

THE BENEFITS OF CONNECTORIZED I/O

Plug-and-play connectorization has been standard practice in industries ranging from appliance manufacturers to industrial sensors for many years. These industries have found it necessary to compete in a business climate where speed and consistency of connection is king. Connectorization is the perfect complement to fieldbus systems. The concepts and goals are identical: reduced installation, reduced troubleshooting and easy expansion. The fieldbus system minimizes point to point wiring which can be time consuming and difficult to troubleshoot. Connectorization takes that one step further, almost completely eliminating troubleshooting. Troubleshooting costs can be significant, but difficult to measure during the initial planning stages. Plants that have implemented plug-and-play connectorization claim up to 75 percent reduction in start-up costs. These are real cost savings.

Cost Savings

The initial capital cost is the major factor in selecting a method of connecting devices. These include material and installation costs. Incorporating plug-and-play connectivity can result in 10-60 percent savings. Actual savings will depend on the size and complexity of the installation.

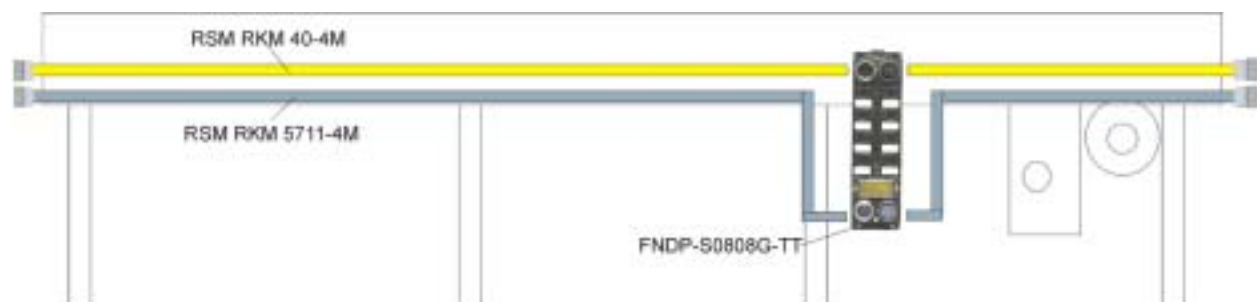
Other savings include reduced design, maintenance, troubleshooting, and expansion costs. Although some of these cost savings are difficult to determine until the condition exists, they quickly change from potential cost savings to real cost savings when the installation begins.

Modular Design

Connectorized networks allow for modularity. By their very nature, traditional wiring methods are not modular. You cannot easily modify an electronic control system using conduit and individual wires. By contrast, connectorized networks can be modified and designed quickly and easily. This significantly reduces both design and manufacturing time.

Example of a Typical Conveyor System

Modular Section



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Overall Layout



D = Diverter Sections (4) M = Middle Sections (4) E = End Sections (4)

This conveyor system consists of (4) Diverter, (4) Middle, and (4) End sections.

The electrical controls for each section consists of the following network items:

- (1) FDNP-S0808G-TT
- (1) RSM RKM 5711- 4 M
- (1) RSM RKM 40- 4 M

In addition it includes:

- (1) Motor, and small starter enclosure (with 2 motors on the Diverter sections)
- (2) Proximity Sensors
- (1) Machine Stop Button

Design Costs

Since the modular system consists of predefined sections, the preliminary design and costing steps can often be done much quicker. Using the above conveyor system example, each section already has a known cost associated with it. The system design is simply a list of the modular sections. (Costs are in U.S. dollars)

	Connectorized Modular Design	Time	Cost	Traditional PLC Design	Time	Cost
	Create System Design and Bill of Material	16 hours	\$448	Create System Diagram	32 hours	\$896
				Layout Main Panel	32 hours	\$896
Total Design		16 hours	\$448		64 hours	\$1792

Material Costs

Material costs for the connectorized modular design are typically higher than the traditional PLC design. In this example we have the following: (Costs are in U.S. dollars)

	Connectorized Modular Design	Qty	Cost	Traditional PLC Design	Qty	Cost
Main Control Panel	Small Panel	1	\$275	Large Panel	1	\$625
Wiring Tray for I/O					240 ft	\$240
Network Cable for I/O	RSM-RKM-5711-4.0M	12	\$626	18 AWG Cable	3000 ft	\$540
Power Cable	RSM-RKM-40-4.0M	12	\$550			
Cable for Motors	Group Motor Cable	120 ft	\$60	Individual Motor Cable	2000 ft	\$600
Cost of I/O	FDNP-S0404G-TT	12	\$3840	Input / Output cards	6-8 ea	\$1440
Total Material			\$4801			\$3445

Installation Savings

The cost of installing a plug-and-play system can be 90 percent lower than cage clamp terminations. The time required to make a plug-and-play connection is less than 30 seconds per connection. The time required to strip the jacket, prepare the conductors, feed the cable through a gland, insert the wires into the terminals and tighten the cable gland is 5 to 10 minutes per connection. This is often complicated when the installation is in a physically demanding location. At a labor rate of \$28.00/hour per NECA labor units, costs add up fast. Terminating this many connections on just a 6-port junction brick means a difference of \$33.00 as compared to \$3.30. Additionally, the real savings are often still hidden since connectorized costs do not take into consideration the savings from the elimination of wiring errors. (Costs are in U.S. dollars)

	Connectorized Modular Design	Time	Cost	Traditional PLC Design	Time	Cost
Wiring I/O	2 Electricians	4 hours	\$224	Make 144 screw terminals, Pull 24 cables - 2 Electricians	2 days	\$896
Troubleshooting and ringing out system	2 Electricians	½ hour	\$28	2 Electricians	2 days	\$896
Total Installation			\$252			\$1792

Add It Up

The total cost to design and build the above connectorized conveyor example is 20-25 percent less in terms of direct costs. (Costs are in U.S. dollars)

	Connectorized Modular Design	Traditional PLC Design
Design Cost	\$448	\$1792
Material Cost	\$4801	\$3445
Installation Cost	\$252	\$1792
Total Cost	\$5501	\$7029

In addition to these savings, there are other indirect benefits that are actually much more significant.

- 80 percent Shorter Design Cycle
- 80 percent Shorter Installation Cycle
- 80 percent Reduced Maintenance/Down Time

Shorter Design and Installation Cycles

Drastically reducing the design and installation cycles results in a tremendous benefit to the manufacturer. It allows them to build much more equipment without increasing the physical size of their facility. It also allows them to meet demanding customer deadlines more easily.

Maintenance/Down Time Savings

One of the most important features of connectorized networks is that repairs can be made in minutes instead of hours. Any section of a connectorized network or I/O cable can be replaced in seconds. Fully connectorized fieldbus networks essentially eliminate signal wire troubleshooting and repair.