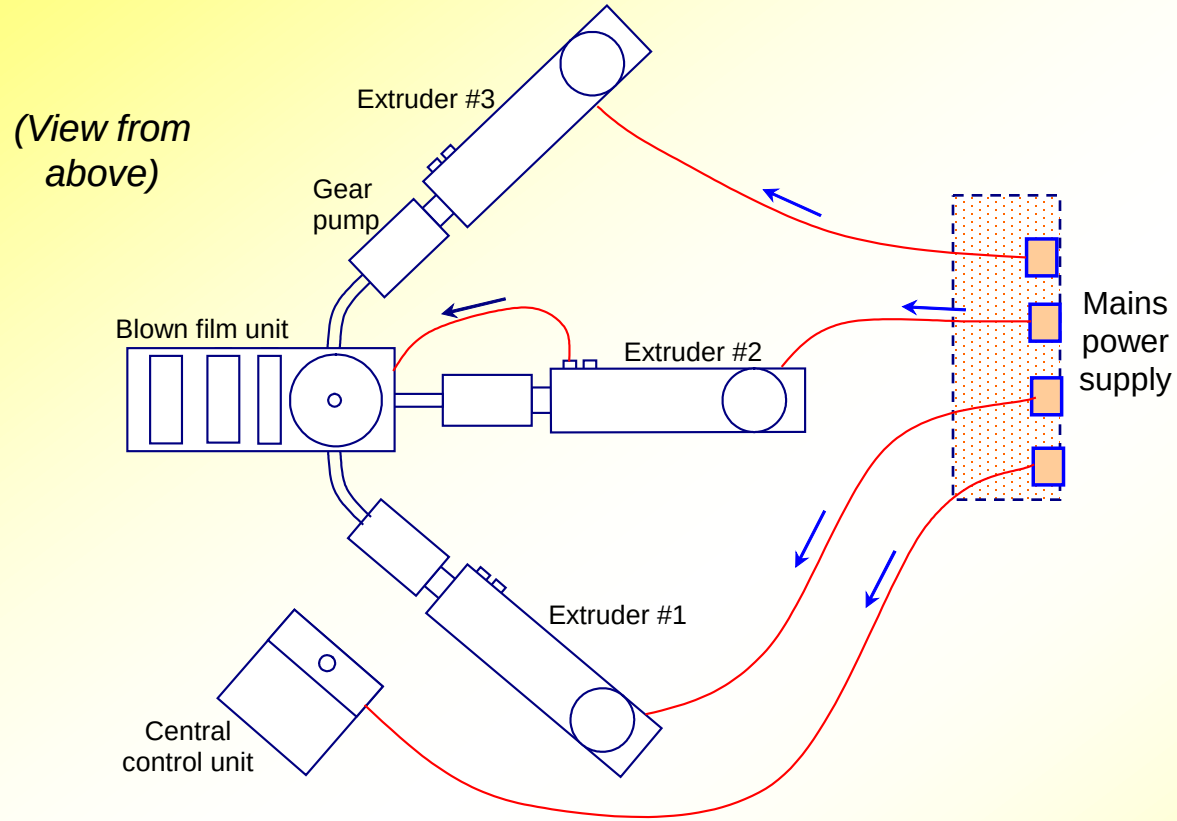

Layout showing 3 extruders connected to the die

Extruder sizes: either 20 mm, 25 mm, 30 mm, and 45 mm

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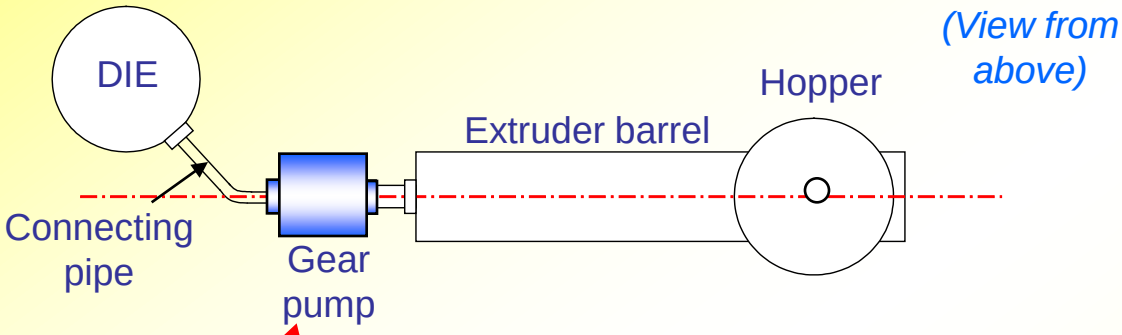
Option: Gear Pump



Gear pump unit

The gear pump supplies melt to the die at consistent pressure, and therefore consistent flow

The gear pump is equipped with a pressure/ temperature sensor coupled to a closed loop system that ensures constant melt pressure at the inlet of the gear pump

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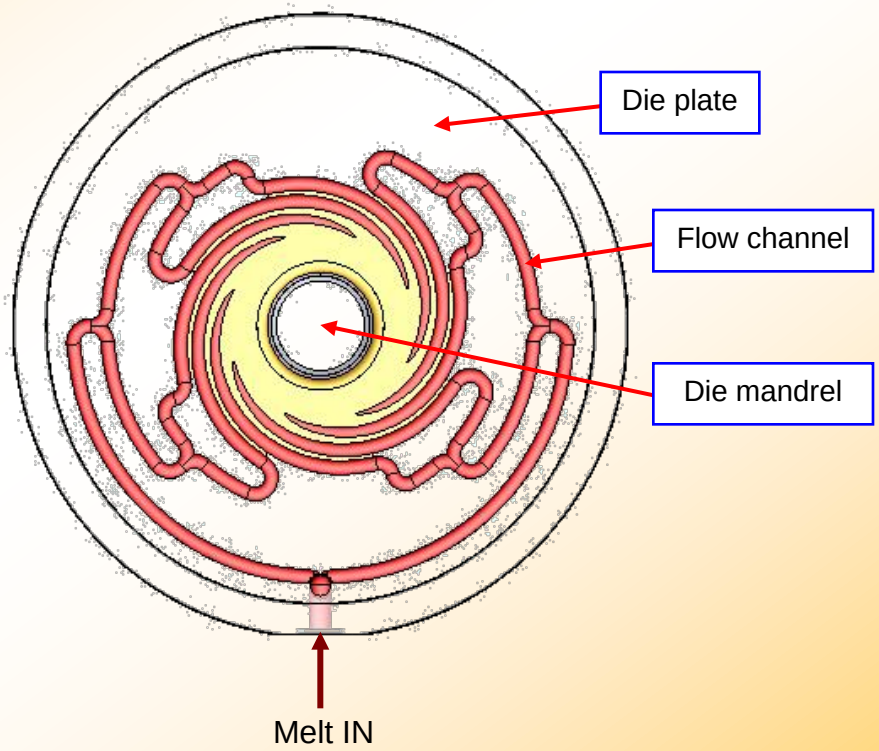
The Pancake Die

5-layer pancake die (LPD40-75/4)
connected to 5 separate 20 mm extruders



Principle of the flat plate
('pancake') die

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Multilayer Pancake Dies

Example: LPD40-75/3

Die can be used with annulus diameters from 40mm to 75mm

Die for making 3-layer film

- Can change the die lip ring and mandrel to have any diameter between 40 mm and 75 mm. Similarly different rings and mandrels can be used to have any die diameter between 80 mm and 120 mm for the LPD80-120 dies
- Dies are supplied for making film with a given number of layers, but . . .
- Spare mandrels can be fitted to the die to block flow channels inside the die to produce film with fewer layers
- Can change the outer die ring only – for different die openings

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Features of the multilayer blown film line are:

- **Blown film unit** – basically the same as the single-layer blown film unit
- **Single-screw extruders** – basically the same as the standard single-screw extruders
  - Can have manual control or closed-loop control
  - Uses jump plugs for relaying signals to the central control unit
- **Central control unit** – for manual or synchronous control of the extruders,

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End of Blown Film Extrusion

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