CYPRESS ENVIROSYSTEMS

Cypress EnviroSystems Application Note

Compressed Dry Air System Energy Savings

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Energy Savings Opportunity: Compressed Dry Air (CDA) System

Many industrial plants use compressed dry air to operate pneumatic tools and equipment. Back in the days when energy was relatively inexpensive, the compressors for these systems were often set to deliver high pressure at all times. However, this is a waste of energy since most of the pneumatic equipment actually does not require higher pressure to operate adequately.

With the advent of much higher energy prices, many plant operators are now carefully assessing how they can lower the supply pressure and therefore reduce duty cycle and energy use of the compressors.

The Challenge:

Capturing the energy savings involves reducing the supply pressure sufficiently to save energy, but not by so much that the operation of the pneumatic equipment is affected. This is not a simple as it may seem. A CDA supply line usually feeds multiple downstream branches, and depending on which combination of equipment is operating at what time, different branches can experience different flow rates and pressure drops.

Therefore, before reducing the supply pressure, it is important to monitor the existing pressures and flow under different operating scenarios to obtain an accurate characterization of the system. Then, once an accurate picture is obtained, the supply pressure can be reduced and different flow and pressure regulators adjusted. To avoid impact to production quality and yield, it is essential that the system is monitored such that at no time should the pressure drop below the required level at any of the branches.

Unfortunately, most existing CDA systems do not have automatic monitoring systems installed. Most only have manual dial gauges used for troubleshooting, and no easy way to obtain neither real-time data, nor alarming and notification. Some plant operators have elected to install transducers to augment the dial gauges. However, this involves a host of costly and time consuming activities:

- breaking pressure seals
- disrupting the production process,
- performing leak checks
- running wiring/conduit
- creating new drawings
- reviewing and approving drawings
- procuring new I/O cards

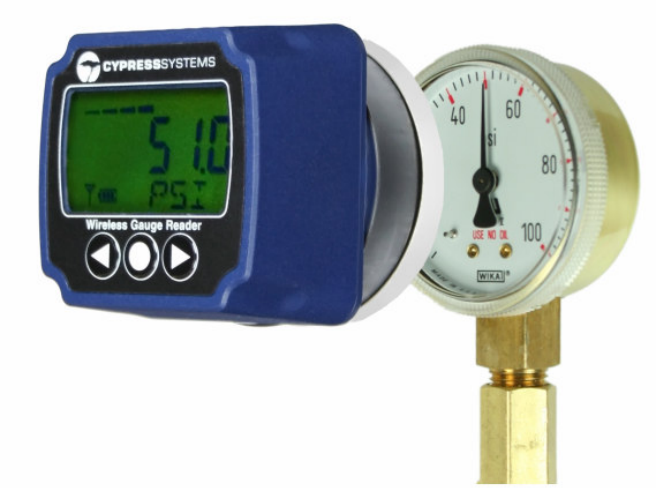
Cypress Envirosystems customer surveys have indicated that the total cost of adding new transducer points to an operating CDA system ranges from $3,000 to $6,000 per point, and may be even higher for plants which are running close to capacity and production is disrupted.

The Cypress Envirosystems Solution:

Instead of using hard-wired transducers which incur the disruption and cost just described, plant operators can now use the new Cypress Systems Wireless Gauge Reader (WGR).

This technology non-invasively clamps on top of existing gauges already installed in the CDA system, and transmits the readings wirelessly to a central receiver and server for monitoring, trending, graphing, alarming and historization. Each WGR installs in minutes, and does not involve breaking seals, leak checks, or production downtime.

Figure I – Non-invasive Wireless Gauge Reader clamps onto existing gauges in minutes



Application Example:

A factory in Ohio has a 750 hp compressor driving their CDA system at a supply pressure of 125 psi. The compressor runs at an average duty cycle of 50%. The annual cost of electricity to operate the compressor is about $123,000.

Over the years, the plant production mix has changed, and some production has been moved to other locations offshore. The plant manager believes that it is no longer necessary to operate at a supply pressure of 125 psi, since there is now less equipment with lower flow rates required, and lower associated pressure drops. In fact he believes that he can safely reduce the supply pressure to 85 psi and still operate acceptably in most circumstances.

Reducing the supply pressure from 125 psi to 85 psi is expected to save about $39,000 per year in electrical costs (at 5 cents per kWh), and also reduce the wear and tear and associated maintenance on the compressor.

Figure 2 – Energy savings calculation for lower compressor pressure

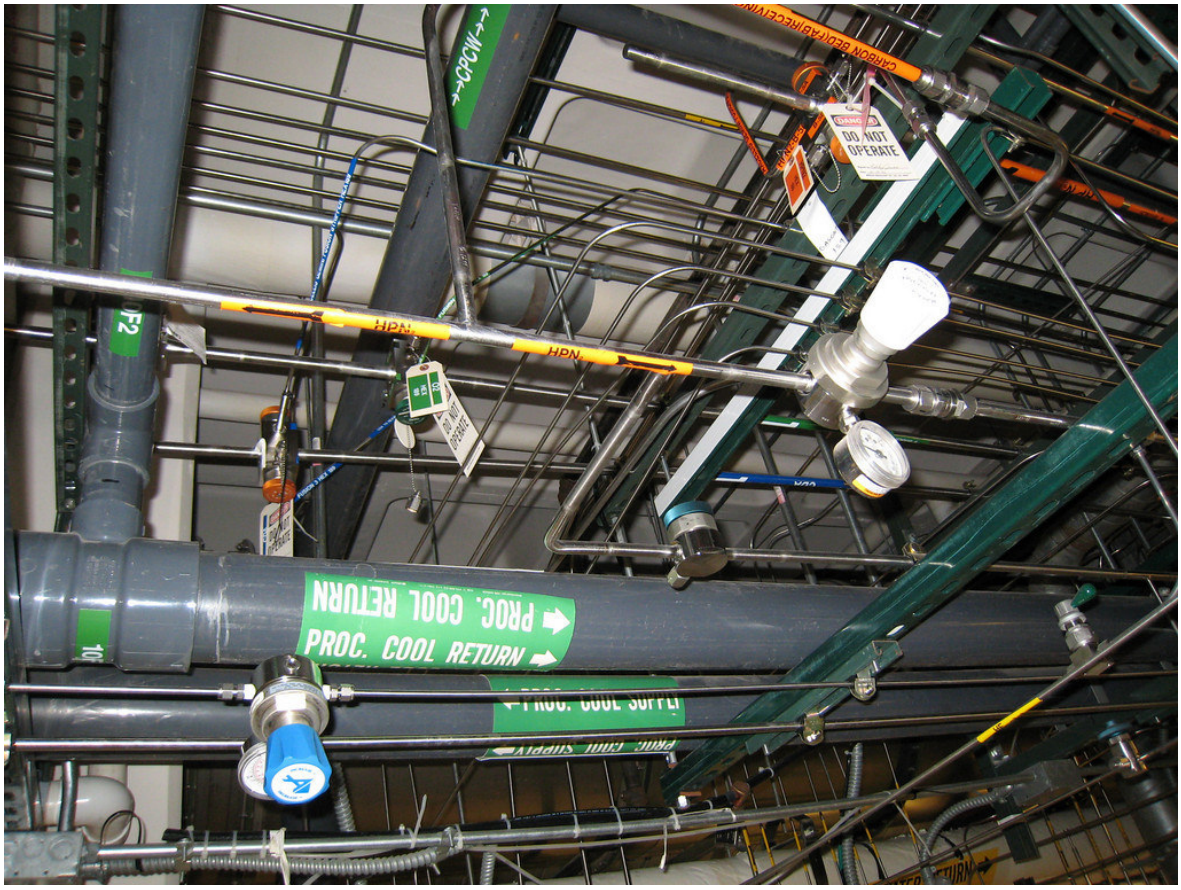
750 hp compressor power consumption	560	kW
Hours in one year	8,760	hours
Duty cycle of compressor	50%	
Energy used per year	2,450,610	kWh
Cost of Electricity	5	cents per kWh
Energy Cost per year (125 psi setting)	$122,531	
Est. Savings (85psi setting)	32%	Lower energy use
Est. Savings (85psi setting)	**$39,210**	**Dollar savings**

The compressor supplies compressed air to18 different downstream branches which has multiple tools and equipment on each branch connected to the CDA line. The plant has a batch type production process, which means that different equipment cycles on-and-off at different times to produce batches. Depending on the combination of equipment that is operating at a given time, the air flow and the pressure drops may vary by 25 psi or more at different branch locations.

The CDA energy savings opportunity has been identified at a corporate level as a high priority project to undertake to reduce energy costs. To get started on this project, the main work required is to install a monitoring system to characterize the operating modes and pressures, and a notification/alarm system to ensure that maintenance staff be alerted should pressures fall too low. The plant staff would like the monitoring data to be tied to their existing Siemens Apogee automation system.

Monitoring points are needed on each CDA branch line (18 locations total), distributed across 30,000 sq-ft of manufacturing area. The existing Apogee system has controller and I/O panels around the perimeter walls of the manufacturing area. Most of the monitoring points are about 60 to 100 feet away from the nearest Apogee I/O panel. Some of the I/O panels do not have spare analog input cards and cannot accommodate any more points.

Figure 3 – Typical branch line with manual gauge and pressure regulators



The plant manager considered two different options for implementing the monitoring system:

Option 1: Traditional Wired Transducers

The traditional transducers would be installed by adding pressure ports on the branch lines and conduit run for signal and power lines from the transducers to the nearest Apogee panel. Additional I/O cards or modules would be installed to accommodate the new points where necessary. Plant operators would be able to monitor values and receive alarms via the Apogee system. Estimated time to install this system is 170-man hours, over 1.5 calendar months.

Option 2: Wireless Gauge Readers

The Wireless Gauge Readers would be installed by clamping them onto existing manual dial gauges at the different branch locations. The units are battery powered (3-5 year life) and do not require power nor signal cabling. Readings are transmitted wirelessly to a central Cypress receiver/server and are optionally passed onto the Siemens Apogee system via an industry standard OPC interface. Plant operators would be able to monitor values and receive alarms via the Apogee system, or via the built-in Cypress Envirosystems web interface and cell/pager notification system. Estimated time to install this system is 15 man-hours, over two calendar days.

The plant is running at close to maximum capacity, which means that any need to shutdown equipment affects production and plant revenue, is very costly. Figure 4 shows the comparison of the upfront costs for implementing the two different options.

Figure 4 – Comparison of Installed Cost per Point for Traditional Transducers vs. Wireless Gauge Reader

	Wireless Gauge Reader	Wired Transducer
Transducer/Sensor	$1,200	$400
Install/Wiring, Leak Check Labor	$50	$1,000
Drawings, Reviews	$0	$400
I/O Panel/Termination	$0	$300
Process Downtime	$0	$1,700
Total Cost (per point)	$1,250	$3,800

Figure 5 shows the payback analysis for the two options. The wireless gauge reader option would achieve a payback of 7 months, while the traditional wired transducers would achieve a payback in 1.7 years (21 months).

Figure 5 – Payback period calculation

	Wireless Gauge Reader	Wired Transducer
Total cost to implement monitoring (18 points)	$22,500	$68,400
Energy Savings achieved	$39,210	$39,210
Payback Period (years)	**0.6**	**1.7**

About Cypress Envirosystems:

Cypress Envirosystems is a subsidiary of Cypress Semiconductor (NYSE: CY). Its mission is to save energy and improve productivity in older plants and buildings, using state-of-the-art non-invasive and wireless technologies to minimize disruption and cost, delivering payback of 12 months or less. More information is available at: www.cypress.com/systems or call (408) 943-2800.