

Control Is A Good Thing



In order to have control in your production line, you must first gain control over the evaluation of electrical control packages.

The ability to control product flow on a packaging line is essential to the overall efficiency of the line. Project leaders want a smooth operating, efficient packaging line, but getting to that goal means selecting the most reliable equipment and conveyors combined with an effective controls scheme. Evaluating conveyor controls can be a difficult and time consuming process in comparing and analyzing quotations, especially when the solutions vary in components and design.

The following discussion is about how to evaluate controls packages to determine if you are getting a properly designed system with the best value for your investment.

Scope of Design

Within the controls quotation should be a description of the work that is being offered. Compare the designs and determine whether the controls to be provided are simple starts and stops in the line or full line control. Simple start and stop controls are less expensive, but if you need flow monitoring and jam detection, then you need to expand your controls selection. Full line control will provide seamless integration of the conveying system with the packaging machines to include back-up and jam detection; which results in optimum throughput, while at the same time preventing package and machine damage.



Simple Starts and Stops

- Simple to operate
- Low cost of acquisition
- No back-up logic
- Minimal safety controls
- No packaging equipment monitoring
- No speed control
- Often used in operations combined with manual processes
- Safety circuits designed to cut power

versus

Full Line Control

- More complex to operate
- Higher cost of acquisition with lower cost of ownership through increased production, reduced down-time, less personnel
- Production line integration / equipment monitoring
- Package flow monitoring / statistical data
- Speed modulation for product variation
- Information collection
- Safety circuits designed to maximize up time



Component Selection

When evaluating controls quotations, the overall quality of the component selection is important. A trusted and experienced conveyor controls source will specify the appropriate VFDs (Variable Frequency Drives) and PLCs (Programmable Logic Controller) for the application as well as plan for the future needs of the line. The selection of VFDs and PLCs based on price alone may lead to expensive rework and poor line performance, while the high-end versions of these devices can be an unnecessary expense to a system that doesn't need the capability. Controls should also offer long-term viability so the technology will be available for future expansions or modifications to the line.

Check to see if electrical panels are U.L. compliant. Many cities in the United States require control panels to be U.L. compliant to meet city code regulations. The consequence for non-compliance to U.L. standards could be forced shut-down of the operations until compliance is satisfied.

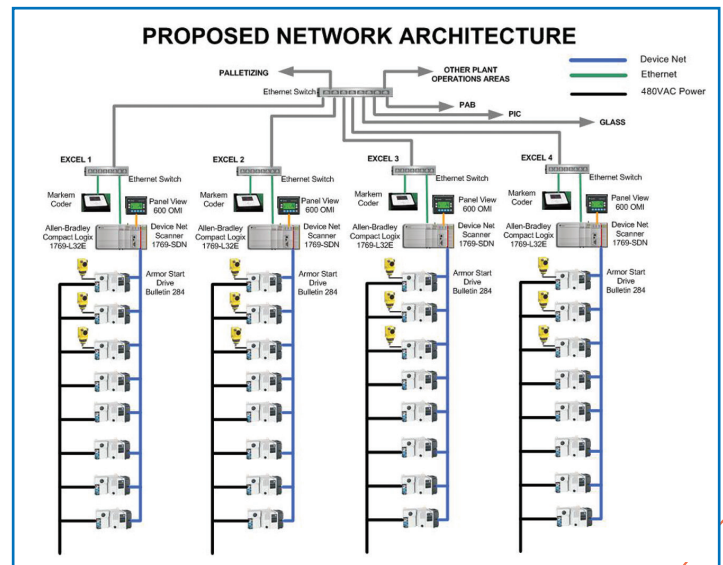
Communications

In comparing communication capabilities between controls quotations, determine which networks best fit the application in terms of topography, capacity and performance. Ascertain which network reduces development, commissioning and maintenance time and cost as well as improving productivity.

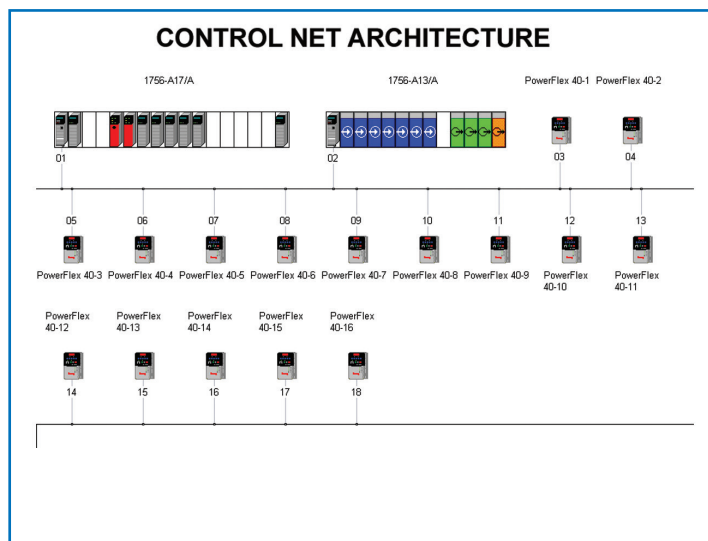
The following are three widely used communication networks and how they are best utilized:

Ethernet/IP

Ethernet/IP is best used for real-time I/O, packaging machine connections and HMI (Human Machine Interface) control. It has the performance and capacity to handle large applications, and is widely used and supported by existing training and standard tools. It also utilizes a long-standing technology that is backed by international standards organizations. Through advancements in the technology, it is becoming more common for Ethernet to be used for drive control.



Schematic showing Ethernet and Device Net communications.



Schematic showing a Control Net configuration.

Control Net

Control Net is optimized for high-speed, deterministic and repeatable I/O drive control and machine to machine connections of standard or redundant configurations. It uses cost-effective, standard coax cable and products are widely and globally available. Control Net is easy to install and configure with off-line performance tools.

Communications *Continued*

Device Net

As one of the lowest cost networks, Device Net provides wiring and installation savings with status and diagnostics for simple devices using CIP (Common Industrial Protocol). Device Net is used for applications with devices that are geographically spread out. It is also used for real-time control, simple VFD speed modulation, device configuration and data collection with both safety and standard devices.



U.L. sticker is shown inside an electrical panel.

Implementation

When assessing controls quotations, look for continuity in how the controls design will be implemented. While one company's controls quote may offer a lower price by utilizing three separate vendors for control panel fabrication, software engineering and wiring installation, it may not have the consistency as the company that provides all these under one roof. With multiple providers, accountability needs to be assigned, compared to an "under one roof" supplier that is responsible for all the services.



Electrical controls manager verifies panel operation.



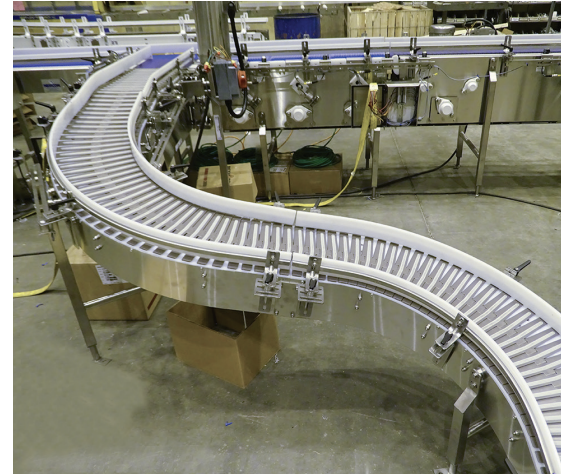
Electrical panel testing in Nercon's U.L. compliant panel shop.

The quote should also offer a Description Of Operation (D.O.O.) in the final documentation. While sometimes missing or abbreviated, the D.O.O. is a critical tool for management to understand the operation of the system and how it works.

Implementation *Continued*

The vendor's ability to test the equipment may be a reason for favoring one quote over another. An FAT (Factory Acceptance Test) can reduce start-up costs by up to 50%.

And finally, assess the requirements for the operator(s) to run the system. An HMI, while more expensive in the up front costs, can reduce the need for technical personnel or advanced training. Touch screens can be used to quickly identify stoppages and program product size or recipe changes to reduce valuable down time.



System set up for F.A.T. (Factory Acceptance Test).

Experience

Discover the experience levels of the companies providing the electrical quotes. Ask each group what percentage of their work is on controls for packaging lines, as well as their abilities to work with conveyor manufacturers. Also, determine their experience interfacing with different machines.

Having engineered and manufactured conveyor systems for over thirty-five years, Nercon has the expertise, facilities and technology to determine the best controls package for your packaging conveyor line.



Nercon controls expert makes adjustments to the controls software during F.A.T.



Nercon's controls technicians set up jobs in-house and travel to the customer site for start-up.

Trends in Conveyor Controls

Nercon's engineering and controls experts are seeing four major trends in conveyor controls technology. Overall, Nercon's packaging line conveying projects are seeing an increase in distributed drive systems, a rise in network drives, an increased use of Ethernet communications and a focus on OEE (Overall Equipment Effectiveness).

Distributed Drives The increased use of distributed drive systems allows the drives to be located on the conveyors near the actual motors. Previous to distributed drives, the standard arrangement was to have variable speed drives located together in a large main control panel and hard wired to the motors they control.

Just one of several advantages in distributed drives is easier maintenance. Due to the new National Fire Protection Agency regulations (NFPA70E), maintenance people are often required to wear protective suits while working on a control panel. Having the drives located on the conveyor line eliminates the need for the special suiting, allowing drives to be maintained and the I/O to be mounted and wired locally to each conveyor. These drives are self contained and reduce the need for large electrical panels.

Network Drives Even when using the centralized drive concept, Nercon is seeing an increased use of network drives. Utilizing network drives eliminate the need for individual discrete wiring to the drives. As communication networks such as Control Net, Ethernet and Device Net become more widely used, the cost of network drives decreases. Another advantage to networked drives is that all the drive parameters can be controlled and monitored remotely.

Ethernet/IP Communications Nercon is seeing more manufactures use Ethernet Communications protocol for line control networks. While some applications may still be best solved using Control Net and/or Device Net, Ethernet/IP is proving to be robust and widely supported throughout the industry. More and more controls strategies use Ethernet/IP in a "network convergence" capacity. The adoption of Ethernet communications has also simplified the task of data collection and integration with plant network systems.

With the improvements in smart switches and the continued development of Ethernet I/P, data collection has become relatively straight forward and cost effective. The data can be passed directly to plant MES (Management Execution Systems) as well as HMI systems on the plant floor for display and collection. Most major food, beverage, and consumer goods manufacturers now collect production data over a plant wide Ethernet network.

Overall Equipment Effectiveness (OEE) From a line integration standpoint, manufacturers are looking to track energy costs, machine down time and excess capacity. Nercon's sales and project engineers are seeing a growing need for controls packages to present complex production issues into simple, intuitive and actionable measurements.

Manufacturers are looking more at controls and information structures of individual machines on a packaging line, in order to procure a solution that collects data for the entire line. Manufactures want data that provides overall information for the line as well as data from the production of an individual product line; all for the goal of shaving time and costs from the manufacturing process.

Purchase Cost vs Cost of Ownership

	Acquisition Cost	Operating Cost	Change Cost
Equipment	<ul style="list-style-type: none"> • Hardware Selection • Environment • Human Interface 	<ul style="list-style-type: none"> • Diagnostic Information • Safety • Energy Cost 	<ul style="list-style-type: none"> • Upgrades • Future Expansions
Software	<ul style="list-style-type: none"> • Integration Level • Communication 	<ul style="list-style-type: none"> • Software Costs • License and Fees 	<ul style="list-style-type: none"> • Parameter Changes • Future Needs
Personnel	<ul style="list-style-type: none"> • Start-up Costs • Training Costs 	<ul style="list-style-type: none"> • Qualified People • HMI Interface 	<ul style="list-style-type: none"> • Turn-over Training • Level of Integration
Technology	<ul style="list-style-type: none"> • Installation Cost • Integrator Support 	<ul style="list-style-type: none"> • Network Compatibility • Production Diagnosis 	<ul style="list-style-type: none"> • Production Feedback • Integrator Support

The true cost-of-ownership on a new fully integrated line includes not only the purchase cost of the equipment and programming services, but the costs associated with the installation and operation of the line. The main cost categories to evaluate are acquisition, operating and change; which are grouped into equipment, software, personnel and technology.

Equipment

The acquisition cost of the controls hardware is driven by the operating environment, equipment selection, installation and human interface requirements. The control hardware costs can stand out, but consider hardware requirements and how specification changes can significantly impact the acquisition cost.

Consider the operating cost of equipment in the line; an investment in diagnostic controls packages may reduce the overall operating cost of the line.

Software

Effective line integration requires the use of software packages to handle communications between motors, sensors and devices. As the level of integration increases, you may need multiple packages to accomplish your line control goals.

Keep in mind that software operating costs may include licenses and annual fees.

Consider the cost of future changes. An HMI gives flexibility to operators to make changes that adapt with production requirements.

Personnel

Operator training should be a cost consideration on new line integration projects, Labor costs can be reduced if the system is designed properly.

Operating cost may include the cost of training turn-over staff. It may be cost effective to build the operator training into the logic during the design phase of the project.

Technology

The main reason to invest in integrated technology is the ability to react to production situations and adjust with very little cost. As the level of integration and control increases, the total cost also increases. However, at some point, the overall cost begins to decline as the production line runs at a higher level of efficiency and support labor is reduced.

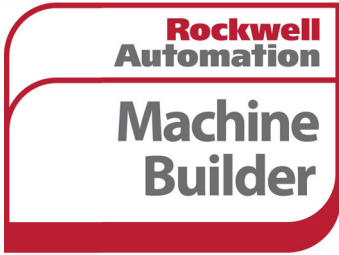
Nercon Is Part of Rockwell Automation's Machine Builder Program

Nercon is part of Rockwell Automation's elite Machine Builder Program. To become a part of the Partner Network program, Nercon demonstrated innovation and market leadership with conveyor and equipment that incorporates Rockwell Automation solutions.

Nercon's customers can expect a high level of support on Rockwell Automation technology used on Nercon equipment. Controls experts and application specialists at Nercon have frequent opportunities to collaborate with Rockwell Automation on product development and design reviews. Nercon controls designers and project engineers will also have knowledge and full access to new technologies from Rockwell Automation.

Through collaboration with Rockwell Automation, Nercon also helps customers develop an ongoing approach to plant-wide optimization, improve machine performance and achieve sustainability objectives.

Rockwell Automation, Inc., headquartered out of Milwaukee, Wisconsin, is the world's largest company dedicated to industrial automation and information. For more information, visit www.rockwellautomation.com/partners.



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