



Manufacturing Intelligence:

# Plastic blown film extrusion





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Risk features

Hazards and precautions

We know that your clients take risk management seriously and that it plays a key role in the service you offer.

We've produced this guide to highlight the controls and prevention measures your clients can take to help reduce the risks associated with the process and types of machinery used in the manufacture of plastics.

## Trade overview

- Blown film (or tubular film) extrusion relates to the manufacture of plastic tubular films and sheeting.
- Blown film can be produced either in tube form (e.g. for plastic bags and sacks) or the tube can be slit to form a sheet.

## Manufacturing Process

The computer controlled blown film extrusion process begins with mixing of polymer resin (typically beads of polypropylene or polyethylene) and any additives that are needed to control the production process and properties of the final film product.

This mixture is then fed via a hopper into the heated extruder (typically an electrically heated screw fed barrel).

An extruder is a device which pushes or pulls the material down a heated barrel out of a shaped annular (circular) die at the end to form a continuous length of product with a pre-set cross-section.

The melted material is then pumped, under continuous pressure, through the rotating die that creates a tube of polymer. As the warm, extruded material is drawn up several stories by nip rollers, the tube is expanded by filling it with air injected through the centre of the die, creating a "bubble" allowing the material to be stretched to the required thickness and to allow air cooling as it travels.

As the bubble enters the nip rollers it's cool enough to be collapsed into a flat tube and then cools further while it travels back down the outside of the tower to an additional set of rollers.

The film then enters the slitter station where one or both sides of the flat tubular film can be slit. Slitting both edges allows the flat tube to be separated into two layers that can each be wound onto their own core.

Further processes involving printing may take place and finally, the finished product is wound onto corrugated or plastic cores and packaged for shipment to the customer.





# Risk Features

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Blown film extruders are large machines, with high output capabilities often run for 24-hour periods. The loss of one machine will have a major impact on a company's ability to supply customers with the required volumes. Plastics remains a highly competitive market and non-fulfilment of even a small order can see the customer disappear.

On this basis, it's essential that the machines are maintained to a high standard by introducing robust Planned Preventative Maintenance (PPM) regimes to reduce the risk of downtime or, in more significant cases, fire caused by component failure.

Where no in-house assistance exists, pre agreed reciprocal outsourcing can be beneficial in the event of a loss. However, this can be challenging as competitors may be looking to secure the same customers.

Product liability can extend to the packaging material, particularly where the manufactured product is to be used for perishable goods. Failure of the packaging will lead to costly recall. In some circumstances, the potential financial loss cost associated with the nature of the failure and spoiling of the product can be very significant.

A further issue is contamination of the packaging materials through poor handling and storage of the completed items and/or contamination arising from maintenance activities on the equipment itself. Quality control and management together with testing and sampling of the completed product is essential. Recall procedures are a must and require detailed records to be maintained to allow a proper recall of suspect materials.

The blown film process is a continuous operation, so the machinery is designed to cope with the high speeds involved and to operate on a 24-hour basis. For monitoring, loading and unloading, the machinery shouldn't be left to run entirely unattended.

Machinery maintenance (see Business Interruption section) is essential, to ensure fail safe systems are in operation such as temperature sensors for the heating of the raw material.

Like any other machine process, there's always a risk of entanglement or trapping. Trip devices and guarding, whether fixed, interlock or distance, must be checked and recorded before use.

Operators/employees must receive proper training in the correct use and in particular specific hazards associated with the equipment, e.g. hot surfaces. In addition, maintenance and breakdown activities along with routine predictive maintenance must be considered when developing risk assessments and training needs.

Isolation of services, formal permit control and management systems are key areas to consider when completing safe maintenance on any powered plant and equipment. Persons undertaking these activities are normally trained and authorised to do so, as their competence needs to be established before undertaking any work on the equipment.





# Hazards and Precautions

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The tables below highlight some specific hazards present in plastic processing, along with the associated controls which will help prevent major loss of physical property.

Generic risks resulting from arson, electrical sources and waste aren't mentioned here.

## Features always present

Hazard	Control
Overheating during the production process.	<ul style="list-style-type: none"> <li>Modern well-maintained machinery, over temperature cut out protection interlocked with process shutdown.</li> <li>No combustible materials to be stored in close proximity to machinery.</li> <li>Good housekeeping around filling hopper e.g. spillages removed quickly.</li> </ul>
Storage of raw material and finished goods.	<ul style="list-style-type: none"> <li>Consider excessive storage of raw material and in particular finished goods, where plastic film reel storage – contributing to a high fire load and potential exposure to process lines.</li> </ul>
Business interruption due to long reinstatement periods of extrusion plant.	<ul style="list-style-type: none"> <li>Review availability of in-house spare capacity on production lines in a separate fire risk or location.</li> <li>Consider third party outsourcing on a reciprocal basis.</li> </ul>

## Features sometimes present

Hazard	Control
Hazard Control Unattended operation – blown film line is an automated process.	<ul style="list-style-type: none"> <li>Shouldn't be run unattended.</li> </ul>
Printing with flammable inks.	<ul style="list-style-type: none"> <li>Adequate vapour extraction systems.</li> <li>Fire suppression system in drying tunnel (depending upon exposure).</li> <li>Acceptable storage arrangements for flammable liquids.</li> </ul>
Reliance on single process plant resulting in increased interruption in the event of loss.	<ul style="list-style-type: none"> <li>Business Impact Analysis (BIA) to identify hazards and to consider methods to reduce risk. This might include major changes such as duplication of operation or more local controls including PPM and Fire Protection (where possible).</li> </ul>



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