Automation Control for Blown Film Line
Lower Total Cost to Design, Develop, and Deliver℠ Solutions from Rockwell Automation

Advantages

- **Rockwell Automation Integrated Architecture™** system simplifies design with a single platform for discrete machine control, process recipe management and integrated temperature control, and drive control.

- **One development environment** for process, discrete, and drives programming reduces development time and cost.

- **Distributed architecture and On-Machine™ components** simplify wiring and assembly to help reduce errors.

- **Allen-Bradley® PowerFlex® drives** seamlessly integrate into the control architecture to provide outstanding torque and speed control. Various modes of operation offer flexibility to meet a broad range of rewinding requirements.

- **Use Add-On Instructions (AOIs)** for tested, and repeatable implementations of the integrated torque, velocity and position requirements included in the unwind, converting, knife positioning and rewind processes.

- **Increase your performance** with field proven sophisticated and integrated technologies such as winder control, air-ring control, tension control and temperature control.

- **Protect your intellectual property** with technology AOIs for a competitive edge in the market.

Overview

Blown Film Extrusion is the primary technology used to make plastic films especially for the packaging industry. Its machines produce protective films used in many industries - including food and pharmaceuticals – that extend product shelf life and improve consumer appeal. Products such as trash bags, frozen food packaging, shrink wrap, stretch film labeling, form, fill and seal packaging, medical product packaging, and agricultural films are manufactured on blown film lines.

During the film blowing process, a tube of molten thermoplastic is extruded and continuously inflated to several times its diameter, forming a thin tubular shape, which can be used directly, or slit to form a flat film. It is extruded through an annular die as air is pumped through a hole in the middle to inflate the tube like a balloon. The film continues upward vertically until it is cool and then it is flattened using a collapsing frame. Finally, it passes through a pair of nip rolls, where it may be slit, and then wound onto reels. The properties of the film product can be engineered by using multiple extruders to form multiple layers of film with different characteristics, such as strength, adhesive properties, opacity, oxygen and aroma barriers.
Blown film offers several advantages. First, it allows the production of tubular film for products such as bags. Second, the stretching occurring in the blowing process is controlled and can develop biaxial orientation of the molecules, providing uniform mechanical properties of the film. It also allows the combination of multiple layers with different properties while the collapsing frame can be rotated to randomize variations in properties or thickness.

The tension control after the film cools and the quality of the winding control are critical to product yield and its suitability for the next process. Because film can be slippery and extensible, tension control determines whether a roll is acceptable for the next operation.

**Challenge**

Multiple layers mean several products from numerous extruders with varying optimum temperature regimens. This multi-leveled situation can result in challenging recipe management. Because of the need for good recipe management, many manufacturers have developed proprietary recipe management systems and use them as selling points.

Machine builders are challenged with multiple extruders and the need for temperature control of the extruded product, resulting in various temperature PID control zones. In addition, bubble formation requires precise air and pressure control. Another factor machine builders contend with is the machine layout and size.
requirements. Components and sensors need to cover a great deal of this real estate, thus encouraging a distributed architecture.

Process and machine layouts demand integrated safety. A contemporary machine safety strategy can be a significant investment, when it comes to total cost of ownership, but it can also play a significant role in reducing overall costs. Increasing productivity while providing the best machine safety for the protection of personnel and production equipment is imperative in today's global economy. In addition to minimizing accident risks and downtime, integrated safety solutions can help decrease the cost of lost production due to accident investigation, damaged product and machinery, litigation and insurance premiums, and staff training.

The value of the film produced on a blown film line depends on uniform properties and film gauge. Maintaining this uniformity can be difficult with extensible film as it transforms from melt to solid form. Maintaining very consistent tension control as the web cools is critical to this process.

Again, the value of a blown film line production depends not only on the film properties, but also the ease and speed of upcoming processes-which depends on how well the rolls are wound.

With a broad range of film properties such as elasticity, thickness and slipperiness, the roll quality depends on flexible winding algorithms, good tension tapering and on varying modes of operation, like full torque control, or speed with torque trim.

Solution

The Rockwell Automation Integrated Architecture system brings together a powerful multi-disciplined control engine, seamless networking, a scalable visualization platform and the information technologies needed to help machine builders meet and exceed the challenges faced by converters in their blown film applications.

Unlike conventional control architectures, the Integrated Architecture system provides fully integrated, scalable solutions using a single control platform and a single development environment. This helps machine builders to more efficiently re-use engineering designs to help reduce their Total Cost to Design, Develop and Deliver a machine and enhance business performance.

A Logix control platform, along with an industrial computer, provides flexible process control, excellent recipe management and control of multiple temperature and pressure zones. Recipe management determines which extruders are needed for specific products and the torque requirements, temperature and pressure regimens for the specific layer components.

The Allen-Bradley PowerFlex family of variable speed drives, combined with the Logix control platform, offer excellent torque control for the extruders, as well as precise speed and tension control of the film in process. The drives, along with standardized Add-on-Instructions (AOIs) provide flexible, yet precise winding control.

Integrated safety solutions combine safety, motion and discrete control capabilities throughout the controller, drives, servos and networks. New safety technologies like safe-speed, safe-direction and safe-off help to significantly reduce development time, maintenance costs and nuisance shutdowns to keep machines running at optimum efficiency. Rockwell Automation integrated safety solutions are focused on overall machine performance, including safety, efficiency, and design productivity, helping machine builders deliver flexible, high-performance machines.

Modular Programming encompasses code structuring, tag naming conventions, state model implementation, HMI practices and more. It is based on industry standards, and provides a consistent framework to get the most from the Integrated Architecture. Modular Programming helps customers leverage industry standards with implementation standards set by Rockwell Automation within their own industrial automation applications.

Access to the off-the-shelf control components built to industry standards for system design, start-up and repair are critical. With more than 450 sales and support locations in 80 countries and a network of authorized Allen-Bradley distributors as well as our Global OEM Technical Consultants (GOTCs)-the supply and support of Rockwell Automation is unparalleled in scope.

Working with Rockwell Automation you can lower your Total Cost to Design, Develop, and Deliver a machine. This total cost approach solution accounts for all costs of delivering a machine or system to market over a given period of time. It is a final result of the purchase and build costs plus all aspects in the future use and maintenance of the machine components considered.