

Application Highlight



2500 Series® Programmable Automation Control System

Upgrading and Integrating Variable Frequency Drives into an Existing Controls System Utilizing EtherNet/IP™ and CTI's 2500P- ACP1 Application Coprocessor

Looking to replace aging variable frequency drives used for one of its plant's systems, Collins Products, a leading manufacturer of wood products, chose a Smart Modernization™ solution from CTI utilizing 2500P-ACP1 Application Coprocessors and 2500 Series® CPUs communicating with the new drives over EtherNet/IP.

Collins Products is a leading supplier of particleboard, hardwood and softwood as well as TruWood™ Siding and Trim products. It was founded in 1855 by T.D. Collins and is still family-owned to this day. Corporate offices are in Wilsonville, OR, and there are six US plants.

Summary

In order to upgrade its variable frequency drives and integrate them into its existing controls system using EtherNet/IP, Collins Products turned to CTI for a phased Smart Modernization plan. The results: several significantly modernized processes using state-of-the-art variable frequency drives delivering high performance and high-quality data to its existing controls system with minimal downtime and at a low cost.

A long-term customer of CTI, Collins Products has a large installed base of CTI and/or Siemens/TI® PLCs throughout their operations, particularly in their Klamath Falls, OR plant. Historically, they have leveraged the built-in Profibus DP master communication port on the CTI 2500 Series PLC CPUs to communicate to Rockwell® Variable Frequency Drives. This has proven to be a very reliable communication network. Like many customers, however, as opportunities for automation upgrades have arisen, Collins has been transitioning to Ethernet-based remote I/O protocols such as EtherNet/IP.



The Problem: How to Integrate New E/IP Variable Frequency Drives into Existing Controls System?

Neal Genge, Process Control Engineer at the Collins Products plant in Klamath Falls, Oregon, approached CTI in Spring 2017 about Collins' desire to leverage the EtherNet/IP (E/IP) protocol for an upcoming variable frequency drive integration project in the plant's Silo Outfeed System. The Silo Outfeed System supplies wood chips to the fiber-making area. Its primary mechanical components consist of three silos, screw conveyors and surge bins. Although Collins Products Engineering group typically replaces drives once they reach 15 or more years of age, the AB® Series 1336 drives in this process area were 20+ years of age and were controlled manually – with hardwire control. Collins had selected Rockwell 755 drives to replace these existing AB Series 1336 drives and needed a solution for integrating them into the control network over E/IP.



During discussions in Spring 2017, CTI proposed the use of a high-performance coprocessor module for its 2500 Series PLCs: the 2500P-ACP1 – Application Coprocessor or “ACP1.” This Advanced Function Module includes high-speed processing and multi-protocol communications support to provide existing systems with a significant increase in performance, features, and functionality. With minimal programming, the ACP1 provides users with the ability to master an EtherNet/IP (E/IP) network. Collins Products selected CTI's proposed solution of the ACP1 module and a CTI 2500-C300 PLC CPU for the project.

The Solution: Smart Modernization Plan Using CTI's 2500P-ACP1 Coprocessor Module

The project kicked off in Fall of 2017 with the goal of upgrading eleven Series 1336 Allen Bradley® drives to significantly newer Rockwell 755 drives using CTI's 2500 Series PLC system to control them over E/IP. The project was implemented in phases. As part of the project, Collins was able to leverage a feature within the Rockwell 755 drives that enables bringing in non-drive control-related I/O signals thus having the drive behave much like a remote I/O rack on a PLC system. This has resulted in considerable wiring savings since Collins does not have to run signal wires all the way to the nearest CTI remote I/O rack on the process. The drive itself transmits these I/O points over E/IP.

A Phased Approach

Phase 1 of the project consisted of upgrading and networking the drives on the silos. The silo drives were selected for phase 1 due to having the easiest access and

a simplified control strategy. Seven drives were networked over E/IP using the ACP1 as the master and the 2500-C300 CPU as the controller and have been running without issue since May 2018. Phase 1 took approximately 4 months to complete so that it caused minimal disruption to plant operations. There were no complications in adding these new drives into the system.



In September 2018, the second and final phase began. Collins engineers upgraded the 5HP drives in the screw conveyors. This completed the project bringing the final 4 drives of the 11 identified at the outset of the project into the ACP1 module via E/IP. Phase 2 was completed in early January 2019.

Due to the success of the first phase of the project and positive indicators from the second phase of the project that was underway, in December 2018, Collins added an E/IP Drive Controller Board on an existing 500HP drive in the BioFilter area. With this update, the Rockwell drive is now communicating to the CTI PLC using Profibus and E/IP simultaneously. Collins is satisfied that this will aid them in the complete conversion to E/IP for communicating to the drive.

For all phases of the project, the integration of the drives required no additional PLC programming by Collins to get the data into the CTI controller. Pertinent drive parameters are accessible via a user-defined V-memory table or via specific WX and WY locations. The table below shows the drive variables that are currently being monitored/controlled by the CTI 2500-C300 CPU and ACP1. In addition to the variables below, Collins Products is also monitoring the drives' motor and drive temperatures and the health of the E/IP network in its Wonderware® host system.



PLC IO Config Start Address: V30000						
Port	P#	Item	Description	Value	Form	PLC Address
0	301	ADV. PARAMETER SET		2 [expert]		
0		Logic Command	2 words - Stop/Start/Etc. Automatically set to port 13; no configuration necessary		Bits	V30000
0	545	Speed Reference	Port 0:Port 13 Reference (ethemet)	877	real	V30002.
13	1	DL From Net 01	Port 0: 1700 User Data integer	1700	Integer	V30004 / V30005
13	2	DL From Net 02	Port 4: Dig Out Setpoint 40007=to control output relay; Disable=not used	Disable	Bits	V30006 / V30007
13	3	DL From Net 03	Port 0: Accel Time 1 Set to 535=Accel 1 from Ethernet; Disable=not used	Disable	real	V30008.
13	4	DL From Net 04	Port 0: Decel Time 1 Set to 537=Decel 1 from Ethernet; Disable=not used	Disable	real	V30010.
13	5	DL From Net 05	Port 0: Accel Time 2 Set to 536=Accel 2 from Ethernet; Disable=not used	Disable	real	V30012.
13	6	DL From Net 06	Port 0: Decel Time 2 Set to 538=Decel 2 from Ethernet; Disable=not used	Disable	real	V30014.
13	7	DL From Net 07	Disabled	Disable		V30016
13	8	DL From Net 08	Disabled	Disable		V30018
13	9	DL From Net 09	Disabled	Disable		V30020
13	10	DL From Net 10	Disabled	Disable		V30022
13	11	DL From Net 11	Disabled	Disable		V30024
13	12	DL From Net 12	Disabled	Disable		V30026
13	13	DL From Net 13	Disabled	Disable		V30028
13	14	DL From Net 14	Disabled	Disable		V30030
13	15	DL From Net 15	Disabled	Disable		V30032
13	16	DL From Net 16	Disabled	Disable		V30034
		Logic Status	2 words - Stop/Start/Etc. Automatically set to port 13; no configuration necessary		32 Bits	V30050 / V30051
		Reference	Feedback Real # speed ref in Hz. Automatically set to port 13; no configuration necessary		real	V30052.
13	17	DL To Net 01	Port 0: Output Voltage	8	real	V30054.
13	18	DL To Net 02	Port 0: Output Current	7	real	V30056.
13	19	DL To Net 03	Port 0: Output Power	9	real	V30058.
13	20	DL To Net 04	Port 0: DC Bus Volts	11	real	V30060.
13	21	DL To Net 05	Port 0: 1700 User Data integer	1700	32b int	V30062 / V30063
13	22	DL To Net 06	Port 0: Alarm Status B	960	32b int	V30064 / V30065
13	23	DL To Net 07	Port 0: Alarm Status A	959	32b int	V30066 / V30067
13	24	DL To Net 08	Port 0: Last Fault Code	951	32b int	V30068 / V30069
13	25	DL To Net 09	Port 4: Dig In Sts	40001	32b int	V30070 / V30071
13	26	DL To Net 10	Port 4: Anlg In0 Value	40050	real	V30072.
13	27	DL To Net 11	Port 4: Anlg In1 Value	40060	real	V30074.
13	28	DL To Net 12	Port 0: IGBT Temp 0-200°C	942	real	V30076.
13	29	DL To Net 13	Disabled			V30078 / V30079
13	30	DL To Net 14	Disabled			V30080 / V30081
13	31	DL To Net 15	Disabled			V30082 / V30083
13	32	DL To Net 16	Disabled			V30084 / V30085

Table 1: Variables Controlled/Monitored by CTI ACP1 and 2500 Series PLC



Upgrade Result

According to Neal Genge, Process Control Engineer for the Klamath Falls plant:

We are very happy with the ease of integration and performance of the CTI ACP1 with the 2500-C300 PLC processor mastering our E/IP network. This will be our "standard" control method as we network additional drives in our plant. We see adding other "smart" E/IP devices within this design framework as they become available.

In summary, the customer was very pleased to modernize several of its processes with minimal cost, downtime or reprogramming. The project exemplifies CTI's commitment to our customers to provide solutions that exceed expectations, respect the value of their existing investment, are cost effective, and have minimal impact on operations.

At CTI, that's what we call Smart Modernization.™



Collins Products' Klamath Falls, OR plant

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