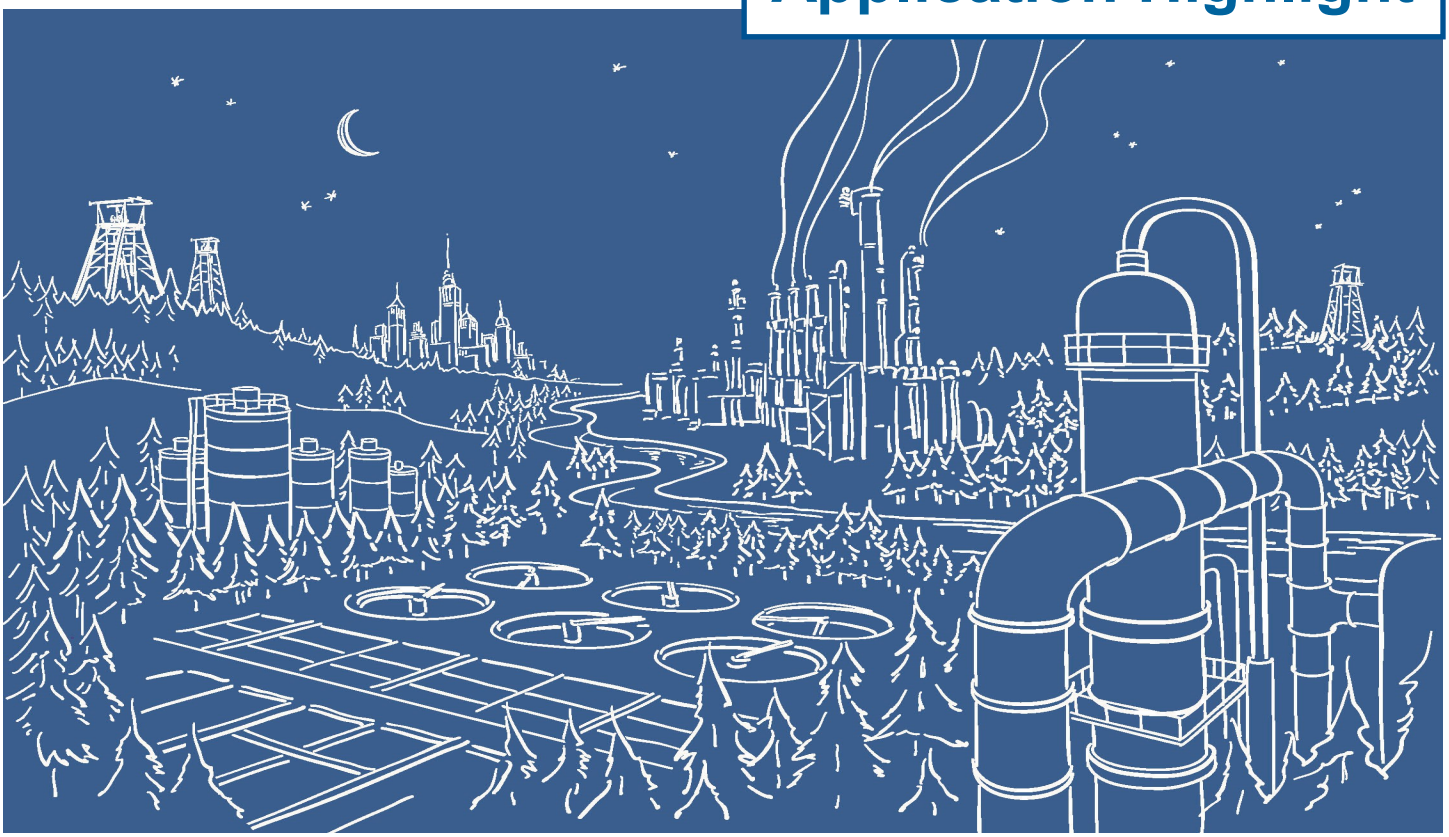
# Application Highlight



# 2500 Series®
# Programmable Automation Control System

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


**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.


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 2500-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.

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 co-processor module for its 2500 Series PLCs: the 2500-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 2500-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 (ethernet) | 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<br>40007=to control output relay; Disable=not used | Disable | Bits | V30006 / V30007 |
| 13 | 3 | DL From Net 03 | Port 0: Accel Time 1<br>Set to 535=Accel 1 from Ethernet; Disable=not used | Disable | real | V30008. |
| 13 | 4 | DL From Net 04 | Port 0: Decel Time 1<br>Set to 537=Decel 1 from Ethernet; Disable=not used | Disable | real | V30010. |
| 13 | 5 | DL From Net 05 | Port 0: Accel Time 2<br>Set to 536=Accel 2 from Ethernet; Disable=not used | Disable | real | V30012. |
| 13 | 6 | DL From Net 06 | Port 0: Decel Time 2<br>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



Control Technology Inc.
5734 Middlebrook Pike, Knoxville, TN 3792
Phone: +1.865.584.0440 Fax: +1.865.584.5720
www.controltechnology.com