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Automation NOTEBOOK®

Summer 2012 Issue 23

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For those who prefer to speak with us in person, please call 1-800-633-0405 x1845. Thanks for your interest, and we look forward to hearing from you.

Editor's Note

What a year we are having at AutomationDirect! Several product additions have been launched so far; many of which you will read about in this issue of NOTEBOOK. Plus, there are many more heading down the pipe. We often share news of our award-winning customer service and our top rankings on various reader polls. Perhaps one of our greatest achievements is being ranked by our co-workers. This past April, the Atlanta Journal-Constitution named AutomationDirect as the Top Mid-size Workplace in the Metro Atlanta area. Our employees voted the company to the top position in the medium-size company category by completing an online survey which covered areas such as company direction, workplace conditions, execution, management, career, and pay and benefits. Also, our company captain Tim Hohmann was among the heads of three companies receiving the Leadership award, honoring those who lead by example.

In this issue of NOTEBOOK, we focus our Student Spotlight on a group at San Diego State University. They recently participated in a theatre technology expo, where they demonstrated how PLCs can work in theatre and on stage. Our User Solution story details how products from AutomationDirect have helped a California company simplify the production of biodiesel while lowering production costs as well. Plus, be sure to read the Product Manager's Corner to learn about the latest and greatest our Productivity3000 controller has to offer.

There's a lot more, including the ever-popular Breakroom. Test your wits to see if you can solve the mind teasers. But, most of all, sit back, relax, and turn the page…

TJ Johns
Coordinating Editor
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New Product Focus

what's new

Industrial Strength Enclosure Heater and Enclosure Lighting Options

STEGO enclosure heaters, thermostats, hygrostats and hygrotherms protect against condensation while providing the greatest possible air circulation.

Touch-safe convection heaters are designed to utilize natural convection, resulting in a circulating current of warm air while minimizing surface temperatures on the accessible side surfaces of the housing. The compact, DIN rail-mountable units are available in 12 to 30V AC/DC and 120 to 140V AC/DC models and with heating capacities ranging from 10W to 150W (depending on model). Touch-safe convection heaters start at $24.25.

Fan heaters with an operating voltage range of 100 to 120VAC are available in screw-mount and DIN rail-mountable versions as well as panel-mount and foot-mount models. Designed with high-performance axial fans, the units provide forced air circulation to prevent the formation of condensation and ensure evenly distributed air temperatures. Screw-mount and DIN rail-mount units have heating capacities of 150W to 650W (depending on model) while panel-mount and foot-mount versions have 950W or 1200W heating capacities. Panel-mount and foot-mount models are designed with integrated adjustable thermostats and built-in overheat protection. Fan heater prices start at $86.75.

DIN rail-mountable enclosure thermostats have also been added. Tamperproof styles available in normally-open and normally-closed models feature fixed set points and are available in single and dual versions. Adjustable thermostats available include single units in normally-open and normally-closed models as well as dual units containing one normally-open and one normally-closed thermostat with separate color-coded adjustable temperature controls. Thermostat prices start at $12.

Electronic hygrostats sense relative humidity and activate the enclosure heater at a setpoint to help prevent the formation of condensation within the enclosure. Available in two models (120VAC and 230 VAC), the DIN rail-mountable electronic hygrostats feature adjustable relative humidity setpoints (40% to 90% RH), high switching capacity and a visual function display. Hygrostat prices start at $55.

Electronic hygrotherms provide efficient temperature and humidity control. With a temperature setting range of 32°F to 140°F and a humidity range of 50% to 90%, the unit is designed with a high switching capacity and optical function display. The hygrotherm senses the ambient temperature and relative air humidity. The unit then turns a connected device either on or off if either the temperature is below or the humidity is above the set point. Hygrotherms are priced at $82.75.

LED lights suitable for panels and enclosures have also been added. Available with either On/Off switch or motion sensor, and in magnet-mount and screw-mount versions, the powerful output allows up to 10 lights to be connected together. LED light prices start at $67.50.

See the full line of Enclosure heaters at: **www.automationdirect.com/enclosure-climate-control**.

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C-more micro

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FREE programming software offers the choice of using many built-in objects, such as buttons, bar graphs and data entry keypads. Or import your own custom graphics, and save to libraries for use in multiple projects. Alarm control, recipes and a built-in project simulator are time-saving tools for more complex applications. All these features at a competitive price, in a rugged and reliable package, give you a sweet HMI for even the smallest control system.

* The programming software is free when downloaded from the AutomationDirect Web site, or the CD-ROM package can be purchased for $25 (part # EA-MG-PGMSW).

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Product Snapshots

Press Releases

Jefferson Electric Buck-Boost Transformers

Buck-boost transformers from Jefferson Electric are designed to maximize the performance and life of electrical equipment, such as air conditioners, heating elements, 277-volt lighting systems, and in motors applications. Also called an isolation transformer, typical use is to power loads with specific voltage requirements which differ from the available line voltage.

Jefferson Electric 60Hz single-phase buck-boost transformers, with 50VA to 2kVA ratings, are encapsulated with electrical-grade resin, featuring high-quality electrical steel cores. The NEMA 3R-rated enclosures are heat-cured with an ASA-61 gray powder coat finish and have slotted mounting holes for quick and easy mounting.

A buck-boost transformer can have two main applications. When connected as an auto-transformer, you can buck (lower) or boost (raise) available line voltage anywhere from five to 20 percent. When used as an isolation transformer, it can be used to step-down supply power to low voltage circuits at the nameplate rating listed.

Buck-boost transformers start at $53 and are UL approved and are backed by a 10-year limited warranty.

Learn more at: www.automationdirect.com/buck-boost-transformers.

Stainless Steel Proximity Sensors

Our line of round bodied stainless steel inductive proximity sensors now includes 3-wire NPN output versions in 8, 12, 18 and 30mm models; also new are unshielded 3-wire 12, 18 and 30mm models. All models have a full 316L stainless steel barrel and sensing face that provides extreme durability in harsh environments, with standard quick-disconnect cable connections. Starting at $45, all units are cULus, CE and RoHS rated and have a limited life-time warranty. See the full proximity sensor line at: www.automationdirect.com/proximity

Metal Guard Foot Switches

Metal guard foot switches have been added to our line of product offerings. These switches, in single and double units, are designed with die-cast aluminum foot cover guards and heavy-duty ABS plastic bases and pedals.

Ideal for machines such as shearing and spinning machines, lathes, wrapping machines and riveting machines and presses, the foot switches are available in three operational formats: safety anti-trip, free moving and free moving maintained. The IP65 –rated foot switches feature two normally-open and two normally-closed contacts with snap action or slow action options available. Metal guard foot switch prices start at $59 and are backed by a one-year warranty. Learn more at: www.automationdirect.com/foot-switches

Pneumatic Solenoid Valve Cables and Connectors

The pneumatics product line now includes several high-quality connectors and cables designed for most popular pneumatic solenoid air valves and sensors.

Three-wire connector cables are available in five pin spacing formats (8mm to 18mm); a four-wire transmitter cable is also available in the 8mm format. Connector styles include DIN 43650 standard forms A, B and C; two DIN style industrial forms (B and C) are also offered. The 24V or 110V AC/DC models feature built-in surge suppression and yellow LED indicator and are rated for connecting with electronics. The 230V AC/DC models are rated for straight-wired products.

Select connectors are field-wireable; all connector styles are available with three and five-meter PVC jacketed cables. Because the connectors are not polarity sensitive, users follow solenoid, sensor, or other devices wiring diagrams for proper connection.

Cables and connectors for solenoid valves start at $4.75. For more product details, visit:
www.automationdirect.com/solenoid-valve-cables

Bryant Industrial Grade Duplex Receptacles and Watertight Wiring Devices and Accessories

The Bryant wiring devices line now includes extra-heavy-duty industrial grade duplex receptacles and watertight wiring devices.

Bryant industrial grade duplex straight blade receptacles feature a full-face, wrap around design molded of high-impact chemical-resistant nylon. Available in 15A and 20A versions, the receptacles are designed with a one-piece copper alloy grounding system with integral solid brass grounding contacts. Eight wiring pockets provide convenient feed-through back wiring and clamp-type terminals with brass terminal screws, and accept up to #10 wire; easy-access break-off tabs support two-circuit wiring. Available in gray or corrosion-resistant high-visibility yellow nylon, receptacles also feature a circuit ID marking area for clear identification of circuits. Industrial grade duplex receptacles start at $9.25.

Two-pole and three-pole watertight plugs and connectors have also been added. Recommended where moisture exists or casual submersion is possible, these devices are constructed with high-visibility yellow double-insulated thermoplastic elastomer housings. Individual neoprene bushings provide a watertight seal. Rugged PBT interiors provide excellent resistance to moisture and temperature. A tongue and groove plug-to-connector design provides optimum protection in wet and damp locations. The 15A and 20A connectors accept multiple cord diameters from #18/3 to #10/3; 30A models accept #8/4 cord. Watertight plugs and connectors start at $14.

Weather protective accessories, starting at $3.25, have also been added, including NEMA 1 non-conductive, impact-resistant thermoplastic elastomer portable outlet boxes, dual-receptacle covers and blank box cover plates. Learn more about the Bryant wiring devices at
www.automationdirect.com/watertight-wiring-devices

Field Wireable Connectors and T-couplers available

Field-wireable M8 and M12 connectors and T-couplers (T-splitters) are ideal for making patch cables in custom lengths from existing cables or bulk wire. Connectors are available in axial (straight) or right angle configurations and three, four, or five-pole versions. T-couplers are available in four and five-pole versions and come in four models: three models split Male M12 to two Female M12 connectors and one model splits one Male M12 to two Female M8 connectors. Connector prices start at $6.75. Learn more at:
www.automationdirect.com/idc-connector

Air Pilot and Manual Control Valves

The NITRA® line of pneumatic products has been extended to include air pilot valves, foot pedal valves, and manual control valves.

The AVS-5 series now includes

single and double-pilot directional control air pilot valves, offering spring return or center closed operation. All are body ported five-port (four-way) spool valves and are available in 1/8" to ½" NPT port sizes with flow coefficients from 0.67 to 2.79. AVS-5 series air pilot valves start at $14.

NITRA CVS series directional control foot pedal valves are five-port (four-way) spool valves designed for non-electrical operator control applications. Available in momentary or latching operation models, foot pedal valves feature a ¼" NPT port with a flow coefficient of 0.80. CVS foot pedal valves start at $25.50. The full line of NITRA air pilot valves can be seen at:
www.automationdirect.com/air-pilot-valves

Manual valves in toggle-style hand lever, push-pull, and rotary-style hand lever models have also been added. Constructed with aluminum alloy bodies, available port sizes are 1/8" to ½" NPT with flow coefficients from 0.78 to 5.29. Starting at $14, models are available in two or three-position detented styles. The new NITRA manual valves can be seen by visiting:
www.automationdirect.com/manual-air-valves.

Multi-Function Digital Timer/ Counter/Tachometers

The new CTT series multi-function devices are easily configured for operation as a digital counter, timer, combination timer/counter, or tachometer. The units offer selectable counting speeds up to 10,000 cycles per

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Product Snapshots

Press Releases

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second. Available in standard 1/16 DIN size, the series comes in 24 VDC and 100-240 VAC powered versions. Multiple transistor and relay output versions are available.

The devices feature double-line, six-digit, two-color LCD displays for counter, timer, or tachometer present values, setting values and menu parameters during setup. Parameters can be easily set using externally accessible DIP switches or the lockable keypad. Additional individual indicators are provided for inputs, outputs and functions.

CTT units are equipped with two outputs; Output 1 is a single-pole single-throw relay and NPN transistor that operate concurrently. Output 2 can be ordered as either a single-pole double-throw relay, or NPN transistor.

Priced at $69, CTT Series devices accept voltage and non-voltage inputs from a wide variety of NPN, PNP, or dry contact sensors. Learn more about CTT Series devices at: www.automationdirect.com/Counter-Timer-Tach.

Productivity3000 High-Speed Counter Input and Pulse Output Modules

The Productivity3000 programmable automation controller line includes three new modules.

The P3-HSO high-speed output module ($349) supports Pulse/Direction, Up/Down and Quadrature pulse outputs on each of two independent output channels. It has both line driver and open drain outputs

and features six general purpose high-speed inputs and four general purpose outputs. The module is fitted with six fault status LEDs, six input LEDs, and eight output status LEDs. Simple move, velocity move, and additional high-level instructions make it easy to implement application motion profiles.

The P3-HSI high-speed input module ($329) has both differential and single ended inputs. This module accepts Pulse/Direction and Quadrature signals on each of the two independent input channels. Equipped with four fault status LEDs, eight input LEDs, and four output status LEDs, it also provides four general purpose high-speed inputs and four general purpose 5-24 VDC 0.5 amp outputs.

The P3-16TD3P DC output module ($151) is a sinking/sourcing protected output module which provides 16 12-24 VDC sinking or sourcing outputs with four internally connected commons. LED indicators signify missing external 24 VDC, open load, over temperature, and over load current conditions.

Modules are UL and CE approved and backed with a two-year warranty. See the full Productivity3000 line at www.automationdirect.com/productivity3000.

Stainless Steel and Air Differential Pressure Transmitters

The ProSense SPT25 pressure transmitter series is engineered to meet many industrial, commercial and OEM pressure measurement applications. Compatible with many different media sensing applications, the all stainless steel welded thin film sensing element

provides very fast response time. With a pressure sensing range from vacuum to 5,000 psi, transmitters are designed to resist vibration, shock and EMI/RFI while providing high accuracy over a wide compensated temperature range. Models feature a ¼-inch NPT male threaded process connection and are available with linear outputs of 4-20 mA or 0-10VDC and with electrical connections of either a DIN 175301-803C L-connector or a two-meter integral shielded cable. SPT25 series pressure transmitter prices start at $109.

The ProSense DPTA series differential air pressure transmitters are precision engineered for accurate low differential pressure measurement of air and non-condensing, non-corrosive gases. Transmitters are equipped with an ultra-thin single silicon crystal diaphragm capacitive sensor to provide inherent repeatability and stability. These transmitters are designed with brass barbed pressure ports, removable terminal blocks and a rugged ABS housing for DIN rail or panel mounting. The series is available in ranges from 0.1 inches to 25 inches water column to measure positive, negative, and bi-directional pressures, with the ability withstand 15 psi overpressure without damage or calibration shift. Backed with a three-year warranty, prices start at $105. For more information on ProSense pressure transmitters, visit: www.automationdirect.com/pressure-sensors.

WERMA audible and visual signal devices

WERMA audible buzzers and optical beacon lights are designed for use on control panels and enclosures.

WERMA 22.5mm panel-mount electrical buzzers are available in 14 models and in 115V AC/DC and 24V AC/DC styles. Constructed of polycarbonate /ABS housing material, the electrical buzzers are designed to mount in a 22.5mm hole. Buzzers are available in continuous and pulse tone models with volume ranges of 80 to 100 decibels; certain models provide eight selectable tones and feature adjustable volume levels up to 100 decibels at one meter. Each buzzer is equipped with simple connector-plug connections.

Additional 22.5mm panel-mount continuous-tone (80 dB at one-meter) electrical buzzers feature LED indicators with either red or yellow lenses. The 150 Series buzzer is available in 24 VDC and 115 VAC models; the 450 Series buzzer with acknowledgement function requires 24 VDC and is silenced by simply pressing the front of the indicator. Prices for 22.5 mm panel-mount electrical buzzers start at $29.

LED and incandescent beacon lights have also been added and are available in red, green, yellow, clear and blue. Two-wire, high-intensity LED 29mm diameter beacons are available in panel-mount styles, or M20 threaded base versions for use with limit and cable-operated switches. Available in 24 VDC and 115 VAC styles, prices for 29mm beacons start at $55.50.

WERMA 57/58 mm diameter beacon lights are available in permanent incandescent, LED and Xenon flashing models. Designed for use in 22.5 mm standard control panel holes, the beacons provide 360-degree visibility. Incandescent models require a maximum 48V while LED and Xenon flashing models require either 24 VDC or 115 VAC power. Designed with 6.3 mm x 0.8 mm spade connectors, the beacons are finger safe when used with insulated spades. Prices start at $28.50.

Also added are 75mm diameter beacon lights in blinking, rotating or permanent LED models, as well as flashing Xenon and permanent incandescent models. LED and Xenon styles are available in 24 V AC/DC and 115 VAC models while incandescent models require up to 250V (depending on bulb selection). Beacons feature high-impact polycarbonate lenses available in red, green, yellow, clear or blue. Incandescent bulbs are sold separately. Prices for 75mm beacons start at $37.

See the full line of WERMA audible buzzers and optical beacon lights and accessories at: **www.automationdirect.com/signal-devices.**

Bryant cord grips

The Bryant wiring devices line now includes wire and cable grips, strain reliefs, support grips, and pull grips.

Bryant cord strain relief grips are used to connect cable enclosures and industrial equipment and prevent cable pullout at the point of termination. When used in conjunction with bus drop support grips and safety springs, the devices are an integral part of an overall cord support and strain relief system.

Deluxe strain relief grips, suitable for indoor and outdoor applications, are corrosion resistant and feature endless stainless steel wire mesh weave to provide easy installation and arc-of-bend control; grips are designed with aluminum fittings and oil-tight, water-tight and dust-tight neoprene bushings. Starting at $29, deluxe cord strain relief grips accommodate a cable diameter range of 0.187" to 1.687".

Dust-tight strain reliefs are designed for use in bus drop grip systems, motor connections, panel boards and internal wiring of machines. The dust-tight grippers are constructed of galvanized steel mesh, and are offered in models for use with cable diameters from 0.32" to 1.70". Designed for indoor use only, the dust-tight grips start at $9.

Standard duty support grips, for indoor and outdoor use, are applied to vertical or horizontal runs of cable or service lines to support dead weight. Designed with strand equalizers to reinforce gripping strength and distribute loads equally, standard duty grips accommodate 0.54" to 1.74" cable diameter ranges. Standard duty support grips start at $15.50.

Light duty bus drop support grips, for indoor use, support flexible cable where it connects electrical equipment to bus duct. The single variable weave grips are made of galvanized steel for additional holding power in abrasive environments and attach to 0.24" to 1.25" cable diameter ranges. Bus drop support cable grips start at $7.

Galvanized steel low-tension pulling grips are ideal for use in utility work, industrial and commercial building service lines, and underground transmission line stringing. The single weave variable mesh provides uniform positive grip power while protecting lines from abrasion. The reusable grips are fitted with a flexible eye which easily attaches to pulling line snake or fish tape. Starting at $15, low-tension pulling grips are available for 0.25" to 1.74" cable diameters. Learn more about the Bryant wiring cord grips at **www.automationdirect.com strain-relief-grips**.

Feature Story

Cloud Computing

Cloud Computing in the Forecast

Cloud-based applications promise to deliver benefits for industrial applications, but implementation challenges exist.

By Christine Lesher

Cloud computing is becoming increasingly attractive for business and personal applications where its low cost solutions and fast deployment help companies and individuals save time and money.

Many people already use the cloud for document management, data backup, Web mail, and music and video storage. These applications are free or very inexpensive, and reliable enough for the most part.

More businesses are taking advantage of cloud-based applications to help streamline their operations and reduce costs. As reported in the Industrial Networking Q2 2012 cover story "The Cloud is Coming," a recent report from The Economist Intelligence Unit and IBM indicates that 90 percent of America corporations plan to use the cloud in their organization by 2015.

Businesses are using the cloud in similar ways to individuals for data storage, Web mail and large data file transfers like software downloads. Some companies have gone to the next step by outsourcing entire functions, switching to a software-as-a-service (SaaS) model in which the cloud provider hosts an application accessed via a thin client or a Web browser. An example of this is a customer relationship management service, such as Salesforce.com, in which users pay a monthly fee for the service, as an alternative to in-house software and databases.

Real Benefits

It's easy to be skeptical about the benefits of cloud computing as many have become immune to the hype about the latest technologies. However, the cloud really does provide significant benefits, especially in terms of cost reductions when compared with in-house systems.

For example, data storage and backup have traditionally been the realm of in-house IT departments that install and manage the software, servers, etc. However, many businesses are choosing cloud providers for data storage because economies of scale result in extremely low fees. For this and other applications, using a cloud provider eliminates or dramatically reduces labor, purchasing and maintenance costs associated with implementing an in-house solution.

Another important benefit to cloud computing is faster deployment and upgrades. Since the cloud provider handles all the deployment and upgrades, a SaaS application can be deployed in as little as an hour or two, instead of the weeks or even months required for an in-house solution.

The cloud, as a remote application, often simplifies and expands remote data access. No longer do companies need to maintain a virtual private network (VPN) to enable access to applications.

The Cloud for Industrial Manufacturing

While cloud computing isn't as common in the industrial automation world, its benefits are making it more attractive for industrial applications. However, simply duplicating the same type of applications and architecture used for other businesses isn't the best way to introduce cloud computing to industrial manufacturing, due to the unique needs of the automation sector.

Industrial applications rely heavily on real-time data, and at present it's difficult to see industrial users depending on cloud computing to deliver this type of information. Nevertheless,

Why Use the Cloud Instead of In-House IT?

1.	Add new resources on demand when and if needed
2.	No need to purchase redundant hardware and software licenses
3.	No need to set up disaster recovery sites that may not be used
4.	Faster deployment of new applications
5.	Higher speed downloads
6.	Provides huge amounts of storage capacity that can be purchased incrementally
7.	More paths for uploads and access purchased incrementally
8.	24/7 maintenance services
9.	More comprehensive security

Table 1: Cloud vs. In-House IT

Cloud Concerns

1.	Data security
2.	Dependence on cloud provider
3.	Internet connectivity issues
4.	Lack of existing regulations

Table 2: Cloud Concerns

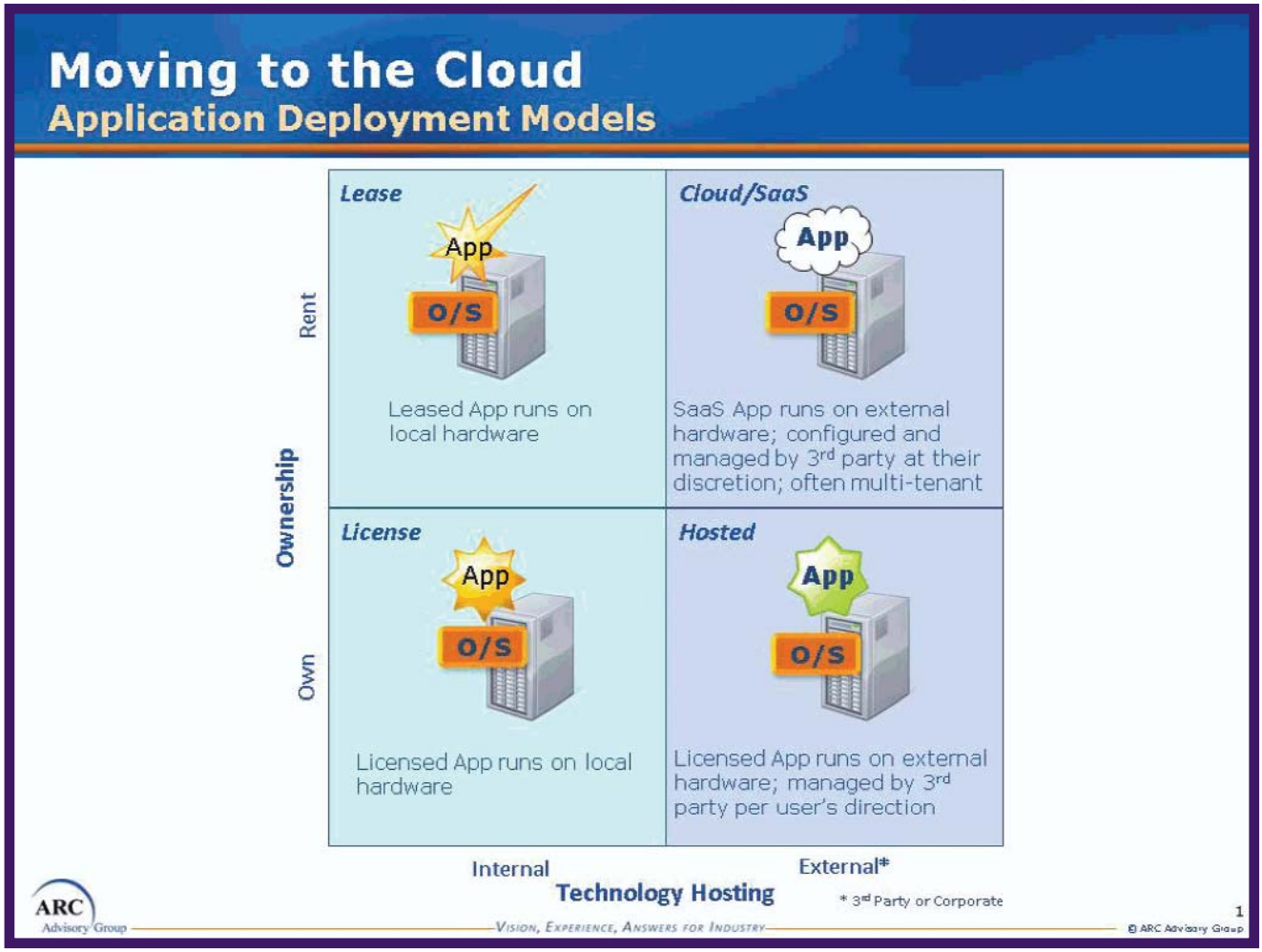

Image 1: ARC, page 4. Cloud-based can be purchased as hosting services for a user application or as software as a service. Diagram supplied by ARC Advisory Group.

industrial manufacturers will most likely follow the lead of other businesses and use the cloud for tasks that support manufacturing, particularly data storage and remote access.

In general, there are two methods for performing manufacturing related tasks. Using the first and currently most common method, the cloud will host a service provided to the manufacturer by a system integrator or an automation vendor. This service will then be sold to the manufacturer, typically on a monthly subscription basis. The second method involves manufacturers, using hardware and other associated infrastructure provided by others, to run their own applications in the cloud.

Regardless of the method selected, two-way access to the automation controllers isn't typically provided. However, this too is changing as system integrators are working with OEMs to design cloud-based access and control systems with automated two-way communications.

For example, in the event of an alarm, the controller could send an alert to a user via the cloud. The user could acknowledge the alarm, and then send a command to the controller to correct the issue.

This two-way access via the cloud will be a significant change from today's models. In some instances, the cloud would become part of the critical path between the end user making a decision and the control system receiving it. In the same way when control systems first moved to non-proprietary networks, these developments are almost certain to involve some controversy.

Considerations for Cloud Computing

Many industrial companies' data contains intellectual property they wish to protect from their competitors. Although cloud providers offer many security features and devices, it can still seem risky to send data into the cloud where others may be able to access it.

Reliability is also a concern for industrial manufacturers who have traditionally only used in-house systems for their production and manufacturing processes. They may fear relying on Internet connectivity and outside service suppliers over whom they have no direct control.

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Feature Story Cont.

Cloud Computing

Continued from, p. 11

While data stored in the cloud is protected by a variety of security measures, storing data outside the plant does create a new type of vulnerability. The cloud provider should have much stronger security and encryption in place, with 24/7 support to stop unauthorized access, than a typical in-house IT department. Data security is the meat and potatoes of cloud providers, giving them an incentive to be informed of the latest security threats, as well as to implement the latest security measures.

However, the collective data in the cloud is much more extensive and valuable than the data in a single industrial company, which makes it a more attractive target to hackers. Applications and data may face increased risk from network threats that were previously defended against at the perimeter of the organization's intranet, as well as from new threats that target exposed interfaces.

A configuration or software error could accidentally allow access to organizational data and resources to other subscribers. An attacker could also pose as a subscriber to exploit vulnerabilities from within the cloud environment to gain unauthorized access. Botnets have also been used to launch a denial of service attack against the infrastructure of a cloud provider.

Having to share an infrastructure with unknown outside parties can be a major drawback for some applications; it demands a high level of assurance of the strength of the security mechanisms used by the cloud provider.

Users must also have confidence in the long-term stability of the cloud provider because of the near total dependency on the selected cloud provider, and this dependency increases with the length of time the provider is used.

For example, a company may use a cloud provider for manufacturing data storage. The selected provider would control the data and be free to raise prices at any time. If the manufacturer decided to switch to another provider, it would require cooperation from the cloud provider to transfer the data.

While regulations exist in the U.S. and other countries that require transfer of money and/or data from one provider to another for the financial services and telecommunications industries, no such regulations exist for the cloud yet. On the other hand, it would be unlikely for future regulations not to implement similar requirements.

Outside of data security, the biggest concern among industrial users is the dependency on an Internet connection to access cloud data. Alternate access paths are typically provided by cloud providers, but users may see internal networks as more reliable than any practical number of Internet connections.

Making the Leap

While remote access is the most obvious draw for the cloud in terms of functionality, asset management is very appealing and seems to be particularly well suited to the cloud. Improving asset utilization is important to manufacturers, but in-house deployment requires large investments in software, servers, networks—as well as IT and asset management experts.

Asset management through a cloud-based model could facilitate virtually instant deployment with very low up-front costs. A manufacturer would only have to provide a high-speed two-way data connection to the control and information system, and then the vendor could immediately begin collecting and analyzing data.

After analyzing the data, the vendor could provide specific recommendations for improving asset utilization. For a monthly fee on a relatively short-term basis, this application would minimize some of the concerns about being locked into a vendor or contract.

Manufacturing stands to benefit from the cloud, and new applications are being developed on a continuing basis. However, it's unlikely cloud computing will be used for real-time control any time in the foreseeable future.

Instead, the cloud is more likely to provide services associated with manufacturing, such as remote access and data storage.

As with any new technology or application, concerns exists in regards to reliability and control. Standards and regulations need to be established, and most likely will be as the market grows. As the technology matures for the industrial automation market, it's a good bet that cloud use will become more widespread among manufacturers who will benefit from its cost savings and faster deployment.

"Give a man a fish and he eats for a day. Teach him how to fish and you get rid of him all weekend. "

– Zenna Schaffer

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Analog Modules	4-channel input (current)	$201.00		$485.81
	4-channel thermocouple in	$301.00		$986.77 (6-ch)
	8-channel output (voltage)	$271.00		$1,454.40
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C-more touch panels in 6" to 15" sizes are a practical way to give plant personnel easy access to controls and data. Check out the powerful yet easy-to-use configuration software by downloading a demo version at:

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System Integrator Corner

Turnkey Solutions

CH2M Hill joins AutomationDirect's SIDirect team

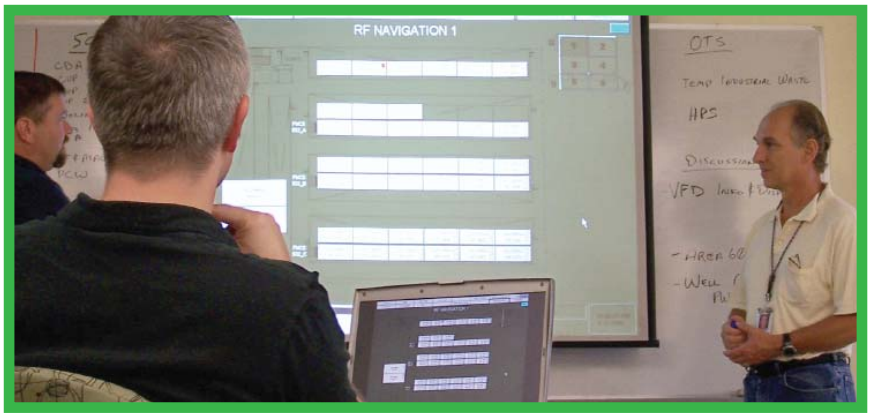
Since its beginning in 1946, CH2M HILL has become a global leader by providing full-service consulting and design, as well as design-build and operations and program management in over 80 countries.

Headquartered in Englewood, Colorado, CH2M HILL was founded on the principle of meeting high-end challenges and creating technical innovations. CH2M HILL provides turnkey solutions designing, engineering, and building projects, while meeting and exceeding goals of both public and private clients. CH2M HILL delivers innovative, practical, sustainable solutions which help clients develop and manage infrastructure and facilities that improve efficiency, safety, and quality of life.

With deep industry knowledge and a breadth of resources across various disciplines, they develop solutions which take advantage of technologies, recommended practices, and knowledge drawn from the various industries they serve to help clients quickly respond to challenges at every stage of a project.

CH2M HILL provides complete project services through various business groups, from architecture, engineering, and construction to program and facilities management. They also provide complete system integration from Batch, Continuous and Discrete Controls to Business Planning and Logistics. As a full service provider, their clients receive a complete solution where simplicity trumps complexity, resulting in profitability.

Their control and systems integration specialists offer complete solutions for projects in existing facilities, as well as in new facilities in all design/construction phases.



As systems integration (SI) specialists, CH2M Hill provides full-service design, programming and commissioning for any size project including:

- Programmable Logic Controllers
- SCADA Software / Systems
- Remote Monitoring and Internet Access Portals
- Facility Controls
- Manufacturing Process Monitoring

A winery enlisted CH2M HILL's design, construction, and system integration services to improve production at their fermentation, storage and bottling facility. The new system included the use of DL205 PLCs and several operator interface terminals configured for alarming and local setpoint adjustment. A SCADA system was also included to provide reporting, trending and historical data collection and retrieval.

On another occasion, CH2M HILL integrated new dissolved oxygen (DO) meters and variable frequency blower drives into a wastewater plant with PID control and SCADA interface. A ***Direct***LOGIC 405 PLC provided control, with an Ethernet interface. The new system allowed much better control of the DO levels at the plant, reducing the risk of discharging dirty water into the Columbia River. They also provided a remote access solution so operators could always see what was going on, since the plant is not staffed full time.

With complete project lifecycle capabilities, CH2M HILL covers every phase of any project including the plan, design, build, upgrade, expansion, renovation, and operation of infrastructure and facilities. Then, when assets reach the end of their useful life, CH2M HILL can decommission, decontaminate, and demolish them, while restoring the environment for new uses. With their years of expertise, CH2M HILL helps increase efficiency, improve speed to market, resolve stakeholder concerns, streamline complex project delivery issues, successfully implement first-generation technologies, maximize scope within cost constraints, and create lasting value.

Learn how CH2M HILL can help with your next project:

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E-mail: **Justin.Colton@ch2m.com**

User Solutions

Alternative Fuel

Biodiesel Fuel Gets a Boost from Automation

Systems produce biodiesel for a total cost as low as 67 cents per gallon, turning waste into profit

Imagine if restaurants and other commercial food enterprises could turn used kitchen oil into fuel instead of simply disposing of it. Then imagine if they could do that in an economic and automated way for a fraction of the cost of the petroleum diesel that it replaces. Now add in the ability to process other oils extracted from crops, and to generate valuable byproducts such as animal feed.

At Springboard Biodiesel (**www.springboarddiesel.com**), our customers are doing just that by using our BioPro™ biodiesel processors to convert organic oils into ASTM-grade biodiesel that works with any diesel engine.

We've designed our small-scale processor series of machines, named the BioPro, to do the majority of the work through an automated process that requires almost no user interaction. No more turning valves, metering in chemicals and carefully monitoring the machine. Instead, users simply add the required ingredients and press a button. All over the world, BioPros are recycling waste oils into low-cost clean fuel. The Florida National Guard produces biodiesel from used vegetable oil to fuel state maintenance vehicles at the Camp Blanding Joint Training Center in Starke, Florida. Remarkably, the Guard has been able to convert its waste cooking oil to biodiesel for a total cost of 67 cents per gallon, when all savings from waste disposal are taken into account.

Daphne Utilities in Alabama created its award-winning cooking grease recycling program with a BioPro 190, in the process reducing sewer spills caused by grease plugs that posed a risk to nearby Mobile Bay. The public drops off used cooking oil at stations throughout the city, and the utility processes the oil into fuel.

With a mere $12,000 start-up cost, Daphne Utilities saves approximately $10,000 a year by creating biodiesel from used oil for about a dollar a gallon, not to mention the significant savings from a 40 percent reduction in spills and avoided waste oil disposal costs.

Nothing goes to waste, as the utility uses the biodiesel to run emergency power generators, and as a fuel additive to increase lubricity. It even uses the glycerin generated during the cooking oil processing to make soaps that are used to educate the public about the program.

The Colusa Indian Community Council uses its BioPro 380 to make biodiesel from a combination of reclaimed cooking oil from the council's casino restaurants, and from safflower oil extracted from sunflowers grown by the tribe. When making biodiesel from sunflower screenings mixed with almond shells at a 90-10 blend, the remaining meal can be sold for approximately $200 per ton for use as a protein-rich feed for livestock. The council calculates its total cost to make biodiesel including chemical inputs, energy and labor is $1.50 per gallon. And that's before including tax credits for alternative energy equipment.

Processing Particulars

Before starting the process, the user fills the machine with 50 gallons of filtered, dewatered oil (the machine can also assist in dewatering). The BioPro can process almost any non-petroleum natural oil including, but not limited to, tallow, animal fats and vegetable oil. The waste vegetable oil gathered from kitchens and restaurants is the most common feedstock, but a vast variety of other oils can also be used.

After filling the machine with oil, the user then adds a predetermined amount of sulfuric acid catalyst followed by methanol. The user then presses the Start button, and waits for the mixing to begin. There's no need to monitor the machine while it does its work, which cuts labor costs and ensures consistent quality and superior safety.

A multi-stage process begins to convert the oil feedstock into ready-to-use biodiesel fuel. The first stage is called Esterification, or simply the "acid" stage.

During this stage, the machine mixes sulfuric acid and a portion of the methanol into the waste oil. The sulfuric acid modifies the free fatty acids so the methanol can attach to them.

When the acid stage is complete, the Transesterification or "base" stage begins. The machine mixes the base catalyst and the rest of the methanol. Usually lye (sodium hydroxide - NaOH) or caustic potash (potassium hydroxide - KOH) acts as a catalyst to break the molecules apart into glycerol and fatty acid chains. Immediately after the molecules are broken apart, the methanol attaches to the fatty acid chains, causing the glycerol molecules to drop out of the oil and become glycerin. During this stage the machine is mixing the oil, chemicals and methanol together with an extremely powerful, tri-blade impeller. This helps to vigorously mix fluids and chemicals together to ensure the oil is chemically altered.

After both reactions have occurred, the oil settles for a period of several hours. The glycerin falls to the bottom of the tank and separates from the biodiesel.

Following the settling period, the user drains out the settled glycerin and begins the washing cycle; this is the only user interaction required during processing.

In the washing process, the machine turns on the heat and lightly sprays a mist of clean, fresh water into the biodiesel. Although it may sound strange to add water to biodiesel, water is heavier so it quickly falls to the bottom.

As the water falls, excess methanol and soap molecules attach to the water and fall with it, thereby cleansing the biodiesel. Another mist wash is performed using the big tri-blade mixing impeller. We call this an agitated wash cycle, and it's used to pull impurities from the biodiesel.

Everything then settles for a few hours, the water drains and another

agitated mist wash starts. Upon completion, the water settles to the bottom and is automatically pumped out by the machine.

After the wash water is drained, the heat remains on and the tri-blade impeller starts again. The combination of heat and mixing evaporates excess water from the freshly washed biodiesel. The biodiesel settles out one last time to finalize the evaporation.

That's all there is to it. There's no need to transfer fluids from container to container, as the machine does this automatically.

When processing is completed, users connect the hose to the included fuel pump to fuel their vehicles.

Automating the Process

Creating biodiesel from common waste oils is an interesting and somewhat complex chemical processing operation, but this complexity is unburdened from the end user by automation. The BioPro relies heavily on Programmable Logic Controllers (PLCs) from AutomationDirect (**www.automationdirect.com**) to control all the various functions of the machine, making the PLC the brains of the machine. For example, the PLC tells the machine when and how long mixing occurs, when and how pumping occurs, when draining begins, etc.

We use the AutomationDirect CLICK PLC or the ***Direct***LOGIC DL105 PLC depending on the size of the machine. Since the CLICK doesn't require a mounting base, it works well for the smaller machines where space is at a premium. For the larger machines, we use a ***Direct***LOGIC PLC because it has more of the required discrete and analog inputs and outputs.

We've written several programs for the PLC which allow optional procedures to be automatically executed according to field conditions.

For instance, the PLC is preprogrammed to accommodate additional equipment that works with our processor systems, such as the INCOSEP™, a device that can be installed inside the BioPro 190 or the BioPro 380 that enables users to more than double their biodiesel processing speed.

CLICK PLC controls small BioPro machine.

The CLICK PLC's free programming software, downloadable from the AutomationDirect Web site, helps keeps the price down on our smaller machines.

In addition to PLCs, we use NITRA pneumatic solenoid valves purchased from AutomationDirect for our pumps. Everything we use must be high quality and durable, and we find that AutomationDirect components fit the bill. We tried a variety of solenoids during development that didn't work as well, so we decided on the higher quality NITRA solenoids to ensure that our pumps operate smoothly.

We also use many signal conditioners from AutomationDirect, such as the FC-T1 thermocouple signal conditioner, and we find that the DIN-mount adaptor makes installation easy.

We appreciate that AutomationDirect provides quality and user-friendly products at a competitive price, but service is also an important factor. We're a company that prides itself on customer service and has a real person answer the phone when customers call, so we're glad that when we need support, a real person at AutomationDirect answers the phone and helps us in a timely manner.

Quick Payback

Our machines span from the BioPro 150 which makes 40 gallons every 48 hours, to the BioPro380EX in line with a SpringPro T76 which makes 100 gallons every 13 hours. Cost per gallon is determined largely by the number of gallons made, and the cost of the oil feedstock.

BioPro fuel processing machines.

For example, a university uses our BioPro 380EX, which makes 100 gallons of biodiesel from 100 gallons of cooking oil every 23 hours, to make 2400 gallons per month. In this scenario, payback for the machine and labor is achieved in only in three and a half months, assuming regular diesel is four dollars a gallon.

We're proud of our BioPros, but we aren't stopping there. The California Energy Commission recently selected Springboard Biodiesel from numerous applicants for a grant to assist with the completion of our new closed-loop production facility.

Continued, p. 19>>

TECHNOLOGY THAT MAKES YOUR JOB EASIER

More productive motion

With the Productivity3000 controller, you get the power you need for advanced applications.

Start with the $599 CPU - 50Mb of memory supports large programs, with tagname database and program documentation stored onboard. The huge (100,000+) I/O capacity gives you plenty of room to plan and expand. And the CPU's seven built-in communication ports make integrating a large system easier than you can imagine.

Now with High-speed Motion Control

These new 2-channel modules add high-speed and motion control applications capability to the Productivity3000 controller, and they're easy to use! Add up to 22 P3-HSO or P3-HSI modules in any combination to any P3-550 CPU and P3-RS base group. That gives you up to 44 axes of motion or high-speed counting capability in a single base group. These modules are supported and fully functional in the CPU base, local and remote expansion bases.

Drop-in Hardware Configuration

Install a high-speed module into the system hardware configuration and define each channel's behavior, status bits, limits and scaling … without the need for an external configuration utility or software.

Simple Instructions

Our standard instructions were designed to make your everyday motion applications simpler. The Find Home, Set Position, Simple Move and the Velocity Move instructions (to name a few) were created to get you up and running sooner. Capabilities such as Registration, Jerk Control and Channel Scaling were included to give you the flexibility to accomplish those jobs.

Application Example

High-speed outputs synchronize the speed of the servo drive controlling the fill conveyor. The conveyor is synchronized with the rotational speed of the turntable based on the signal(s) from the table encoder feedback via the high-speed input module.

Download the free programming software and check it out!

http://bit.ly/p3000

Read more, watch free videos, and download the FREE software at:

www.productivity3000.com

AUTOMATIONDIRECT.com

PERFORMANCE + VALUE = PRODUCTIVITY

User Solutions Cont.

Alternative Fuel

Continued from, p. 17

The Benefits of Biodiesel Fuel
• Burns 88 to 90% cleaner than regular diesel if made from waste cooking oil (http://www.arb.ca.gov/fuels/lcfs/072009lcfs_uco_bd.pdf)
• Burns 78% cleaner than regular diesel when made from virgin soybean oil (according to the EPA)
• Can be made from most any vegetable or animal oil
• Will run in virtually all diesel engines without any conversion equipment or modifications.
• Offers superior lubricity, creating less engine wear
• Mixes with hydrocarbon-based diesel in any ratio

Table 1

For this project we will need more inputs and outputs, so we've selected the Productivity3000 programmable controller from AutomationDirect.

For this larger application, we decided on the Productivity3000 because it provides a number of features that we need, such as seven communication ports (including Ethernet), and built-in local I/O expansion capabilities. The Productivity3000 is very competitive in price, and combines the features and capabilities of a PC-based control system with the cost and compact size of a PLC.

We're dedicated to supplying consumers with an economical way to create biodiesel in an automated process from materials that would otherwise be wasted or end up in landfills. As we keep expanding our offerings, we will continue to rely on high-quality and cost-competitive automation components from AutomationDirect to make our machines as economical as possible.

BioPro Features and Benefits
• Makes ASTM-D6751 grade biodiesel fuel
• Fully automated process that's extremely easy to use
• Can make clean-burning renewable fuel for as low as 95 cents per gallon if feedstock oil is free
• Made from 304 stainless steel
• All motors and pumps are explosion proof
• CE certified
• Converts any oil that is 5% Free Fatty Acid Analysis (FFA) or less.
• More than 6.5 million gallons of annual installed capacity in 14 countries.
• On the campuses of 60 U.S. colleges and universities

Table 2

"If A equals success, then the formula is: A = X + Y + Z, X is work. Y is play. Z is keep your mouth shut."

– Albert Einstein

"Employee of the month is a good example of how somebody can be both a winner and a loser at the same time. "

– Demetri Martin

Product Manager's Corner

Programmable Automation Controller

Set Your PAC in Motion

By Jeff Payne
Product Manager; PAC/Programmable Relays
AutomationDirect

The 2012 year has brought many new enhancements for the Productivity Series control platform; you will notice subtle improvements to the software as well as major module additions such as the High-Speed Counter and Pulse Output modules. In this article we will review these enhancements to offer a better understanding of current product updates.

The software has received several advances in our most recent releases. The enhancements were based on feedback and suggestions we received from our customers and from those using the software utility on a regular basis. Our goal is to continue to improve the usability of the product until we are satisfied you have the best programming tool in the industry.

Bit-of-Word Data Types support

The addition of Bit-of-Word support complements the use of arrays for manipulating individual bits of a word. You can now target individual bits of an Integer tag in any instruction that accepts a Boolean tag.

Data View Trend graph

The new trend graph addition to the Data View gives you the ability to quickly chart Boolean tags or integer values you are currently monitoring in the Data View window.

New Toolbars

New toolbars were added for the Ladder view, Data View and Task Management panes to optimize space and improve the ease of use. Look for more of these toolbars throughout the software as well as additional functions to be added to these new toolbars.

Tabular PID tuning window

You can now monitor and tune up to five separate PID loops in the PID tuning window, giving you the ability to more easily tune and adjust your entire process.

Search & Replace Enhancements

The latest improvements to the Search and Replace feature include separate Tag, Comment and Instruction searches and the capacity to Find and Replace partial tag names. This can be especially beneficial when your application calls for extensive duplication. For example: Create one PID loop called "Oven1". Then create and assign all associated tags (Oven1_SP, Oven1_PV, Oven1_P, Oven1_I, Oven1_D, etc.). Now you simply Copy/Paste the first instruction in your ladder code and Find/Replace "Oven1" with "Oven2", and your second PID is complete (repeat for as many instructions as you need).

Add Multiple tags to Data View

With two mouse clicks (Right Click > Monitor in Data View) you can now add all tags from a single instruction, an entire rung or a group of rungs to a new Data View tab. This eliminates a tremendous amount of time when troubleshooting specific areas of code.

Enhanced Print options

Customization was the focus when working with the latest print features. We discovered that users are looking for different ways to print their ladder code, so we added the ability to rung wrap and show even the longest and most complex rungs on a single page, select the font size, default font type and custom fonts for each comment type, wiring labels, System IDs, etc.

Revamped Firmware upgrade tool

This now allows you to quickly compare the Firmware versions, view firmware files offline and filter on the module type(s).

View Tag comments in the ladder

The new toolbars make it easier to add some features. There are many viewing options in the ladder code offering more customization and the ability to see varying levels of detail. You have toolbar icons for enabling and disabling Task comments, Run comments, Instruction comments, Tag names, Tag details and Block details. Enabling the Tag details will show the comment field associated with each tag from the Tag database.

Task Management Sync

The Task management window is where you organize all program tasks. These tasks can be many and in various folders. The new "Sync with Editor" option ensures the task you select in the Task management pane is the

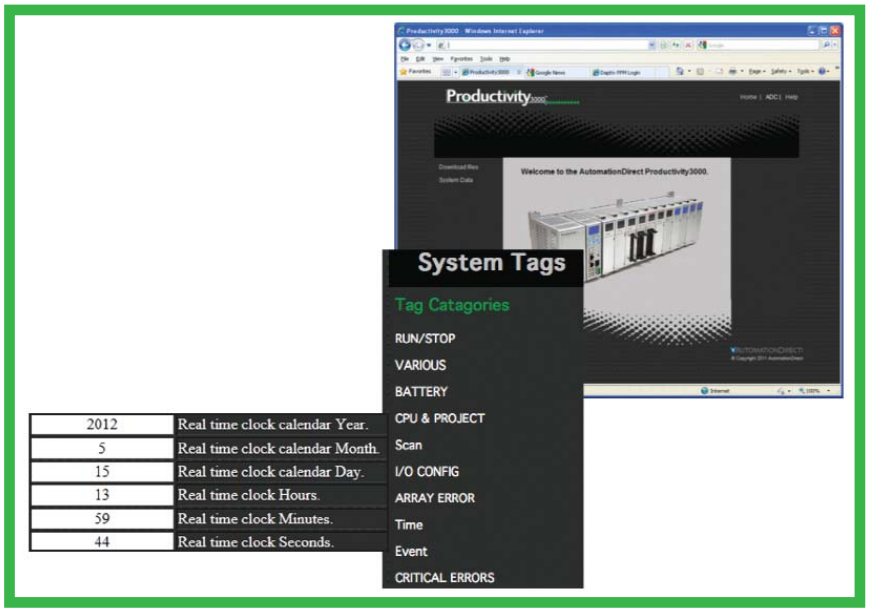

Image 1: With the P3-550 CPU's Integrated Web Access you can access Data Logger files stored on the connected USB device as well as read-only System Tags to view system status.

task you are currently viewing in the Ladder editor.

Beyond this list of software enhancements are a couple of major additions to the product. First is the built-in Web Access; with this you gain access to data log files stored on the removable USB drive, system tags and error and event history. This is an excellent tool when paired with the built-in data logging feature of the P3-550 CPU. You can now access process data from anywhere (with the proper provisions and security considerations). Simply configure your CPU's data logger to store files to the removable USB device port and enable the Web server from your CPU's hardware configuration page. From here it merely requires you typing the IP address of the CPU into any browser and your data is at your fingertips. ***See Image 1.***

Our latest hardware additions include the High-speed counter input (P3-HSI) and Pulse output (P3-HSO) modules. These new 2-channel modules add high-speed and motion control applications capability to the Productivity3000 controller, and they're easy to use! Add up to 22 of these modules in any combination - that gives you up to 44 axes of motion or high-speed counting capability in a single system.

Drop-in Hardware Configuration

Install a high-speed module into the system hardware configuration and define each channel's behavior, status bits, limits and scaling, all without the need for an external configuration utility or software.

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Our standard instructions were designed to make your everyday motion applications simpler. The Find Home, Set Position, Simple Move and Velocity Move instructions (to name a few) were created to get you operating more quickly. Capabilities such as Registration, Jerk Control and Channel Scaling were included to give you the flexibility to accomplish those jobs.

Application Example

In the diagram, high-speed outputs synchronize the speed of the servo drive controlling the fill conveyor. The conveyor is synchronized with the rotational speed of the turntable based on the signal(s) from the table encoder feedback via the high-speed input module.

Image 2: High-speed Application Example Diagram

Summary

All these features were designed to help get your project up and running in minutes, not hours or days. Look for additional enhancements to these modules in the future.

We continually strive to improve our products and value your opinion. Please download the latest software revision and take a test drive. If you have comments or suggestion for improving the product further, please visit our site below or contact our Technical Support staff at 1-800-633-0405.

For additional information on these features and more, check out the Productivity Series Web site.

www.productivity3000.com

"They usually have two tellers in my local bank, except when it's very busy, when they have one."

– Rita Rudner

"I'm against picketing, but I don't know how to show it."

– Mitch Hedberg

Tech Brief

Sizing AC Motors

Important Considerations for Replacing and Sizing AC Motors

How to determine whether to rewind or replace a motor, and how to find the right motor size for your application.

By Joe Kimbrell
Product Manager; Drives, Motors and Motion
AutomationDirect

Every business is trying to conserve energy in the face of high utility costs, so getting the best return on investment (ROI) is critical for maintaining a healthy balance sheet. The decision to replace existing motors with newer premium efficiency motors needs to take into account both the increased energy efficiency as well as ROI gained by installing a new motor.

Background on Classes of Motor Efficiency

There are three basic standards of motor efficiency: pre-EPAct, EPAct, and Premium Efficiency (also known as NEMA Premium). In 1992, the Department of Energy issued the Environmental Policy Act of 1992 (EPAct '92). This legislation set minimum standards for efficiency of the majority of general purpose motors sold in the U.S. The actual requirements for motors went into effect in 1997. Motors sold after EPAct '92 went into effect are commonly referred to as EPAct motors.

In 2007, the Energy Independence and Security Act of 2007 (EISA) was signed into law. This legislation raised the minimum efficiency for most i nduction motors sold in the U.S even higher. The requirements for this law went into effect in 2010. Motors that meet the latest efficiency guidelines are referred to as Premium Efficiency (PE) or NEMA Premium motors.

Rewind or Replace?

One of the first decisions made when a motor fails is whether to rewind or replace the motor. The biggest determining factors in that decision are the age of the motor, the type of motor involved, availability, how often the motor runs, and its efficiency. When a pre-EPAct motor isn't working properly, replacement is most always preferred (age of the motor and gains in efficiency play a significant role in the ROI).

When an EPAct motor fails, the increased savings of replacing this motor with a Premium Efficiency motor requires consideration. If a Premium Efficiency motor fails, the repair/replace decision becomes even less clear-cut. The Department of Energy has information that can help you determine the payback when deciding on purchasing a new Premium Efficiency motor vs. repairing pre-Epact, EPAct, or existing Premium Efficient motors.

http://1.usa.gov/MS3AbN

In the past, rewinding a motor usually meant losing efficiency, but that's no longer true, as original motor efficiency can be maintained in most cases. In fact, it's sometimes possible to increase efficiency with a motor rewind. To determine the effect on efficiency for a specific motor, experts at a motor repair shop should be consulted.

When the motor in question is a special or custom motor, additional factors help determine whether to repair or replace, such as the longer lead times required for custom motors, and the higher costs of replacing them.

In these cases, rewinding may be a more attractive proposition. For non-custom standard efficiency motors, replacement is often the better way to go because the efficiency gains usually outweigh the cost of a new motor.

The amount of time a motor runs can also help determine whether rewinding or replacing is the better option. For motors that operate continually, the ROI for a new, premium efficiency motor can be achieved fairly quickly. For motors that only run periodically, careful analysis is needed in the cost calculations for replacing versus rewinding. To help with these calculations there are several Web sites, such as the Department of Energy website. The Department of Energy also provides a free software package, MotorMaster+, which assists with motor rewind/replace decisions, as well as creating a motor survey if replacing is determined to be the better option.

Considerations for Replacing a Motor

A common mistake that happens when the decision is made to replace a motor is thinking that buying any new premium efficiency motor will deliver optimal efficiency. When trying to boost savings by increasing energy efficiency, selecting the right-sized motor is at least as important as the energy efficiency of the new motor.

If the new motor is oversized, the energy savings will be less than if the right sized motor was installed. The best method for determining the right size motor is to conduct a thorough motor survey. Correctly sizing an AC motor is important because overloaded motors can overheat, and underloaded motors waste energy. A motor's energy usage accounts for more than 95 percent of its lifetime cost, so achieving maximum energy efficiency is crucial, and rightsizing the motor is a key step.

Sizing and Output Speed

The two most important factors when sizing any type of load are required torque and speed. Finding the required output speed is usually easily accomplished by determining the design specifications. However, it's usually more difficult to determine the correct torque.

A too-frequent problem in today's industrial applications is the use of oversized motors, an issue that can be

addressed with more precise up-front engineering. For example, if an application really requires slightly more than 5 horsepower (hp) at infrequent intervals, a 7.5 hp motor is often installed to make sure there's enough headroom. In this situation, the 7.5 hp motor will definitely work, but it will be running well below full load torque and further down the efficiency curve (wasting energy).

For applications that only require the motor to operate above full load for short periods of time, selecting the right size motor with a higher service factor could be a better option. For example, if a motor has a 1.15 service factor, it can occasionally handle an additional 15 percent load without damaging the motor.

The Importance of a Motor Survey

Conducting a motor survey is the best way to correctly size a replacement motor. A motor survey should begin by reviewing and cataloging the nameplate information on the current motor to obtain the rated speed, efficiency, full-load current, etc.

The motor nameplate is the first step of a motor survey. It supplies available information, such as speed and full-load current, to help select the right size motor.

The next step is to use a clamp-on meter to monitor the current the motor is drawing during normal operation. Most systems have many unknown factors, such as friction and mechanical transmission efficiencies, which affect motor loading. Thus, getting an actual measurement of the current going into the motor helps determine the true required motor size.

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Student Spotlight

San Diego State University

PLC Training at the United States Institute for Theatre Technology Annual Conference and Stage Expo

Loren Schrieber, Professor
School of Theatre, Television, and Film
San Diego State University

AutomationDirect's programmable logic controllers were featured in a training center hosted by the United States Institute for Theatre Technology (USITT) at their annual Conference and Stage Expo held in Long Beach, California, this spring. The training center was equipped with ***C-more*** Micro touch screens and both ***Direct***LOGIC DL05 controllers and CLICK PLCs.

Automation is no longer just for the factory floor. The entertainment industry has also harnessed the latest generation of automation controllers' incredible power to make graceful scene changes possible with the press of a single button. From cats flying into the heavens on giant Michelins, Spiderman chasing super-villains over audiences on Broadway, to the incredible effects-driven Las Vegas shows such as "O" and "KA," automation devices have become indispensable to theatrical productions at every level.

Recognizing that training is key to safety in automation, USITT solicited the help of the San Diego State University School of Theatre, Television, and Film—one of a handful of schools with a formal program in theatrical automation—to set up the training center at Stage Expo. Both graduate and undergraduate students were involved in the project.

AutomationDirect's price advantage and outstanding service made them the PLC vendor of choice. Students assembled four DL05 stations, each demonstrating a different automation concept. One station used a proximity switch reading the teeth of a motor-driven sprocket to illustrate the use of counters. The second used pulsed outputs to drive a stepper motor. The third station was equipped with an F0-2AD2DA-2 analog module which demonstrated input and output of continuously variable data, while the fourth was used to read the output of an

Continued, p. 24>>

Student Spotlight cont.

San Diego State University

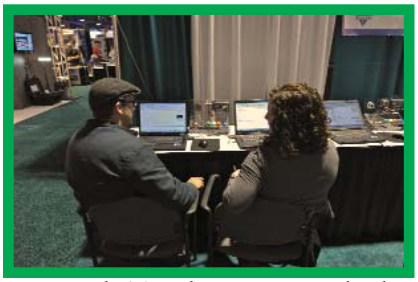
Continued from, p. 23

incremental encoder and display results on an 8-inch ***C-more*** color touch screen.

CLICK PLCs were used more whimsically. Students were assigned in pairs to create machines of their choosing, which the CLICKs would control. Each machine was required to incorporate the ***C-more*** Micro touch screens while demonstrating the use of timers and counters.

One team built a ping pong ball air cannon with CLICK-controlled azimuth and elevation, countdown timer and valve trigger all initiated by a retro-reflective beam detector. This proved to be the most popular machine, with trainees attempting to pummel each other with ping pong balls.

The second team built a machine which, when activated by pressing a green GO button, simply turned itself off by extending a pneumatic finger to



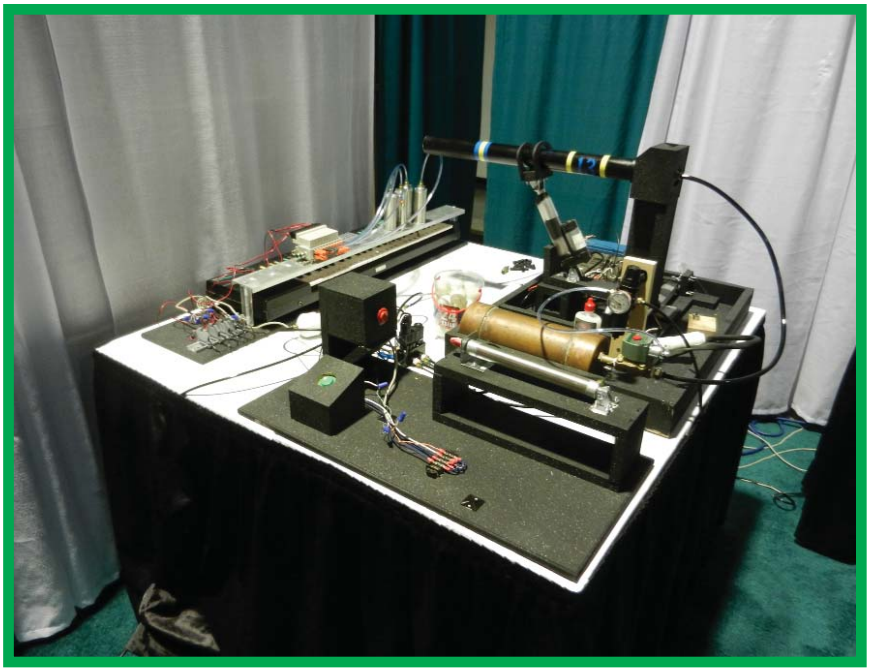
press a red STOP button. Every third or so attempt to turn itself off was programmed to fail and the finger would have to bump the STOP button several times in frustration before shutting down.

Another machine consisted of a ***Direct***LOGIC DL-05 PLC connected to a pneumatic bell. At the push of a button, a pneumatic claw reached up to pull a plastic ball down against a spring. Once in the cocked position, a second pneumatic cylinder pulled the claw back, launching the ball to strike the bell; because the bell was VERY loud, this machine became very annoying.

The final machine was a simple electronic piano played with pneumatic fingers. A slight miscalculation in the length of the fingers gave a whole new meaning to piano as a percussion instrument; it eventually beat itself to death.

At each of the stations, trainees were shown the ease of ladder logic and stage programming. Most participants were astounded at how easy it was to build a useful program with simple diagrams. The limited version of the ***Direct***LOGIC software and the completely free CLICK software are both available for download from the AutomationDirect Web site.

Having practical applications and animated devices as part of the training center made for a very exciting exhibit visited by scores of conference attendees. USITT would like to thank AutomationDirect for making the training center possible.



Business Notes

Goings-on in the Industry

By Joan Welty

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We've streamlined our brokered services to Canada as well. For orders shipped via air service, any applicable shipping charges include brokerage fees. For orders $49 U.S. and over, brokerage fees are included, and AutomationDirect nominates the broker. Note that if you allow AutomationDirect to broker any LTL shipment, you can take advantage of our flat rate charge based on weight; charge includes freight costs to the specified address on the order, and brokerage fees. With the flat rate option, duties and taxes will be added to the order at checkout. See the Canada Flat Rate Table in our updated Terms and Conditions online to determine brokered LTL shipping charges.

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– Douglas Adams

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Tech Brief cont.

Sizing AC Motors

Continued from, p. 23

Motors operate most efficiently near full load, so determining load requirements accurately is important. The greatest efficiency is achieved above 70 percent of full load torque. Below 50 - 60 percent, efficiencies start to drop off dramatically.

There are several web sites that provide information on how to determine motor load size, such as **http://1.usa.gov/LDOEbW.**

Conducting a thorough motor study may seem like a complicated task, but there are tools available to help with the calculations.

Moreover, investing the time to conduct a thorough motor survey will help ensure the correct size motor, one that will deliver maximum savings throughout the motor's life.

A wealth of additional information (motor survey forms, case studies, software tools, and fact sheets) can be found at the Department of Energy's Web site: **www1.eere.energy.gov/manufacturing/tech_deployment/motors.html**.

"If you can dream it, you can do it."

– Walt Disney

"Be yourself; everyone else is already taken."

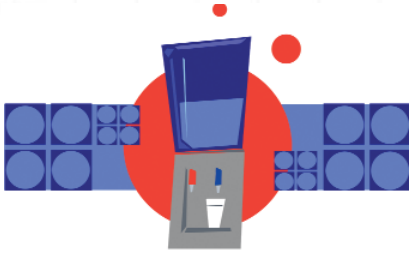
– Oscar Wilde

"I've learned that people will forget what you said, people will forget what you did, but people will never forget how you made them feel."

– Maya Angelou

The Break Room

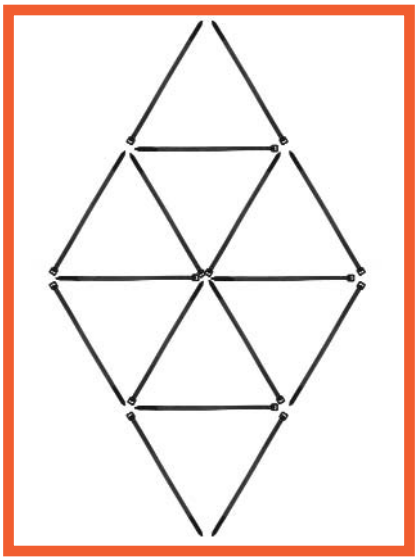
Brainteasers



By Chip McDaniel

BrainTeasers

Cable Tie-up I



1.) *Can you remove four cable ties from the following arrangement and leave four equal size triangles with no extra "offshoots" or loose ends?*

The Curly Shuffle

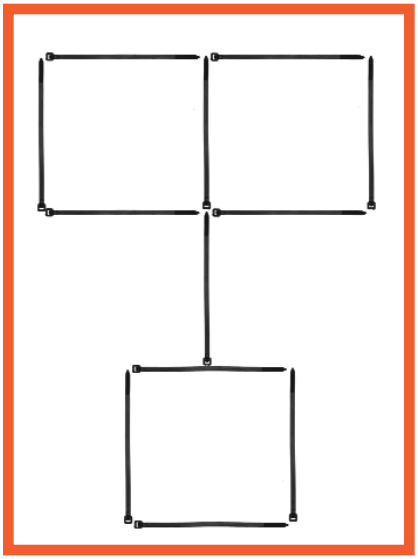
2.) A factory has three CNC machines - each with its own operator. One day a large order is received and Larry quickly boasts "Curly and I can produce all those parts in ten days, but if you let Moe help me instead of Curly, we can do it in 9 days". Curly is offended, and replies "Forget about Larry, if Moe and I produce the parts, we can finish in 8 days".

How long would it take each CNC operator to produce all the parts on his machine individually?

Widgetry

3.) During the morning shift the probability of a widget passing by a certain sensor (on a conveyor belt) in a 20 minute window is 0.9. *What is the probability of a widget passing that sensor in a 4 minute window?* Please assume a constant probability throughout the shift.

Cable Tie-up II



4.) *Starting with the arrangement shown above can you move only six of those cable ties and produce a pattern with five (unique) squares?* No doubling-up the cable ties or loose ends, please.

"All I've ever wanted was an honest week's pay for an honest day's work."

– Steve Martin

Please visit **www.automationnotebook.com** to find the answers to these brainteasers.

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