

Your guide to practical products, technologies and applications

Automation NOTEBOOK®

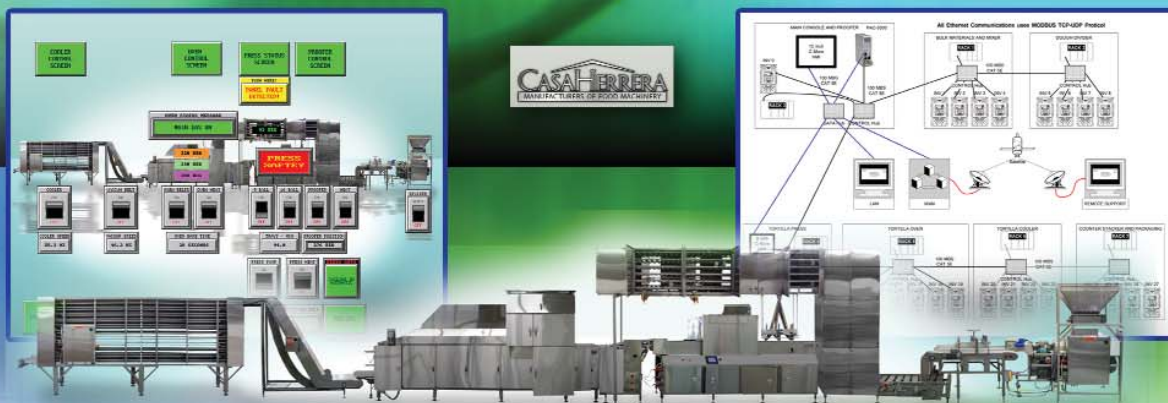
Fall 2010

Issue 18

Cover Story

Powerful PAC Upgrades Tortilla Machine

Advanced automation helps Casa Herrera produce tortillas reliably, quickly and precisely



New Product Focus

Pneumatic solenoid valves and air prep



Feature Story

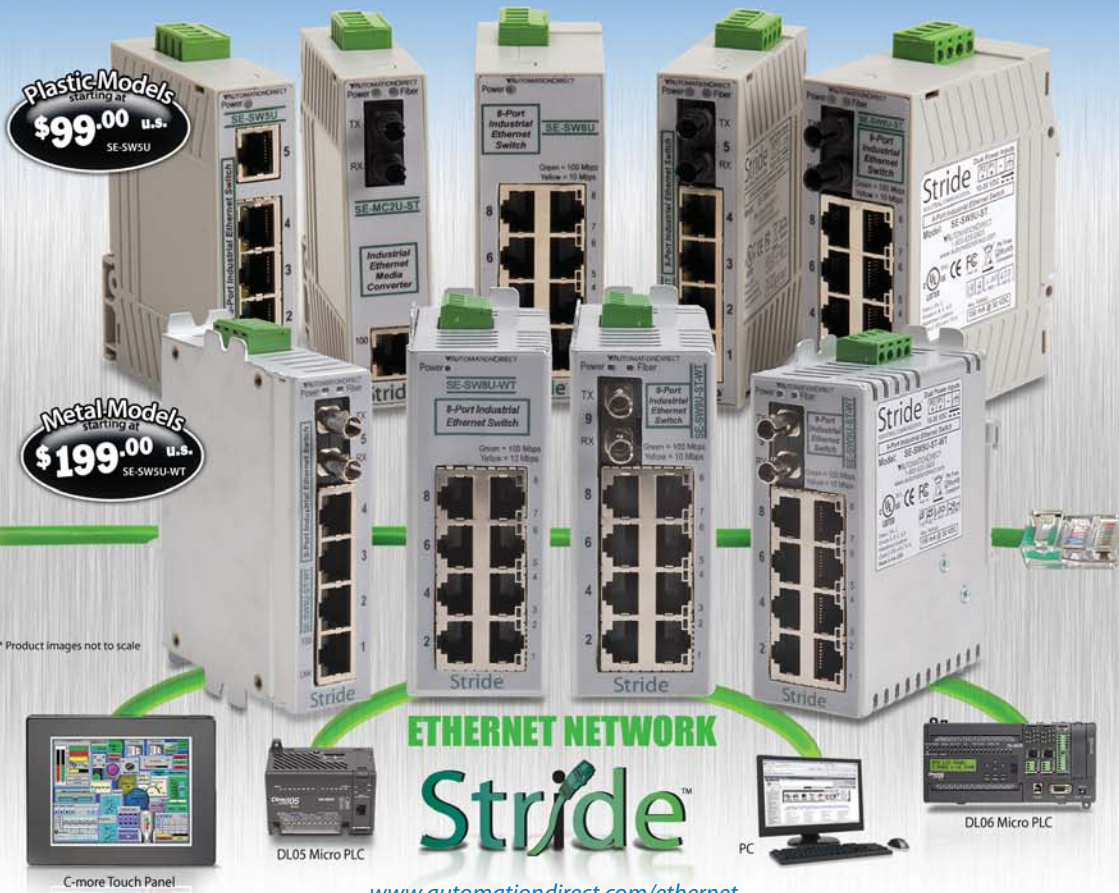
Maintaining machine quality
while reducing time to market

Technology Brief

Electric Arcs (Part 1 of 2)

Talk Fast for Less

Stride Ethernet Switches for Industrial Applications



www.automationdirect.com/ethernet

Our STRIDE family of industrial grade unmanaged Ethernet switches and media converter is specifically built for industrial environments. Install Stride switches and your Ethernet control network will maintain more consistent cycle times even under heavy I/O and data exchange. The aluminum-housed models offer a wider operating temperature range (-40 to +85 deg. C).

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Product Description	AutomationDirect		
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8-port Ethernet switch with eight 10/100BaseT RJ45 Ethernet ports	\$172.00 SE-SWSU	\$259.00 SE-SWSU-WT	
5-port Ethernet switch with four 10/100BaseT RJ45 Ethernet ports and one 100BaseFX fiber optic port	\$172.00 SE-SWSU-ST	\$259.00 SE-SWSU-ST-WT	
9-port Ethernet switch with eight 10/100BaseT RJ45 Ethernet ports and one 100BaseFX fiber optic port	\$242.00 SE-SWSU-ST	\$339.00 SE-SWSU-ST-WT	
Ethernet-Fiber converter with one 10/100BaseT RJ45 Ethernet port and one 100BaseFX fiber optic port	\$162.00 SE-MCU-ST		

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Automation NOTEBOOK

Your guide to practical products, technologies and applications

Contributors

Publisher	Tina Gable
Managing Editor	Joan Welty
Coordinating Editor	TJ Johns
Design Manager	Justin Stegall
Contributing Writers	Brian Elliott Lenny Filipkowski Scott Martin Chip McDaniel Ron Meade Pat Phillips Jack Smith

CONTACTS

Automationdirect.com Inc.
3505 Hutchinson Road
Cumming, GA 30040

Phone 1-800-633-0405
or 1-770-889-2858

Fax 1-770-889-7876

Monday - Friday
9 a.m. to 6:00 p.m. EST

www.automationdirect.com

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Editor's Note

"Like sands through the hourglass, so are the days of our lives." That was the opening line of a once-popular daytime soap opera. Have you ever thought about those words? When I was a kid, I thought things like school breaks, vacations and holidays lasted forever. But, as each year passes, I tend to think time might be gaining momentum. The candle for this year has almost burned itself out and we've all been too busy to notice.

We've introduced so many new products this year; it's hard to list them all in this space. The good thing is, we're not done. Many more are coming down the pike. Be sure to keep an eye out for them in coming weeks and months.

We have a great issue of Automation NOTEBOOK ready for you. This issue is filled with information about our latest products and line extensions. Pat Phillips (our process and fluid power product engineer) provides an interesting article about our NITRA pneumatics line; our Student Spotlight focuses on Sam Flournoy, a young man who has developed a unique biodiesel production machine. Contributing writer, Jack Smith, discusses the importance of time-to-market in our feature story.

You'll also find informative technical articles, and we provide some mental relaxation in the Breakroom. Be sure to let us know what you think about Automation NOTEBOOK. We look forward to your comments.



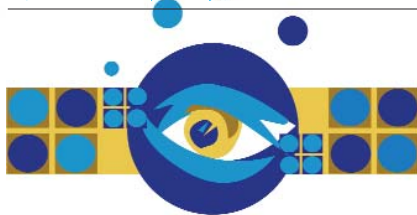
TJ Johns
Coordinating Editor
editor@automationnotebook.com

Table of Contents

New Product Focus	4
Pneumatic solenoid valves and air prep	
Product Snapshots	6
Air Conditioners; Single-piece flexible wire duct; ProSense temperature probes; select DINnectors in smaller quantities; GS Drive accessories; Encapsulated Power Supplies; UL 489 Miniature Circuit Breakers; Door safety hardware added for MCCBs, Manual Motor Controllers/Disconnects	
Cover Story	8
Powerful PAC Upgrades Tortilla Machine - Advanced automation helps Casa Herrera produce tortillas reliably, quickly and precisely	
System Integrator Corner	12
KCC Software combines panel building and software integration	
Product Management Corner	16
NITRA Pneumatics	
Student Spotlight	17
Sam Flournoy - Biodiesel Entrepreneur	
Tech Brief	18
Electrical Arcs (Part 1 of a 2-part series)	
Feature Story	19
Maintaining machine quality while reducing time to market	
FYI	24
Enclosure Cooling explained	
Business Notes	29
Low-Cost Online Training	
Break Room	31
Brain Teasers	

New Product Focus

What's New



Solenoid valves and air prep parts now available

The NITRA™ line now includes several new series of products to help meet a broad range of pneumatic air supply pressure regulation and filtration applications. While each series is designed to work in stand-alone applications, the modular design enables field assembly for combining additional components.

The AF Series particulate and moisture separation air filters are available with 1/8 to 1-inch NPT female port sizes and either a semi-automatic or automatic drain. Polycarbonate bowls are standard on 1/8 through 1/2-inch sizes, with metal bowl guards provided on 3/4 through 1/2-inch sizes. The 3/4-inch and 1-inch sizes feature all-metal bowl construction with sight gauges. Prices start at \$11.25.

NITRA AR Series pneumatic air pressure regulators are available with adjustable pressure ranges of 20-130 psi or 7-60 psi. These regulators feature a locking pressure adjustment knob and integral pressure gauge. The AR series prices start at \$17.00.

The AFR Series combines particulate/moisture separation air filters and adjustable pressure regulators, all in a single convenient unit. Available in 1/8-inch through one-inch sizes, the pressure regulator features a locking pressure adjustment knob, integral pressure gauge with adjustable pressure range of 20 -115 psi. AFR Series prices start at \$23.00.

AL Series mist-type air lubricators are available with 1/8-inch to one-inch



NPT female port sizes and a lubrication rate adjustment with sight gauge. Polycarbonate bowls are standard on 1/8 through 1/2-inch sizes, while metal bowl guards are provided on 3/4 through 1/2-inch sizes. The 3/4-inch and one-inch sizes feature all-metal bowl construction with sight level gauges. AL Series prices start at \$12.25. Replaceable 40-micron filter elements are standard. When stricter filtration is required, optional, customer-installable, filter elements are available starting at \$1.00.

NITRA ARV pneumatic manual shut-off pressure relief valves are available with 1/8-inch to 1/2-inch female ports. The three-way, two-position design is used to shut off upstream pressure and relieve downstream pressure. The manually rotated knob can be locked out with the included padlock. ARV prices start at \$19.75.

Three new series of directional control solenoid valves are also available. Solenoid coils for each series are available in either 24 VDC or 120 VAC control voltages. DIN-style wiring connectors feature LED indication of solenoid coil status.

AVP series three-way stackable poppet-style valves, starting at \$16.75, can be used in individual valve applications or, to simplify piping connections, multiple valves can be field assembled to share supply air. AVP series valves include single-solenoid, two-position, spring return, normally-

closed models.

AVS-3 series valves, starting at \$19.75, are body ported three-port (three-way) spool valves with port sizes up to 3/8-inch NPT and flow coefficients (Cv) from 0.78 to 1.67. AVS-3 series valves include:

- Single-solenoid, two-position, spring return, normally-closed
- Double-solenoid, two-position, energize

open/energize closed

AVS-5 series body ported five-port (four-way) spool valves start at \$19.75 and are available with port sizes up to 3/8-inch NPT and a flow coefficient (Cv) range of 0.67 to 1.68. For multiple-valve applications, AM-5 series manifolds are available in 2, 4, 6 or 8 stations (starting at \$9.25). AVS-5 series valves include:

- Single solenoid, spring return, normally-closed
- Double-solenoid, two-position
- Double-solenoid, three-position, center-closed or center-exhaust

See the complete NITRA line at:

www.automationdirect.com/pneumatic-parts

"A mistake is simply another way of doing things."

— Katharine Graham

"A good film is when the price of the dinner, the theatre admission and the babysitter were worth it."

— Alfred Hitchcock

Best prices on pneumatics



NITRA™
PNEUMATICS

Filters
Regulators
Lubricators
Filter/regulator combos
Relief valves

Get best prices on ALL the components you need to complete a pneumatic control system!

The NITRA family now includes rugged directional solenoid valves and air prep components:

- Solenoid valves with 24 VDC or 120 VAC control voltages, starting at \$16.75
- Regulators in ranges of 20-130 psi or 7-60 psi start at \$17.00
- Mist-type air lubricators start at \$12.25
- Air filters start at \$11.25

Other NITRA components available in the most popular styles and sizes

- Stainless Steel cylinders and switches
- Polyurethane and nylon tubing
- Most popular fittings
- Meter-in, -out, and inline flow control valves
- Stop, check and manual hand valves

Directional solenoid valves and manifolds

CHECK OUT OUR PRICES ON PNEUMATICS

Product Description	AutomationDirect NITRA	VS.	MSC	McMaster-Carr	Grainger
Directional Solenoid Valve 5-port, 4-way, 2-position, 1/4" NPT, 24 VDC, single solenoid	\$26.75 AVS-5312-24D		\$84.81 64470475	\$60.78 6124K513	\$90.15 3JC6
Combination Filter/Regulator 1/4" NPT, gauge, mounting bracket	\$29.00 AFR-3233		\$115.47 42007401	\$72.76 7390K17	\$104.20 42K92

All prices are U.S. published prices. Many other part numbers are available from all vendors. Items are closest equivalents; some minor differences may exist. AutomationDirect prices are from October 2010 Price List. MSC prices are from www.msclink.com 9/6/10. McMaster-Carr prices are from www.mcmaster.com 9/6/10. Grainger prices are from www.grainger.com 9/6/10. Prices subject to change without notice.

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Product Snapshots

Press Releases



Air Conditioners added to enclosure cooling options



Heat inside an enclosure can decrease life expectancy in controlling units such as PLCs, HMI, and AC drives. Excessive heat can cause nuisance faults from electrical and electronic components, circuit breakers and fuses. To help alleviate such problems, AutomationDirect has added NEMA-rated Stratus™ air conditioners for enclosures.

These closed-loop cooling systems are recommended for harsh environments, or when there are washdown requirements, heavy dust and debris, or airborne chemicals present. Available in 120V and 230V units, the NEMA 12, 4 and 4X-frame Stratus 1,000 to 8,000 BTU/H air conditioners feature free-standing rigid chassis for easy installation and maintenance. NEMA 12 and 4 models are constructed of 16-gauge cold rolled steel; NEMA 4X units are made of 16-gauge 304 stainless steel. All units contain an active condensate management system; NEMA 4 and 4X models have protective-coated condenser coils.

Designed to fit enclosures as shallow as 12 inches, each unit features a digital LED temperature controller with visible alarm and is pre-wired for

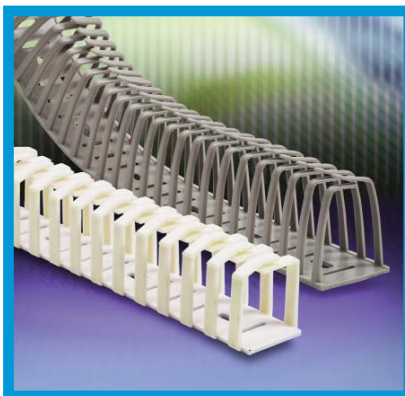
external alarm monitoring. The highly energy-efficient compressors are charged with CFC-free refrigerant and equipped with anti short-cycle protection. All models are UL and cUL listed. Prices start at \$1,099.

Replacement filters are also available for each of the three frame sizes, starting at \$24.

To see the full line of Stratus enclosure air conditioners, visit:

www.automationdirect.com/enclosure-cooling

Single-piece flexible wire duct now available



AutomationDirect's Dinosaur self-adhesive flexible wire duct is designed for transporting wiring to cabinet doors from control panel interiors and for electronic equipment. Sizes ranging from 0.5 x 0.5 inch to 1.5 x 1.5 inch are now available in single-piece quantities or cost-saving cartons. With a UL 94V-0 flammability rating and CSA approval, the duct is made of low-smoke, halogen-free polypropylene, giving it resiliency to bend and twist without breaking. The flexible duct can be used in extreme operating conditions up to 176°F. Base perforation on the self-adhesive duct allows for mounting with rivets or on DIN rail, if desired. Prices start at \$98 per case and \$3.75 for single pieces. Learn more at:

www.automationdirect.com/wire-duct



ProSense™ line adds quarter-inch temperature probes

AutomationDirect's ProSense line of process sensors now includes quarter-inch RTD temperature probes. The three-wire, 100 ohm platinum RTD probes are made of durable 316 stainless steel and measure temperatures ranging from -40 to 302°F. The probes are available in lengths from 160mm to 360mm. Thermowells and fittings are also available. The quarter-inch RTD probes start at \$29. To see the complete proSense line, visit:

www.automationdirect.com/temp-sensors

Select DINnector products available in smaller quantities



In keeping with our objective to provide the best value in industrial control products, AutomationDirect now offers a selection of popular terminal-block mounted supplementary protectors, ground terminal blocks,

end brackets, and DIN rail in smaller quantities.

DINnector resettable supplementary protectors are now available in single-piece and 20 packs. Supplementary protector prices start at \$10 for single pieces.

A selection of screw-type terminal block sockets for the protectors, with and without LED indicators, can now be purchased in both five-packs and 50-pack quantities, starting at \$7 for a five-pack. Terminal block spacers and separators are available in 10-packs and 50-packs, starting at \$3.

Ground terminal blocks rated for size six to 10 AWG wire are available in quantities of 10 and 50, starting at \$24 (10/PK).

DIN rail can now be purchased in packs of two as well as boxes of 10. The 1-meter pieces start at \$6 for a two-pack. End brackets are also available in 10-packs and 50-packs, starting at \$6.50 (10/PK).

To view the full line of Dinconnector terminal blocks and accessories, visit: www.AutomationDirect.com/terminal-blocks

Encapsulated power supplies added to RHINO line

AutomationDirect has extended its RHINO™ line to include AC/DC switch mode power supplies encapsulated in an ultra-compact, low profile housing. The new PSE series is ideal for space-limited applications and can be easily screw mounted to a panel or equipment chassis. The power supplies can also be DIN rail mounted using the optional DIN rail mounting kit.

The PSE series features a universal AC input range of 85-264V and is available in single or dual output models. Output voltage ranges include 5, 12, 15 and 24 VDC; and +/- 12 and +/- 15 VDC. Single output models provide a maximum output power range from 15 watts up to 60 watts, while dual output models provide 15 watts and 30 watts. Designed with a double-insulated plastic resin housing, no external grounding is required. Screw terminal blocks provide easy connection



and the series is short circuit and overload protected.

Backed by a 3-year warranty, RHINO PSE series encapsulated power supplies are RoHS compliant, UL and cUL listed. Prices start at \$49.50 for single output models and \$51.75 for dual outputs.

See the full line of RHINO power supplies at:

www.automationdirect.com/power-supplies-encapsulated

UL 489 miniature circuit breakers now available



The Eaton WMZT series miniature circuit breakers have been added to AutomationDirect's product offering of circuit protection devices. The single-pole, double-pole and triple-pole devices, available in sizes from 0.5 – 40 Amps, offer optimum and efficient protection for branch and control circuits. The series' current-limiting design provides fast short circuit interruption, within one half cycle of the fault, which reduces circuit-damaging let-through energy.

WMZT circuit breakers are available with C and D curve thermal magnetic overcurrent protection characteristics. C-curve devices are suitable for applications where medium levels of inrush current are expected, such as small transformers, lighting, pilot devices and control circuits. D-curve devices provide protection from nuisance tripping where high levels of inrush current are expected, such as motors, transformers and power supplies. The series is also suitable for reverse-feed applications.

The series is DIN-rail mountable and features a trip-free design so the breaker cannot be defeated by holding the handle in the "ON" position.

A selection of field-mountable accessories is also available, including auxiliary and alarm switches, shunt trip, lockout attachments and bus bar systems.

Prices begin at \$16.50 for the 0.5 amp breaker. View the full line at:

www.automationdirect.com/mini-circuit-breakers

MCCB door safety hardware added



AutomationDirect now offers Type C361 door interlocking safety handle and roller kits for the 3P Series molded case circuit breakers. The safety interlock handles, when connected to the MCCB, secure an SDN series NEMA 12 disconnect enclosure to protect against unauthorized entry while the breaker is in the ON position. A door interlocking safety roller kit is available for enclosures over 36" tall. Handle prices start at \$159 and the roller kit is \$35.

View the molded case circuit breakers and accessories at:

www.automationdirect.com/mccb

Continued, p. 14>>

Cover Story

Trends in Automation

Powerful PAC Upgrades Tortilla Machine

Advanced automation helps Casa Herrera produce tortillas reliably, quickly and precisely

By Ron Meade,
Chief Executive Officer
Casa Herrera

Casa Herrera builds tortilla preparation equipment for the corn and flour tortilla industry, provides equipment for the bakery and snack food industries, and is the preferred supplier to several national brands. We build several varieties of our machines to meet customer specifications, and we install and service all of the equipment we manufacture.



Image 1, This production line from Casa Herrera mixes, divides, forms, presses, bakes and stacks tortillas. The entire line is monitored and controlled by a single high-performance PAC.

For one of our current design tortilla making machines (see Image 1), we wanted to upgrade the control system. We've been building the same machine for seven years, and mechanically it's proven and reliable. The problem was with the PLC control system. Although the PLC we were using was reputed to be the best in the world, we experienced limitations due to slow speeds and information streaming interference, and the service was adequate at best.

We wanted to upgrade to a control system that was capable and reliable, and also flexible enough to install on different machines. The control system also had to be easy to maintain, diagnose

and repair in the field. After evaluating all of the leading competitors in the field including PLCs, industrial PCs and Programmable Automation Controllers (PACs) – we selected and recently installed a control system from AutomationDirect.

For assistance with control system design and implementation, we called in local control systems integrator Memco:

(www.memcoautomation.com).

Memco works closely with our AutomationDirect value added reseller Quantum Automation (www.quantumautomation.com) on complex control projects such as this one. Memco designed, fabricated, programmed and installed the tortilla control system based on a Productivity3000 PAC, C-more HMI panels, and GS variable speed motor drives – all supplied by AutomationDirect:

(www.automationdirect.com).

The Productivity3000 monitors and controls the entire machine via 365 discrete and analog inputs and outputs. Each of the 27 motor drives is interfaced to the controller via a high speed Ethernet data link. The two HMI panels are also connected to the controller via Ethernet. As shown in Figure 1, industrial Ethernet hubs are provided to control and coordinate all data exchange.

Making Tortillas

The first stage of production is dough mixing, where the pneumatic conveyor brings bulk flour to the weigh hopper. The weigh hopper discharges to the mixer, where water and shortening

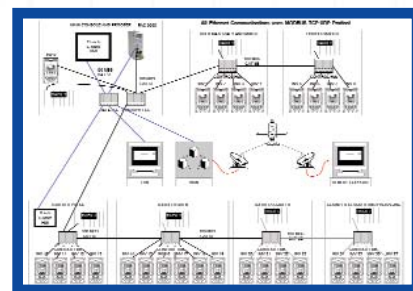


Figure 1, Each area of the tortilla machine is interfaced to the main console via high speed Ethernet data links. The Productivity3000 main controller monitors and controls the entire machine, and the two HMIs provide all required operator interface.

are added and where mixing occurs for a programmed period of time. The mixer then discharges into a dough transportation system that goes to the divider.

The divider extrudes and cuts off precise weight dough balls, and runs them through a rounding table that rolls them into ideal spheres of consistent weight. The dough balls fall into a synchronizing gate on the proofer that drops them into moving tray cups. The pieces rest for 5-10 minutes in the cups, then are discharged in various patterns to the press loader, a series of vertical tubes below the proofer discharge point.

The loader orients the dough balls for correct placement on the press belt in order to optimize pressing head operation. The balls are pre-pressed with pneumatic pistons to shape them into pucks so they won't slide or roll around when the belt indexes into the pressing section.

The pressing section has a hydraulically actuated upper and lower metal platen plate with three heat zones. The combination of heat, pressure, platen speed and time causes the dough balls to extrude evenly into round tortillas. Surface starches and oils are properly gelatinized and sealed, so the tortillas do not get soggy with wet or juicy fillings.

Tortillas travel next into a maximiser, basically two short conveyors on top of each other that raise and lower pneumatically to receive alternate loads from the press. This machine

has four speeds for the top and the bottom belt, two for receiving and two for discharging.

With the proper electronic gear ratios calculated in the controller and communicated to the motor drives, belt speeds can be precisely adjusted. This allows surging product from the press to be fed out in a continuous steady stream to the oven.

The oven is a three-tier design with longitudinal burners, exhaust air management and combustion air control. The control system monitors the belt temperatures using non-contact infrared sensors, and it also controls the burner actuators. The exhaust is controlled based on the input BTU to the system to maximize fuel savings.

Leaving the oven, a vertical vacuum conveyor takes the tortillas nearly straight up, then down the top tier into the atmospheric cooler. The cooler is a series of open weave stainless belts, with cross ventilation, stacked on top of each other. The tortillas flip over when going from one tier to the next for efficient cooling. If lower temperature discharge is needed, the cooler can be installed in a cold room or it can be fitted with an onboard refrigeration unit.

Once cooled, the tortillas go into the counter-stacker which collates them into rows. The rows are typically stacked into groups of 12, 24 or 36 tortillas – although different quantities can be selected as desired. The stacker discharges the stacked tortillas onto a conveyor that leads to an automated bagger that bags, seals, date codes and discharges packages onto a conveyor for final boxing.

Complex Control

With modern automated tortilla machinery, there are many critical timing points throughout the production line. The product is very sticky at the beginning, slippery in the middle, and flexible at the end - making the equipment setup for each area very exacting. The Productivity3000 helps everything stay in sync by controlling all parts of the production line.

Phil McCall, our control system

designer at Memco, explains: “In the overhead proofer, each tray is about two inches apart and has a row of nine baskets. Based on the product pattern - two to six pneumatic trippers have to pop out between the trays, tip the tray over to dump the dough balls into the loader and then retract – all in a fraction of a second. This timing is controlled by a main shaft encoder on the proofer, and a proprietary algorithm tips the trays with the proper amount of advance so the trippers always pop out dead center at different tray speeds.”

Another critical timing point is the maximiser between the press and oven infeed. Its purpose is to fill the oven evenly and completely for a good bake, even though the product is coming in uneven slugs from the press.

“We use the extensive math ability of the Productivity3000 - where all variables are in 32-bit floating point - to adjust maximiser top and bottom belt speed, acceleration and deceleration. This allows the machine to accept the rapidly moving slugs from the press and lay them down into an even stream for the oven,” says McCall.

“Using 100 MB/s high speed communications directly to the motor drive, we can adjust the belt speeds in 1-2 milliseconds. We have tried other brands of PLCs and drives and have had unacceptable results, even with products costing two to three times as much,” adds McCall.

The control system components are networked together using Ethernet communications. The network is reliable, very fast, and easy to connect and maintain. The entire database is stored in the Productivity3000 memory, so technicians have full system documentation online.

The HMIs have extensive graphic capabilities, giving us the ability to display pictures of the machine and of the sub-panels to assist maintenance personnel with troubleshooting (*see Image 2*).

“The Productivity3000 is one of the fastest processors I have ever programmed,” notes McCall. “With the

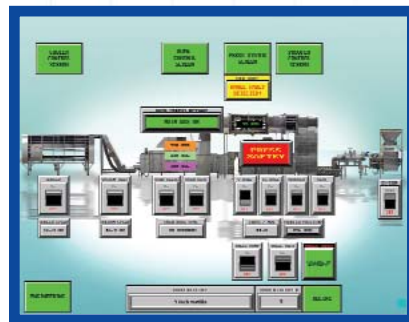


Image 2. The HMI panel displays detailed graphics - allowing it to show exact images of machines, operator faceplates and real-time information in any of nine languages.

entire line programmed and running, the scan time of the processor and all I/O is 0.6ms. This makes the machine very responsive to the operator. On this application, we used approximately 5% of the system resources. I have no doubt that this system could run multiple lines or even an entire plant, with performance exceeding standalone PLCs, and at lower cost to boot.”

Free Software and Support

The programmable controller, HMIs and motor drives are very straightforward to set up and program. Tag names from the Productivity3000 program were imported into the HMI programming software, which saved lots of time. The analog cards have displays that show the status of each channel and its configuration, so technicians don't need a meter to perform checks.

The HMIs have the capability for remote viewing, or even full remote control from a standard Web browser. They also have multi-language support - so the names and words on the screen can be changed to one of nine languages at the push of a button - including character or script based languages like Chinese, Japanese and Arabic.

The controller and HMI programming software packages are either very inexpensive or free, with no tech support contracts required. All the technical support we need is also free from AutomationDirect.

Future Perfect

Casa Herrera sells many variants of this line: bigger, smaller, single line and

Continued, p. 10>>

Cover Story cont.

Trends in Automation

Continued from, p. 9

double line. For example, the machine can have one transverse proofer with double drops to two presses, two ovens, two coolers, and two counter-stackers and baggers.

To accommodate these various types of lines, MEMCO devised a scheme where the operating logic in each type of machine on the line is in a separate file. These files are called to action upon the system recognizing various control system components connected to the controller via the Ethernet network.

The Productivity3000 has the ability to ignore a completely disconnected rack or motor drive, and not fault the system. This means that our end users have the entire software program already loaded for any future expansion. All they need to do is power the equipment and plug it into the network.

This also means that we only need to maintain one program for all our tortilla lines sold with the AutomationDirect control system. We are currently working on control system additions to integrate machine vision and robotic handling to the product line. This will allow us to provide our customers with a complete turnkey manufacturing solution.

Troubleshooting Made Easy

When Casa Herrera approached control system integrator MEMCO - we wanted a control system that had a cutting edge intuitive diagnostic system, got around language barriers, and was able to implement remote servicing capabilities over the Internet.

Because virtually all control system information is stored in the controller CPU, the troubleshooting system could be very elaborate. We chose to use high resolution photographs of the panel back plate as-built drawings, showing every component in its relative position. We then used popup windows to overlay the panel drawings in their location on the machine. These pop up windows become visible when any fault

occurs, and an animated red box blinks around the problematic item.

The Productivity3000 processor keeps track of the status of system components, and assigns conditions to tag names when we add a module or component. For example, in the tag name database for an 8-channel output card, there is a module fault tag as well as a tag indicating a blown fuse on each of the outputs. We can use this information to bring up a button on the display screen that blinks and informs the operator that there is a module problem.

When the operator presses the button, it takes him to a high-resolution photograph of the machine and of the panel where the blown fuse is located. When the operator touches the picture of the panel, another high-resolution image of the back plate inside the panel appears in front of the enclosure image.

On the image of the back plate, a red blinking box appears around the suspect module. A high-resolution image of the component side of the output card appears next to the chassis. This image shows the location of the fuse circled in a red blinking box - and the function, type, rating and part number of the replacement fuse in a text window (see Image 3).

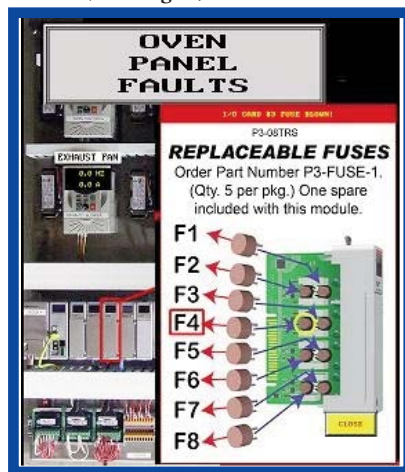


Image 3, The control system automatically detects faults and displays relevant information down to the component level and the part number for fast diagnostics and repairs.

The Productivity3000 system allows hot swapping of modules, so the maintenance person can check the circuit and repair the short. He or she can then pull the card out hot, replace the fuse, reinsert the card and restart the machine. The average time to locate a blown fuse, tripped overload, tripped breaker, power supply problem or drive fault is about two minutes from seeing the fault to having the suspect part identified.

Troubleshooting the motor drives is just as easy. When a drive fault occurs, the same sequence of windows and animation leads the maintenance person to the correct panel. A blinking box indicates the tripped drive, and a text window tells what equipment the drive operates. The box also shows what type of fault has occurred such as overcurrent during running, ground fault at the motor, phase loss or some other abnormal condition.

One of the most unique features of the control system is the transfer of motor drive information. If a customer has a faulty motor drive - the repair procedure is to turn off the power, unplug the communication cable, install the new drive, plug in the communication cable and power up the drive.

Because all motor drive parameters are stored in the Productivity3000's CPU, upon first scan the processor recognizes the new drive. It then reconfigures the communication port for remote control and downloads all drive parameter settings, all in about 3 seconds. This means that local plant personnel don't have to be familiar with motor drive or control systems programming to replace a drive.

The troubleshooting system usually enables quick repair to be performed by a mid-level maintenance person. But if the problem cannot be solved quickly on site, the programmable controller and the HMI feature full remote access. With this feature - every I/O module, motor drive and sub-component connected to any of the communication ports can be accessed through the Ethernet data port - either locally, or remotely through a standard Internet connection.

We can remotely view every motor drive parameter as well as every status register. The same goes for every rack, power supply and I/O module. The HMI screens also allow live real-time remote viewing and control so the screen faults can be seen from anywhere. For detailed off-line analysis - the data logs, fault logs and event logs stored on the local USB memory stick can be viewed and downloaded using FTP.

Since the commissioning of the first Productivity3000-based tortilla line for True Foods in Melbourne, Australia - we have gone online from California to monitor the control system in real time. We have added customer-specific changes to the program, and we've tuned motor drive parameters. We also added new screen buttons and data trending features to the HMI, all in a matter of minutes.

more Advanced Instructions



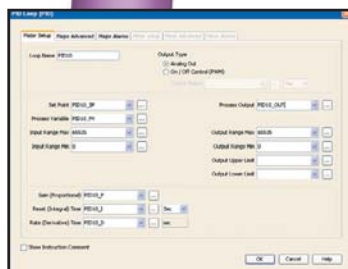
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System Integrator Corner

Modernizing Machines

KCC Software combines panel building and software integration

By Scott Martin,
KCC Software



KCC Software, located in Huntsville, Alabama, was founded in 1994 and quickly developed an impressive client list including IBM, Bosch, HP, Bose, Johnson Controls, BASF, and Nucor Steel just to name a few. While primarily working with the semiconductor and steel industries, KCC Software has satisfied clients in several industries, including automotive, general manufacturing, electronics, textile, and poultry. We specialize in machine/process controls, management/monitoring systems, and custom integration of data from multiple sources and systems. We can provide a seamless and useful supply of information by tying factory floor to corporate databases and MRP systems, and can use enterprise data to help make factory floor decisions.

KCC Software's programming and software system expertise attracts a broad range of clients from other system integrators to end users who often have mechanical and electrical capabilities in-house.

System design is 60% PC-based programming and 40% PLC-based programming and integration. Many of the solutions provided are a combination of PLC-based controls and PC-based monitoring, database writing/reading/reporting and even browser-based access to information. As an example, MillAlert™ (www.millalert.com) is a KCC Software product designed for the recycled steel industry. MillAlert offers PLC interfaces to radiation monitoring equipment, PC-based archiving, trending, TXT alerting, and reporting with Web-based system status access. (Figure 1)

When Maples Industries, one of the nation's largest bath set and area rug



KCC Software Panel



KCC Software Panel Enclosure with Touch Screen

producers, needed an expanded capability to meet changing market demands, they turned to KCC Software. KCC created a desktop design program which allowed Maples' designers to create intricate patterns at a detail level four times greater than they had before. KCC Software also designed new PLC controls for their dye application process which sprayed multiple dyes to exacting specifications in order to match their existing patterns. The system monitors yarn tension and speed and dynamically adjusts spray timing to make sure each color is applied exactly to match the pattern.

In addition to project development, KCC Software has also partnered with several companies in the development of their products. MillAlert is a joint venture with Chase Environmental Group. KCC Software worked with BOC Gases to develop more than 20 products. Inergi also partnered with KCC Software to develop the controls for a new line of wood-burning furnaces for poultry farms.

To learn more about KCC Software and read more application stories, visit: www.kccsoftware.com.

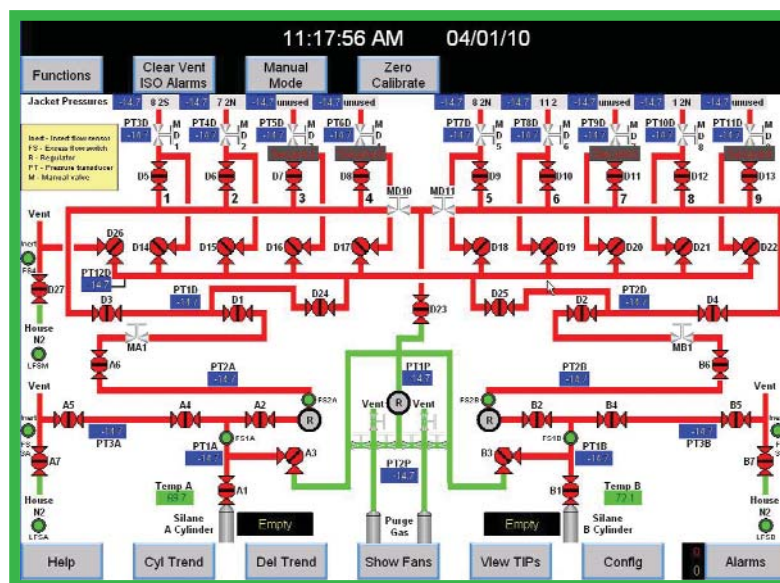


Figure 1, Roof Main Screen

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--------------------	-------

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* All prices are U.S. published prices. Prices and specifications may vary by dealer and configuration. AutomationDirect prices are from October 2010 Price List. Allen-Bradley prices are based on www.rockwellautomation.com/en/e-tools 9/6/10.

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Product Snapshots

Press Releases

Continued from, p. 7

Manual Motor

Controllers/Disconnects



The new Bryant® line of manual motor controllers (MMC) is UL listed as “suitable as motor disconnects.”

Because the NEC® recognizes that a controller and disconnect can be the same unit (article 430.109), Bryant has designed a compact controller to meet the rigorous demands of a motor disconnect. By utilizing Bryant’s MMC devices, the user benefits from the convenience of one device fulfilling two needs.

Bryant’s controllers feature thermoset bodies, to provide high resistance to electrical arc tracking, and AC-rated silver alloy contacts for excellent conductivity and extended life. The compact devices are available in NEMA 1, 3/3R and 4X enclosures; each enclosure has lockout/tag out capability.

Bryant Toggle AC manual motor controllers feature quick-make/slow break operation to provide reliability and long life. Each toggle switch controller has a 10,000 amp high-fault short circuit withstand rating, excellent dimensional stability and superior dielectric strength. Optional NEMA 1 enclosures without switches, as well as side guards for close wall applications and finger-safe environments, are also available.

Single-phase and three-phase toggle controllers are available in 30, 40 and 60 Amp sizes, up to 600 VAC, and 2-pole and 3-pole configurations. Designed with a clamping plate for back

or side wiring, toggle switch type controllers start at \$21.50.

Available enclosed toggle AC manual motor controllers feature NEMA 1 or NEMA 3R enclosures. NEMA 1 metal enclosed switch controllers, ideal for use in indoor environments, are designed with ½” and ¾”-inch NPT wiring conduit knock-outs. The all-aluminum cover and base are designed with top, bottom or back wire entry points; the base is pre-drilled for rear surface mounting. NEMA 1 enclosed toggle controller prices start at \$27.50.

NEMA 3R rain-tight enclosed toggle controllers are available in either all-aluminum or chemical and impact resistant thermoplastic enclosures, making them ideal for outdoor applications. The all-aluminum enclosure, with pre-drilled base for rear surface mounting, is designed with ½” NPT wiring knockouts for 30 Amp models; 60 Amp models feature ¾” and 1” conduit knockouts. NEMA 3R enclosed toggle controller prices start at \$40.

NEMA 4X enclosed rotary AC manual motor controllers, ideal for heavy wash down and corrosive environments, feature impact and chemical resistant thermoplastic enclosure bodies. An over-center rotary switching mechanism ensures reliable operation and allows positioning of up to two N.O. / N.C. auxiliary contacts. NEMA 4X enclosed rotary controllers start at \$99.

Learn more about Bryant manual motor controller/disconnect components at:

www.automationdirect.com/manual-motor-controllers

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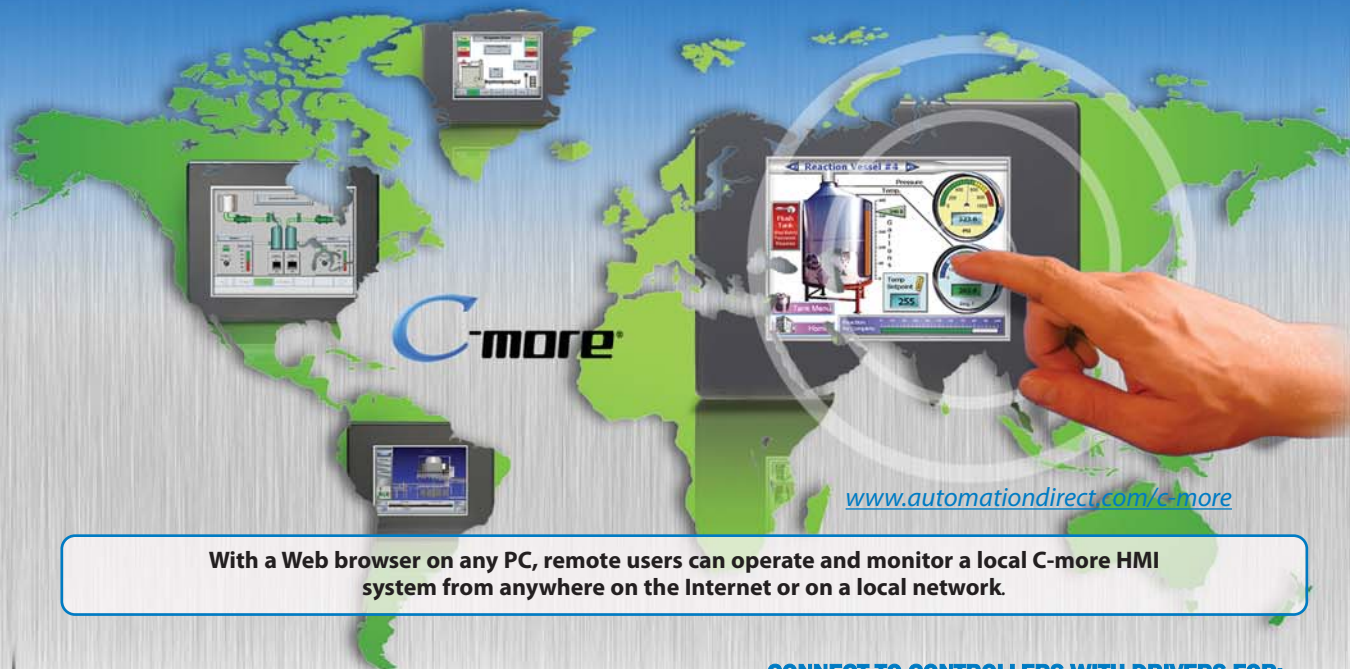


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Product Management Corner

complementary technologies

A complete pneumatic solution

By Pat Phillips,
AutomationDirect
Product Engineer,
Process and Fluid Power



Product management teams at AutomationDirect constantly work to add products which complement our core PLC offering. The product offering now includes a number of automation components not normally found inside control cabinets. An excellent example of this is our line of NITRA™ pneumatic products which ties in with our existing PLCs and controls.

With recent additions to the NITRA line, we now offer a complete line of pneumatic automation components from air preparation to directional control and actuation, including all interconnecting fittings and tubing. The NITRA pneumatics line offers customers a more complete selection to solve their automation and control needs.



Figure 1, Filers, Regulators and Lubricators

Air Preparation

NITRA air prep components, often called FRLs (Filters, Regulators and Lubricators) prepare an incoming compressed air supply for use by a pneumatic system. Filters remove water and contaminants from the air. Regulators reduce and maintain supplied air pressure to the user's desired setpoint. Lubricators add lightweight oil to the air which prevents damage to system components requiring continuous lubrication. Lockable

relieving shutoff valves are also available to safely turn off a pneumatic system for maintenance. AutomationDirect's current NITRA air prep line consists of modular components that can be mounted separately or assembled into combination units.



Figure 2, Directional control

Directional control

The directional control devices of a pneumatic system consist of valves which turn an air supply on and off, or change the direction of air flow between two ports. Our current NITRA line has a small selection of manual on/off valves and a larger variety of solenoid operated valves. Manifold blocks are available for 5-port valves to simplify installation and connections. PLC outputs can control these solenoid valves, connecting the electrical and pneumatic systems of an automation application.



Figure 3, Actuators

Actuators

Most of the work in pneumatic systems is done by air cylinders. Our NITRA A-series cylinders are some of the simplest cylinders to apply. They are low cost, non-repairable cylinders which are permanently lubricated at the factory, giving the user years of reliable service. Models are available in single-acting and double-acting styles, with a large choice of bore and stroke sizes to meet most needs. Solid-state position switches are also available to allow a

user's PLC to monitor the status of the system.



Figure 4, Tubing and Fittings

Tubing and Fittings

Tying these components together to complete a system are NITRA's nylon or polyurethane tubing and push-to-connect fittings. We carry tubing in several of the most popular sizes and colors. Push-to-connect fittings have become the desired format for many industries and we currently stock nearly 400 styles.

We consider the current NITRA product offering to be a strong base on which to build for the coming years. Look for more styles and sizes in all product categories as we continue to expand the NITRA line.

The addition of pneumatics to our primarily electrical product lineup is another move toward making AutomationDirect a one-stop shop for all our customers' industrial automation needs. We will continue adding product lines in the future to achieve this goal. Linear motion, power transmission, bearings and fasteners are just some of the new product lines currently under consideration.

"I bought some batteries, but they weren't included."

— Steven Wright

Student Spotlight

The Future of Technology

Sam Flourney - Biodiesel Entrepreneur

By Chip McDaniel
AutomationDirect



Sam Flourney first contacted Automation Direct in February of 2009. As a 14-year old who had just finished building a biodiesel processor in his garage, he now wanted to automate the process. We immediately began looking around for the candid camera! But it turns out he was serious, as he was producing about 180 gallons of biodiesel per week; he had already purchased a DL06 PLC to use as his automation controller.

Sam explained, "At that point my processor was much easier to use than most other homemade systems, but it was still very time consuming. Right from the start, I knew I would have to automate the processor because high school was going to take up most of my time."

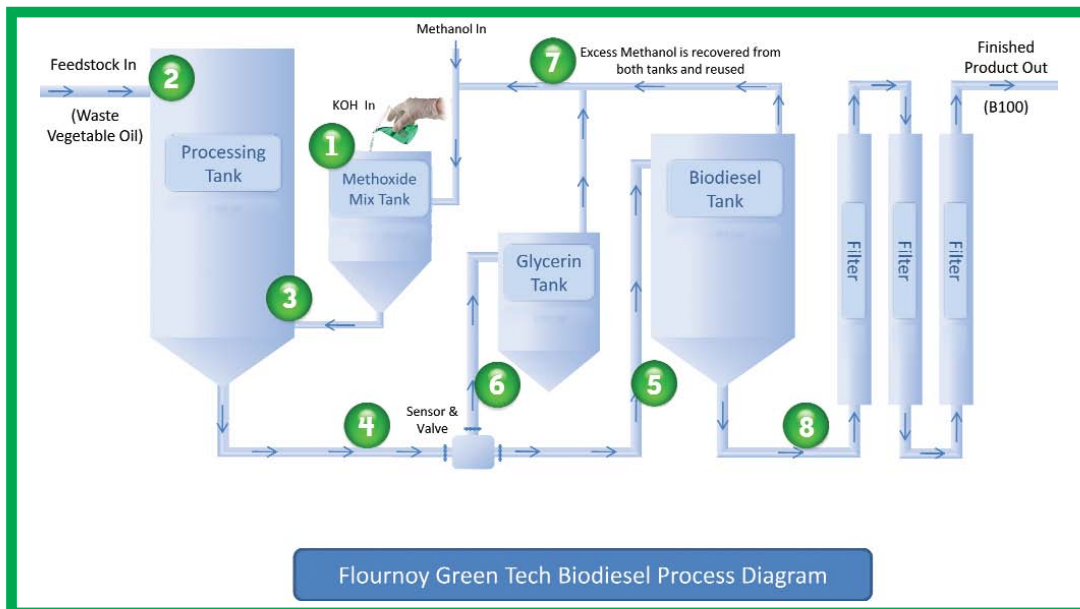
He also had an eager customer for all that fuel – Sam's father operates a tree service in Richmond, Virginia, with numerous diesel trucks thirsty for Sam's product.

Sam further explained that he became interested in biodiesel after his father purchased a diesel VW wagon from a farmer who was making biodiesel in a shed – with very crude tools and methods: 'two rusty water heaters, a

cheap pump, and a pair of jeans to use as filters.' Sam wasn't impressed by the setup, but was intrigued by the concept. He says, "In early 2008 I knew literally nothing about biodiesel. I spent hundreds of hours researching biodiesel over the course of about four months. I had never been so motivated to learn about

biodiesel. And I was having so much fun just learning about this the whole process, knowing that in the end it would be helping my family, the environment, and me."

Sam spent the next eight months scrounging stainless steel tanks, valves, fittings and various other parts from



Step-by Step Process

- 1** Potassium Hydroxide (KOH) is measured and poured into the Methoxide Mix Tank along with Methanol. *This is currently the only manual step in Sam's process. He can literally measure out the KOH, add it into the Methoxide Mix Tank and press the "GO" button – the rest is automated.*
- 2** While the KOH and Methanol are mixing to form Methoxide, waste vegetable oil is pumped into the main processing tank.
- 3** The main processing tank is then heated and the Methoxide is slowly introduced and mixed to ensure the most complete reaction. Once the reaction is complete, the contents of the processing tank are allowed to settle. Biodiesel sinks to the bottom and the by-product glycerin rises to the top.
- 4** As the layered liquid is pumped out of the Processing Tank, an ultrasonic sensor in the plumbing monitors the color and consistency of the liquid.
- 5** First, the Glycerin (from the bottom) is pumped into the Glycerin Tank.
- 6** When the fluid boundary is detected by the sensor, the flow is then diverted to the Biodiesel tank.
- 7** Excess methanol is removed from both the Glycerin and the Biodiesel Tanks, and is pumped back into the Methoxide Mix Tank for use in the next batch.
- 8** The Biodiesel is pumped through a series of filters, and is ready for use.

something new. I started out with zero knowledge, and within a few weeks I could walk you through a titration test, or tell you all of the pros and cons of

junkyards and closed factories, and cajoling his father's welder to help him weld up the frame. He designed the

Continued, p. 21>>

Tech Brief

Power Principles



Electrical Arcs (Part 1 of a 2-part series)

By Brian S. Elliott

Those of us who have worked with, or around, electrical equipment have witnessed electrical arcs. At the very least, we've seen the sparks produced when a relay or contactor switches off. Similarly, most of us also know that repetitive arcing can be very damaging to contacts over the long term, requiring periodic replacement of relays or their contacts.

The principal reason for arcing is the inductive kickback produced by a coil when it is de-energized. When power is disconnected, a coil naturally tries to preserve the current. It does this by increasing the voltage. In some cases, this increase reaches several thousand volts, which easily promotes arcing across contacts and through the coil itself.

During this discharge, localized temperatures often become high enough to promote rapid erosion of the control contacts. Induction motors and solenoid coils represent the most common source of arc energy. This phenomenon is easily observed by watching a motor starter with open contacts. When the motor turns on, the contacts close in a fairly uneventful fashion. However, when the contacts open, there is a bright, momentary arc produced which is visible to the naked eye. This arc represents the inductive energy stored in the motor coil.

Another common source of arcs occurs when energized components are placed too closely to an opposite potential. When properly utilizing commercially available components, a

proximity situation rarely occurs. There are, however, several situations which promote arcing. Obviously, using components at higher voltages than they are rated for reduces their effective stand-off voltage, thereby creating an arc. Electrical components should never be used at voltages higher than the manufacturer's recommendations. Over the long term, dirt also becomes a factor. As dirt builds up on electrical components, standoff voltages may decrease until an arc initiates. One of two things happens at this point; either the arc energy blows away the dirt build-up and the component returns to normal operation, or the dirt burns and a carbon path is produced on the insulating surfaces of the component(s), permanently reducing the stand-off voltage. This, in turn, promotes more arcing, which causes more damage and a run-away situation can rapidly form. If the power source is sufficient to maintain a continuous arc, then extreme damage to the contacts and surrounding components can occur in very short order.

Controlling arc damage from coils and motors is done by suppressing inductive kickback. There are three basic methods which can mitigate inductive kickback: shorting, arc lengthening and switching management.

For lower power applications, such as small solenoids and fractional horsepower motors, shorting is the simplest method. Shorting can be accomplished by using a metal oxide varistor (MOV), a neon lamp or a spark gap. An MOV is the most common component used to suppress lesser energies. These devices represent an open circuit below their specified rating and become conductive above that rating. An MOV is connected directly to the terminals of the coil. When the coil is disconnected, its voltage starts to rise, and when it reaches the MOV rating, its output becomes shorted. All arcing is suppressed because the kickback voltage is never large enough to initiate the arc in the first place. *Figure 1* shows how an MOV is used in a circuit to suppress inductive kickback.

A neon lamp serves the same basic function as an MOV, with slightly less precision and at lower voltages. In this

case, when the voltage climbs high enough to light the lamp, the inductive energy dissipates through the element. When neon lamps are used for transient suppression, they are placed in the same location as the MOV in *figure 1*.

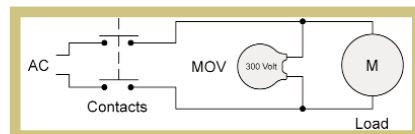


Figure 1, MOV Suppression

A spark gap can also serve to suppress inductive energies. Once again, the protective element is placed across the terminals of the coil. As the voltage rises, it eventually reaches a point which causes a spark to form across the gap; the idea being that the arc gap will initiate a spark before the control contacts.

MOVs, neon lamps and arc gaps have practical limitations. For applications involving higher energies, such as multi-horsepower motors or an entire branch circuit, controlling inductive kickback through shorting simply isn't practical. Usually, arc lengthening is used for these applications. In these cases, the arc is lengthened until inductive energies can no longer sustain the reaction.

There are principally four methods used to lengthen an arc: long-throw contactors, pneumatic suppression, magnetic suppression and arc dividing.

Long-throw contactors have the disadvantage of being disproportionately large in comparison to other techniques; therefore, these devices are not commonly used. Pneumatic suppression is typically used for switching situations which deal with extremely large inductive energies. Pneumatic suppression interrupters, as illustrated in *figure 2*, are most commonly used to switch large elements of the power distribution grid throughout the United States.

Magnetic suppression and arc dividers are typically utilized when switching multi-horsepower motors. Magnetic suppression is accomplished by forcing the arc to follow the longer field lines of a fixed magnet placed in

Continued, p. 22>>

Feature Story

Industry Practices

Maintaining machine quality while reducing time to market

By Jack Smith
The Hebert Agency

Machine and robot builder OEMs and their end user customers face similar challenges. For OEMs in a highly competitive market, quick machine delivery can make the difference between getting the order and losing it to a competitor.

In a challenging economy, end users tend to take more time making machine upgrade or purchasing decisions.

However, once a decision is made, they may need quick machine delivery in order to get the jump on their competitors and begin seeing a return on their investment.

Time-to-market pressure has increased dramatically in the last two years. Both OEMs and end users are trying to determine how to do more with less, how to integrate innovation into their growth strategies, and how to deliver their products faster.

OEMs and machine builders seek solutions which help them accelerate time to market—such as standardized PLCs, PACs and HMIs—without sacrificing the integrity of their designs or the quality of their equipment. However, this is easier said than done.

Generally, reducing time to market requires certain tradeoffs. There is less time for OEMs to build and test their products and systems, leading to possible pitfalls. These pitfalls seem to be in conflict between their desire to offer machines and equipment which establish differentiation and a competitive edge, and to do so ahead of any competitors.

Quick Delivery Means Market Advantage

"Delivery lead time is often a significant factor in selecting a company

to deliver a material-handling system," said Jeff Hanna, the director of control and software development for Intelligrated (www.intelligrated.com) in Mason, Ohio, in Control Design's June 2010 cover story, "Seize the Advantage."

"It's not always clear that we'll receive a premium for fast delivery, but it's often a critical element in deciding who will get the order. In systems that do not offer unique material handling features or software differentiation, lead time will be an especially important factor." Intelligrated designs, builds, installs, programs, and supports material handling systems for distribution centers and manufacturing systems.

"Delivery time is always important," agreed Tom Kleeman, CEO at Spartanics (www.spartanics.com) in Rolling Meadows, Illinois, in the cover story. "On occasions, it seems that it's the only consideration."

Spartanics designs and builds equipment for the printing and converting industries. The company's product offerings extend from standard counting and press-feeding equipment to custom laser-cutting systems. Spartanics faces the same pressures many other OEMs and machine builders face: Machine orders are down, but when the orders do come in, customers want the machine yesterday.

"Our customers may have contractual obligations that put a lot of pressure to get equipment in place and in production in a timely basis," said Kleeman in the Control Design cover story. "In other cases, the customer has calculated a payback for the investment and is anxious to start the clock as soon as possible."

The same is true for Saber Engineering in Auburn, Calif., which builds material-handling work cells and wafer robotic transport stations for companies in electronics, solar, and general manufacturing industries. "In 30% of the cases, delivery time is given the highest priority in awarding the project," said Bob Sullivan, Saber Engineering's vice president in the

Control Design cover story. The work cells that Saber builds use various robotic, servo, PLC, HMI, and vision systems to perform automated tasks.

Offering products or features that others don't can give machine builders a competitive advantage. Such is the case for BioAutomation (www.bioautomation.com), a manufacturer of DNA synthesizers in Plano, Texas. "We are lucky in that our market is small and there are not many people for them to go to," said Jeff Strauss, the company's vice president. "There are competitors in certain sections of the market we serve, but no one else covers the range of the market that we do." However, Strauss is quick to add that customers may desert the machine builder if they can't deliver quickly.

Cutting Time to Market is Risky Business

Sometimes machine builders can command higher prices when their customers demand shorter lead times, but not always, especially in tight economic markets. However, even if OEMs can get quick-delivery bonuses, the prize may not be worth the consequences. "The larger factor could be risk," Hanna said in the Control Design cover story. "Despite the product strategy and type of sophisticated tools we use, risk increases because the time to test the systems often is reduced to meet schedules. The added costs can be quantified, but the risk is much harder to quantify."

When OEMs build machines for fast delivery—especially custom machines—there are usually certain tradeoffs such as features, testing, or quality. Also, it usually costs OEMs more to build machines quickly. "Often we have to write software with incomplete or not fully tested hardware," said Bob Fung, director of engineering at Owens Design (www.owensdesign.com) in Fremont, Calif. in the cover story. "Material is selected to minimize design, build, integration and test time—sometimes at a much higher cost." Owens designs and

Continued, p. 20>>

Feature Story cont.

Industry Practices

Continued from, p. 19

builds automated manufacturing equipment for the semiconductor, hard disk drive, and solar industries. Most of the 12 to 15 systems a year that Owens designs and delivers require short delivery times.

OEMs in the robotics industry face the same issues. Rick de Jong is the general manager at AEMK Systems (www.aemksystems.com). The Waterloo, Canada, company specializes in high-speed, vision-based robotics systems for automation, assembly, and packaging applications.

"In general it costs more to cut time-to-market because you need to increase resources to meet shorter deliveries," De Jong said in the Control Design cover story. "Additional costs can be quantified in increased labor rates due to overtime pay, additional outsourcing due to inadequate labor resources, and potential increases in supply-chain cost to accelerate deliveries of raw components."

Service after the sale can pose additional risks down the road. "If the machine is a one-off custom solution, quick project turnaround could mean that we're in a weaker position when field support is required," said Kleeman in the cover story. "Some of this is unavoidable. If we have limited time to build and test a system, then 12 or 18 months later, it's more difficult to diagnose a problem."

Automation and Standardization Offset Cost and Reduce Risk

Machine builders can deal with fast delivery times as well as trim costs by using modern, off-the-shelf automation instead of designing custom controls. Fung's advice is to select off-the-shelf components or building blocks rather than custom automation, select components and systems that reduce wiring effort and debug time, and design systems that require less software customization.

Saber Engineering's Sullivan agrees: "Cutting time-to-market means overtime on the design, modified component selection, and expedited fees

Costs and Risks of Cutting Time to Market
1. Expedited delivery of components and hardware
2. Increased man hours for project management
3. Increased overtime
4. Outsourcing may be needed
5. Limits machine and system testing
6. Increases time for debugging

Table 1

How Automation Speeds Time to Market
1. Simulation tools enable simultaneous engineering
2. Open systems minimize learning curves
3. Modular and scalable controllers simplify design
4. Digital network minimize wiring time and speed commissioning
5. Automatic tuning minimizes commissioning and startup time
6. Integrated development environments speed software design
7. CAD accelerates electrical design processes

Table 2

for equipment," Sullivan said in the cover story. "It generally costs 15% to 25% more to expedite a schedule by 10% to 15%, but most customers will pay for an expedited schedule. Using standardized equipment, components and software that are off-the-shelf helps reduce expediting costs, and that means more profit." Sullivan added that having standard equipment and standard designs with known delivery schedules in place is vital. Saber's transport station uses industry-standard PLC and HMI products to speed time-to-market.

Port Orford, Oregon-based NC Electronics (www.omniturn.com) achieves quicker build times by modifying its basic machine to meet custom requirements. The company uses a modular building-block approach to building automation into its Omniturn CNC machines. "We build our machines to a certain point and leave flexibility for quick customization," said George Welch, Omniturn's CEO, also in the Control Design cover story. "This keeps the cost down. We also try to use off-the-shelf automation from prior

projects. If you have a mature product with a well organized production process, there is no downside."

AEMK Systems has a similar approach. "Our DeltaBot technology was designed specifically with short lead times in mind," de Jong said in the cover story. "Our ability to minimize mechanical components, maximize resources due to inherent design features, and provide the correct talent in the indirect labor segment greatly accelerates build time."

Kleeman said that for automation system designs—capturing and communicating design intent as early as possible can accelerate build times because parts are fabricated sooner, components are purchased earlier, and mistakes are minimized. "With shorter build times, you become risk-adverse and tend to stick with hardware and systems that you know," said Kleeman. "Sticking with that solution can be cheap insurance, especially when there are other technical risks in the project that aren't so easily mitigated."

Student Spotlight cont.

The Future of Technology

When talking about the machine controls, “minimizing the learning curve is all important,” Kleeman continued. “The automation vendor can be a hero for us if he’s willing to help us along as we build our application.”

“With a reduced build time, selecting a common platform that is well understood is the best choice,” Sullivan said in the cover story. “This reduces the spin-up time needed to become familiar with a new product. Equipment delivery time is also a key factor, as many times you need the equipment yesterday. We try to use more all-inclusive automation packages that have many of the functions and features required by our customers. This cuts development time and ultimately time to market.”

Don't Sacrifice Quality for Speed

Typically, faster time to market can provide a competitive advantage to most machine builders. However, quick delivery must not impact machine quality and reliability. It's important for OEMs to know, understand, and communicate the extent to which they can deliver equipment realistically. “We're not willing to commit to schedules we don't believe are achievable, and we've lost programs because of this,” Fung said in the Control Design cover story. “In a number of cases, the customer selected a supplier because of lead time and came back to us since the machine that was delivered on time didn't work months later.”

Accelerating time-to-market means that there is not as much time to cover design aspects in an effort to avoid unintended consequences. “The more time you take, the higher the quality and consistency,” said Strauss. “Obviously, you have to find the correct balance for each project based on complexity and market pressures.”

Using standard off-the-shelf automation components such as PLCs, PACs, and HMIs can help speed up machine development time, reduce errors, increase profit margins—while ensuring high-quality, consistent and reliable machine designs. 🟢

Continued from, p. 17

plumbing and electrical systems from scratch. He admits, “I never had any electrical experience before in my life, so this went pretty slow in the beginning.”

He produced the first batch – 20 gallons – in late 2008, and tested it in an old ‘retired’ diesel engine. He reports, “It ran beautifully, and the exhaust even smelled a bit like French fries. I can't imagine a first trial run being more successful.”

Sam began running larger batches and refining his process. “I had a machine that could produce a valuable product that was also better for the environment. But it was still a lot of work. I had to constantly move around the machine – turning valves manually, turning the pumps on and off manually, and monitoring the whole process.”

The next logical step was to automate the process, so Sam contacted AutomationDirect and purchased his first PLC. “The automation of the biodiesel processor was the hardest part of the entire project, but I enjoyed every step because I was always learning something completely new, and it was really cool! It is very rewarding to watch the machine do something automatically that I had previously done by hand.”

Because he was unfamiliar with PLCs, Sam developed a specification outline and hired a PLC programmer via a freelance programming Web site. When the programmer drug his heels, Sam started dabbling with *DirectSOFT* programming software. He quickly learned more about programming a biodiesel process than the (presumably adult) contractor, so Sam let the programmer go. “I am very happy that the programmer did not complete his job. This forced me to learn how to do it myself. I could not have fully automated the machine without knowing how to write the code for the PLC,” explains Sam.

Sam came back to AutomationDirect for a temperature sensor, temperature controller, solid-state relays, ultrasonic sensor, transformer, and even an 8-inch C-more HMI for his control enclosure. He added automation step by step,



while continuing to perform many operations manually. When he finished, the machine was producing batches of biodiesel completely autonomously. Sam continued to refine his process, and reduced the batch time from six to four hours. Before long he was producing over 1,000 refined gallons a week with the fully automated processor.

Sam's journey was not without pitfalls. He reports one scary incident, where he noticed a clog in his mixing tank causing pressure to build up in some of the PVC piping. Before Sam could shut down the processor, the pipe cracked, sending a highly caustic (and flammable) mixture of potassium hydroxide and methanol spraying in all directions. To make matters worse, the E-stop button was located just beyond the broken pipe which was spewing the chemicals. He dashed through the spray to hit the button.

Fortunately, Sam always wears full protective gear including a gas mask and full apron – and he suffered only a minor injury to his ear. Sam immediately set to work repairing the processor with a newfound respect for the potential danger, declaring “I take all safety precautions even more seriously than before”. He added an emergency “OFF” button 50 feet from the processor, installed pressure relief valves that open if there is an over-pressure situation, beefed up the plumbing, and added shields over the plumbing in several critical places.

Sam has always thought he might build biodiesel processors for sale as turnkey products. He was ready to begin building a second system and wanted to incorporate the many improvements that

Continued, p. 23

Tech Brief cont.

Power Principles

Continued from, p. 18

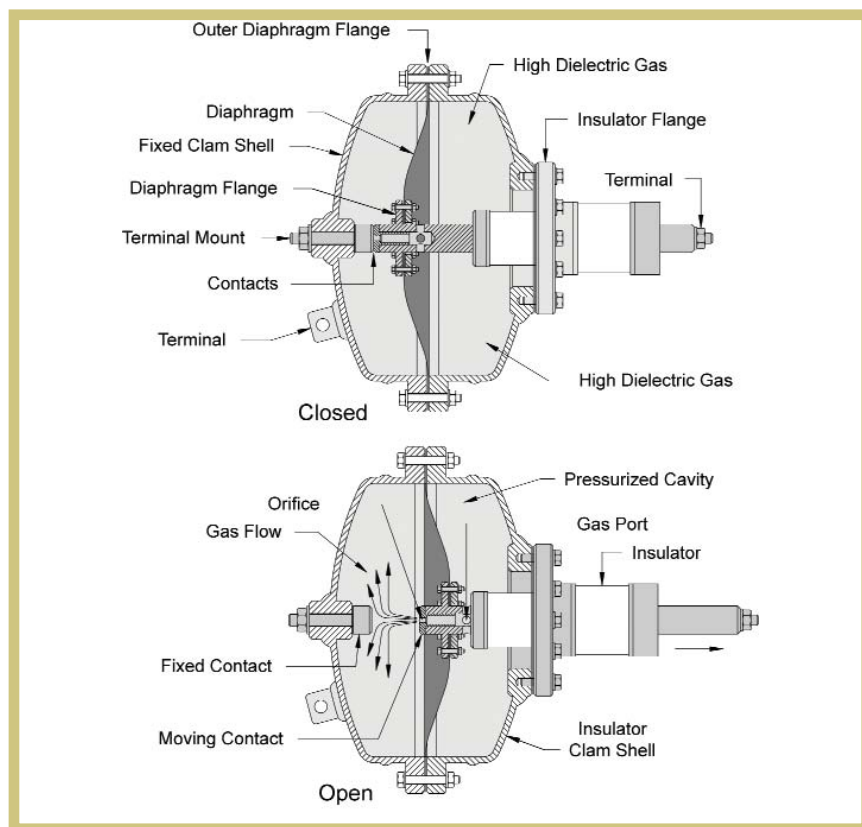


Figure 2, Pneumatic Suppression Interrupter

close proximity to the contacts. The longer path is specifically designed to force an arc length that can't be sustained by the available inductive energies. *Figure 3* shows a schematic representation of magnetic arc suppression.

Arc dividers are typically a set of high-temperature, insulating plates arranged just above the arc formation area. The idea is that the heat generated by the arc forces it to rise into the plate array. This has the effect of dividing the arc into several sections, which immediately extinguishes it. Arc dividers are generally used for higher horsepower applications and long throw interrupters. *Figure 4* shows a schematic representation of an arc divider.

Switch management represents the cutting edge of arc suppression technologies. In these cases, a high speed, solid-state switch element is utilized. Usually a silicon-controlled rectifier (SCR) or high-power transistor set makes up the switch element. If the

switch can be turned off at or near the zero crossing of the AC signal, then the coil will have substantially reduced inductive energies and the damaging effects can be principally negated. SCRs are rather popular for these applications because they operate with AC power and turn off when the line current drops below a given level very near the zero crossing. This characteristic of SCRs makes them nearly ideal for switching AC devices with a high inductive component. *Figure 5* shows an AC cycle and its associated inductive energy zones.

Since arcs have a tendency to jump toward a neutralizing potential, this makes them a severe safety hazard. It is very important to de-energize and discharge any electrical equipment that is being serviced. This is particularly important with circuits having storage potential, such as high-voltage capacitors. Devices like this retain a lethal electrical charge well after the power has been disconnected. Many circuits have what is termed a "crowbar", which is a

relay which shorts and discharges any components with storage potential when the power to the equipment is disconnected.

Safety procedures and devices implemented and used on and around high voltage circuits are, to say the least, extremely important. When working with this type of equipment, these procedures and devices mean the difference between a safe working environment and serious injury, or even death. In part two of this article, we'll discuss safety procedures and equipment commonly applied when working with or designing high voltage electrical equipment.

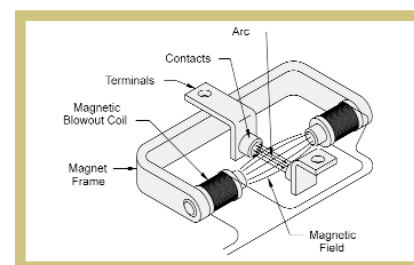


Figure 3, Magnetic Arc Suppression

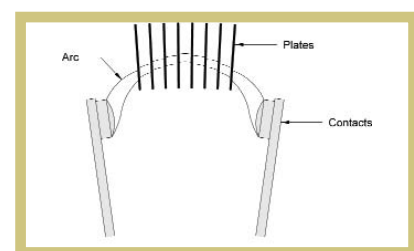


Figure 4, Arc Divider

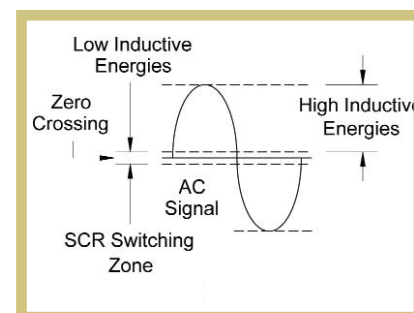


Figure 5, Inductive Energy Zones

(Sources, Suppression & Safety Considerations)

Student Spotlight cont.

The Future of Technology

Continued from, p. 21

could be afforded by a 'clean start'. He listed his existing biodiesel processor on eBay – mostly on a lark. Imagine his surprise a month later when he was offered \$40,000 for his prototype!

Sam feels that automation is a key selling point of his design. "Many other processors on the market claim to produce fabulous amounts of biodiesel per day. The truth is, unless you want to be attending the system all night, every night, you must have a fully automated processor." In addition to the fully automated operation of his processor, Sam points out several other features that set his design above other machines on the market:

1.) *All stainless steel components:*

other units use brass, steel, and PVC for plumbing. Brass will cause high acidity in biodiesel; steel will rust, which can ruin pumps and other components. PVC is very weak compared with stainless and does not tolerate heat. Along with the pipes, all of the tanks, pumps, valves, and other components in contact with the biodiesel are stainless steel. "Stainless is very resistant to strong chemicals, very strong, and it looks great" explains Sam.

2.) *No threaded pipes:* most other processors use pipes and fittings with pipe threads. Pipe threads rely on thread sealant to keep the pipe joints from leaking. Biodiesel, Methoxide, and even waste vegetable oil will 'eat' the thread sealants. "They might work at first, but over time, you will have a leaky mess. My processor uses stainless steel pipe that is welded to flanges, eliminating the need for thread sealants" Sam continues. The flanges incorporate a gasket that is extremely resistant to chemicals and heat. Flanges also make it very easy to remove a component from the machine for maintenance.

3.) *Overlapping batches:* due to the additional tanks he incorporates, Sam's processor can start a second batch while the last filtering step is underway. This reduces the

subsequent batch time by up to two hours.

4.) *The C-more touch panel interface* makes the machine very easy to use. The panel will alert the operator if the PLC detects a problem with the process. There are even graphical screens to walk the operator through scheduled maintenance procedures and trouble shooting.

5.) *Methanol recovery* from glycerin and biodiesel tanks: The methanol removed from the glycerin is reused in the process, thus reducing production costs. Excess methanol is also removed from the biodiesel, increasing the quality of the finished product.

6.) *Mixing:* This processor has been designed to mix the Methoxide into the feedstock slowly and thoroughly to ensure a complete reaction. Once the Methoxide enters the main processing tank, it is mixed into the feedstock using an inline mixer.

7.) *Mobile unit:* This processor is built on wheels so it is very easy to move it around.

8.) *Safety:* "I have learned firsthand that safety is the most important component. This machine has been designed to ensure that it can do its job as safely as possible," assures Sam. The unit has many safety relief valves, shields, and two emergency stop buttons - one on the machine and another away from it. The PLC also monitors the process to ensure everything is running smoothly. If something is not operating correctly, the PLC safely pauses the process, notifies the operator of the problem, and suggests corrective action in many cases.

Sam recently flew to Los Angeles, CA, to commission the prototype machine for his first paying customer. Sam has now designed version 2.0 of the Flournoy Green Tech Processor. He is currently building a "showroom model" of this new version, and he is accepting preorders at his Web site:

<http://www.flournoygreentech.com> 

Here are links to several of his YouTube videos:

Part 1 (prior to automation):

http://www.youtube.com/watch?v=6RyG5Kt_xbQ

Part 2 (prior to automation):

http://www.youtube.com/watch?v=pm_eLn6Buc3Y

News Coverage:

<http://www.youtube.com/watch?v=f1gON0xVXQo>

Biodiesel Fun Facts:

Biodiesel is a liquid which varies in color — between golden and dark brown — depending on the production feedstock.

Blends of biodiesel and conventional hydrocarbon-based diesel are commonly distributed for use in the retail diesel fuel marketplace. The "B" factor is used to indicate the amount of biodiesel in the mixture. Some common mixtures include: 100% biodiesel – labeled B100, 20% is labeled B20, 5% is labeled B5, & 2% is labeled B2.

Blends of 20 percent biodiesel with 80 percent petroleum diesel can generally be used in unmodified diesel engines. Biodiesel can also be used in its pure form (B100), but may require certain engine modifications to avoid maintenance and performance problems.

Biodiesel has different solvent properties than petrodiesel, and will degrade natural rubber gaskets and hoses (mostly in vehicles manufactured before 1992). These parts can be replaced with fluoroelastomer versions which are nonreactive to biodiesel.

Biodiesel has been known to break down deposits of residue in the fuel lines where petrodiesel has been used. Therefore, it is recommended to change the fuel filters on engines and heaters shortly after switching to a biodiesel blend.

Biodiesel has better lubricating properties and higher combustion quality than petro-diesel. Biodiesel blends can reduce fuel system wear, and can increase the life of some fuel injection equipment.

The calorific value of biodiesel is roughly 9% lower than regular Number 2 petrodiesel. Variations in biodiesel energy density are more dependent on the feedstock used than the production process.

Biodiesel has virtually no sulfur content, and it is often used as an additive to Ultra-Low Sulfur Diesel (ULSD) fuel.

FYI

Industrial Air Conditioners

Enclosure Cooling Explained



By Lenny Filipkowski,
AutomationDirect
Product Manager,
Industrial Components

What causes all that heat?

There are basically two sources of heat which cause an electrical enclosure's internal temperature to rise above the manufacturer's recommended ratings for the control equipment: internal and external sources.

Internal Sources

The same items which can be damaged by heat may also be a key source of the heat. These include items such as:

- Power supplies
- Servos
- AC Drives/inverters
- Soft starters
- Transformers
- PLC systems
- Communication products
- HMI systems
- Battery back-up systems

External Sources

Sources of heat which can cause the internal temperature of your enclosure to rise above a desired level involve the external environment. These include items such as:

- Industrial ovens
- Solar heat gain
- Foundry equipment
- Blast furnaces

How do you reduce internal temperature of your enclosure?

There are three basic cooling methods to reduce the internal temperature of your enclosure: natural and forced convection, and closed-loop cooling.

Natural Convection Cooling

If the ambient temperature outside the enclosure is cooler than the inside of the enclosure, then the heat can be dissipated into the atmosphere by radiating it through the surface of the enclosure and with louvers or grilles with filters. (Image 1)

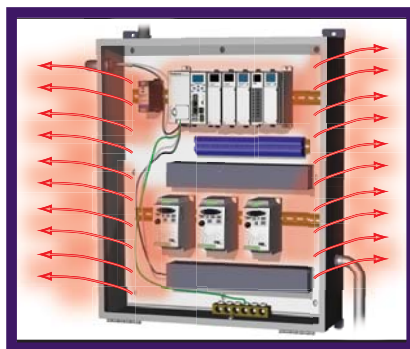


Image 1, Natural Connection Cooling

Forced Convection Cooling

If you have clean and cool ambient air outside of the enclosure, then a simple forced-air system may be adequate. A system such as a filter fan and the associated grille with the appropriate filter may be an acceptable option. (Image 2)

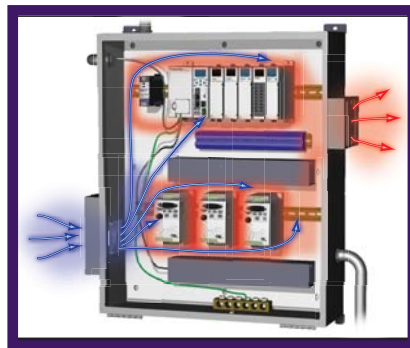


Image 2, Forced Connection Cooling

Closed Loop Cooling

While natural and forced convection cooling are typically less expensive, they are very limited in their effectiveness to reduce the temperature to an acceptable level. A more typical choice, in these cases, is an air conditioning unit that provides closed loop cooling.

Closed-loop cooling is designed to keep the ambient air separate from the internal enclosure air. This system is needed for:

- Harsh environments
- Washdown requirements
- Heavy dust and debris
- The presence of air-borne chemicals
- Ambient temperatures as high as or higher than the desired internal temperature (Image 3)



Image 3, Closed Loop Cooling

How do air conditioners work?

Air conditioners, by name, intimate that they are producing cold air, when they are simply transferring the hot air away from the inside of the enclosure. The air being blown into the enclosure has the heat removed; it is colder than the internal air.

There are two basic systems in an air conditioner. First there is the compressor, refrigerant, evaporator coil, and condenser coil system which transfers the heat to the outside of the enclosure. The second system is an air moving system which is comprised of an evaporator fan plus a condenser fan. The brain of the system is very similar to a typical home unit using a thermostat. The thermostat monitors the temperature inside the enclosure and will start the refrigeration cycle when the temperature reaches the setpoint. Typically the setpoint is 95 degrees Fahrenheit (typically the coolest temperature desired) and normally the thermostat has a differential setting of +5 degrees F, so the refrigeration cycle will begin at 100 degrees F.

The evaporator fan runs continuously to keep the air circulating inside the enclosure, allowing the internal temperature to be monitored by the thermostat. When the temperature

Continued, p. 26>>

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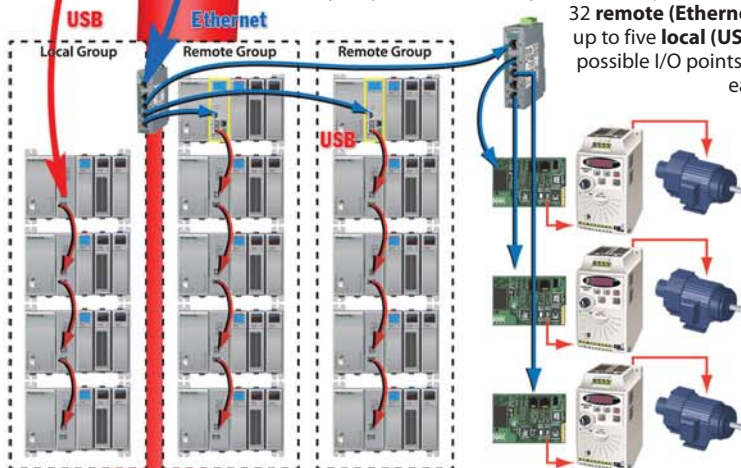
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FYI

Industrial Air Conditioners

Continued from, p. 24

reaches the setpoint the compressor will turn on and start the refrigerant flowing. The refrigerant will flow through the evaporator coils and collect heat from inside the enclosure. The condenser fan will blow across the coils to transfer the heat outside the enclosure.

During this cycle, humidity is also removed from inside the enclosure. Most air conditioners have either a drip tube to collect and remove the condensation or a condensate removal system to burn off the condensate outside of the enclosure. (Image 4)

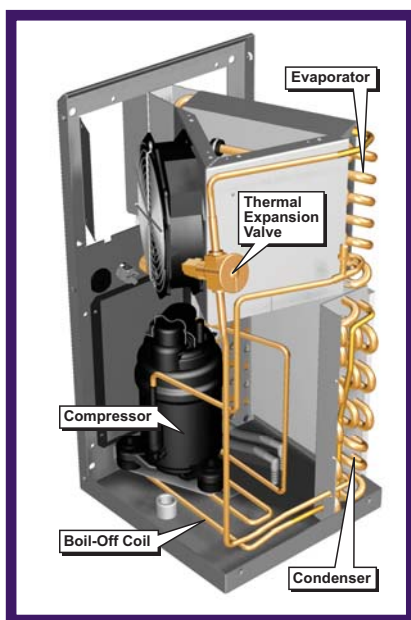


Image 4, Cooling System Components

How are air conditioners rated?

Air conditioners are rated by their cooling capacity; this is the maximum amount of heat energy an air conditioner can remove. They are expressed in BTUs per hour in the US and Watts per hour in other parts of the world. A BTU is defined as the amount of heat energy needed to raise the temperature of one pound of water by one degree Fahrenheit in one hour.

Manufacturers typically use different points on the performance charts to declare the BTU rating of their units, but use the maximum outside temperature for which the unit is rated

(i.e. 125°F).

Some manufacturers will use a point on the performance chart of 95 degree F internal temperature and 95 degree F external (ambient) temperature to compare the efficiency of their units to other manufacturers' air conditioning units.

How do you choose the right air conditioner?

The best way to select the right-sized air conditioner for your enclosure is an online calculator, such as (http://ftp.automationdirect.com/pub/stratus_ac_btuh_calculator.zip) to determine the BTU rating needed; then use the performance charts supplied by the manufacturers to determine what unit would best meet your actual needs.

After you have determined the BTU size needed, determine the type of environment in which it will be located, such as NEMA 12, 4, or 4X; select the appropriate voltage rating and that will lead you to the proper unit.

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— James H. Boren

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NEMA 4X air conditioner, 230 VAC, 6000-8000 BTU/H	\$2,718.00 TA10-060-26-4X		\$9,687.00 CR4306266034

*All prices are U.S. published prices. AutomationDirect prices from October 2010 Price List. Hoffman prices are taken from www.hoffmanonline.com Price List 4/5/10. Prices may vary by dealer. Many other part numbers are available from all vendors.

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5 mm three-wire DC shielded with M8 Q/D	\$35.50 PD1-AP-1F	\$129.00 871C-D1NP5-P3
18 mm three-wire NPN DC shielded with 2 meter cable	\$18.50 AK1-AN-1A	\$80.00 872C-DH5NN18-E2
18 mm AC shielded with 2 meter cable	\$31.00 VK1-A0-1B	\$98.00 872C-ASN18-A2

*All prices are U.S. published prices. AutomationDirect prices are October 2010 prices. Allen-Bradley prices taken from <http://www.rockwellautomation.com/en-e-tools>, September 6, 2010. Specifications may vary by dealer and configuration. Prices subject to change without notice.

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Business Notes



Low-cost online training too good to be true?

That's what newbies to Doug Bell's training are calling and asking. Says Bell, president of Interconnecting Automation, "I've been fielding calls from people who are used to spending thousands of dollars on one training class. They just don't believe they can get a quality experience for so little. That's why I've made full-length sample videos available for viewing and a 'Try-before-you-buy' category so you can view full-length samples of all offerings before purchase!"

After fifteen years offering regional training classes focused on *DirectLOGIC* PLCs, Doug launched his online video training libraries this spring, and they now cover a wide range of AutomationDirect products. For a 30-day subscription fee (typically \$29.95 to \$39.95), the user has unlimited access to the videos in a collection. In addition to collections for an Introduction to PLCs, C-more HMI, and the Productivity3000 controller, he has recently released new topics that are proving popular.

The new CLICK video library (\$39.95) is an in-depth look at the CLICK micro PLC series of components, with more than 50 topics including inputs, outputs and programming instructions. The course includes all "Intro to PLC 101" videos.

For a more hands-on approach, Doug has a low-cost pre-wired CLICK PLC trainer equipped with pushbuttons and indicators for \$189. The trainer lets you code and test simple programs. Currently, you can save \$10 by purchas-

ing a combination package, which includes a CLICK trainer plus one month unlimited access to the CLICK online tutorial library, for \$219.95.

The Drives 101 library (\$24.95) teaches the basics of AC drives and motors, DC motors, and more. The library includes more than 20 pre-recorded videos addressing often difficult-to-master topics such as motor types, variable frequency drives and motor speed control.



One of the most recently released libraries is a set of 56 data collection videos covering each of the Bizware data collection software products including: DataWorx, DataWorx Pro, Datalynx, and DataWorx P3K. For 29.95, the extensive library provides in-depth tutorials to identify key elements and benefits of a database, plus communication, data verification, testing and more.

An exciting expansion for Interconnecting Automation is a new continuing education course for programmable logic controllers based on the CLICK PLC. Priced at \$195, the student is allowed 120 days to complete the course of study. The course includes online study and instruction, as well as quizzes, writing multiple programs (reviewed by the instructor), progress testing and a comprehensive final exam. Upon successful completion, students receive a completion certificate and continuing education units.

For more in-depth training, Doug has teamed up with veteran PID expert Cecil Smith to offer a new way to learn PLC PID theory in the convenience of office or home. Cecil has 30 years of experience in PID control, and has

wrapped it into a self-guided computer based training (CBT) package that lets you learn at your own pace. It covers all the same topics and material presented in Doug and Cecil's extremely popular 3-day training class. Download the complete set of files (\$695), install and start learning on your own schedule.

Major topics include:

- Designing and Implementing PLC PID Control
- Effect of Tuning Parameters on Loop Performance
- Proportional/Integral/Derivative Control Actions
- Loop Tuning Methods
- Auto/Manual/Cascade Modes
- Windup Options
- Bumpless Transfer
- ON/OFF vs PID

So what ARE the customers who have tried Bell's online video training saying?

"I did not know anything about PLC's. After watching the videos, I went out and programmed a small CLICK PLC to turn on two pumps, and three solenoids. Did not work perfect, so went back and watched the videos again and found out what I was doing wrong. Thanks Doug for putting this up."

"I was afraid to work on the C-More touch screens. Called Doug on the phone and he told me to watch the online videos. I was a little resistant as I felt what is \$39.95 going to get me. I finally did and WOW, I could not believe. The videos show you exactly how to setup - config - and program the operator interface."

"Wanted to try the Productivity 3000 PAC. Was very hesitant to as it was brand new. So I figured what the heck, its only \$39.95 to watch some videos on it. After I enrolled I was blown away at the depth of the videos. They get into more detail then I ever expected. Do not know how they can make it by charging only \$39.95."

Visit:

www.interconnectingautomation.com/onlinecourses to view the complete list of libraries, and start learning.

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Bryant motor controllers are UL listed as "suitable as motor disconnects," which means that a motor controller marked as such can also be used as a motor disconnect.

You benefit from the convenience of one device fulfilling two needs. These 600 VAC controllers are available in 2- and 3-pole models, with or without enclosures, up to 60A (30 hp).

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- AC toggle switch controllers, starting at \$21.50
- AC enclosed toggle controllers, NEMA 1 and 3R
- AC enclosed rotary switch controllers, NEMA 4X

Industrial Features

- Thermoset body provides high resistance to electrical arc tracking.
- Silver alloy contacts for excellent conductivity and extended life
- Lockout / Tagout capability

Applications

- Can be used locally at the motor
- "Suitable as a motor disconnect"
- Across-the-line motor starting
- Industrial machines

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Controller/Disconnect	AutomationDirect Bryant	VS.	Grainger Leviton	AplusSupply Pass & Seymour
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Disconnect switch, 30A, 3-pole, NEMA 1 enclosure	\$58.50 30103D		\$98.65 N1303-DS	\$99.42 7813PMD
Disconnect switch, 40A, 2-pole, no enclosure	\$37.00 40002D		\$66.85 M5402-DS	\$77.92 7842MD
Disconnect switch, 40A, 3-pole, no enclosure	\$59.00 40003D		\$122.80 M5403-DS	\$116.25 7843MD

All prices are U.S. published prices. AutomationDirect prices are from October 2010 Price List. Leviton prices taken from www.grainger.com 10/6/10. Pass & Seymour prices taken from www.aplusupply.com 10/6/10. Prices and specifications may vary by dealer and configuration. Prices subject to change without notice.

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The Break Room

BRAINTEASERS & HUMOR



BrainTeasers



Elephant Hunting Tactics of Professionals

In order to hunt elephants:

Computer programmers...

Hunt elephants by executing Algorithm A:

1. Begin at the tip of South Africa
2. Perform alternating west to east and east to west searches
3. Decrement the latitude argument in a non integer sequence between each search
4. Catch an animal
5. Compare the found animal to a known elephant
6. If found animal matches a known elephant, terminate the search, else Resume at step 3

Experienced Programmers...

Place an elephant in Cairo, Egypt to ensure that their search algorithm will

terminate properly.

Assembly Language Programmers...

Perform the same search on their hands and knees.

Mathematicians...

Develop a hypothesis supporting the existence of a unique elephant before proceeding with the search as a subordinate operation, collecting all animals found, testing them against the hypothesis and discarding all that don't fit.

Professors of Mathematics...

Develop a hypothesis supporting the existence of a unique elephant before sending his/her students on the search, requiring that they collect all animals found, test them against the hypothesis, and bring all matching animals to him for publication.

Statisticians...

Hunt the first gray animal they see N times and call it an elephant.

Experienced Statisticians...

Add that there is a small probability that the animal they hunted is a mouse.

Economists...

Don't hunt elephants, but they believe that if elephants are paid enough, they will hunt themselves.

Trickle-Down Economists...

Don't hunt elephants either. They believe that if you give the elephants a small tax incentive, they will hunt themselves.

Experienced Economists...

Have never even seen an elephant, but they attempt to hunt them by controlling the interest rates.

Consultants...

Don't actually hunt elephants and indeed may never have hunted elephants, but they can be hired at great expense by the hour, plus expenses, to advise those who do. This is, of course, in addition to the time it takes to find out what an elephant is.

Experienced Consultants...

Can also measure the correlation of hat size and bullet color to the efficiency of elephant-hunting strategies, if someone else will only identify the elephants.

Managers...

Set broad elephant-hunting policy based on the assumption that elephants are just like field mice, but with deeper voices.

Experienced Managers...

Document in their project files the source of the advice that elephants are just like field mice.

Quality Assurance Staff...

Ignore the elephants and spend their time looking for mistakes the hunters made while packing the Jeep.

Sales Staff...

Don't hunt elephants. Instead, they spend their time selling elephants the hunters haven't caught yet, and promise delivery two days before the opening of elephant hunting season.

Software Sales Staff...

Ship the first thing they catch, write up an invoice for an elephant, modify the documentation to match, and promise a real elephant at the next update.

Hardware Sales Staff...

Catch rabbits, paint them gray and sell them as "laptop" elephants.

"All lasting business is built on friendship."

— Alfred A. Montapert

"Bill Gates is a very rich man today... and do you want to know why? The answer is one word: versions."

— Dave Barry

"I paint objects as I think them, not as I see them."

— Pablo Picasso

more extreme HMI



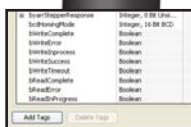
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- Data exchange

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10 YEARS
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See it, save it, control it - easier

Use the technology built into the Productivity3000 programmable controller to make your job easier. Our C-more HMI offers a wealth of features that make it a perfect match for this controller.

Transfer tagnames from PLC program to HMI database - Export your tagname database from the Productivity3000 program and import it into C-more's configuration software to jumpstart your HMI development. No more digging through your notes, or hunting through your ladder logic to find the right tagname.

Up to 32 C-more panels on one system - Connect up to 32 C-more HMIs to a Productivity3000 controller via Ethernet for control and visibility of your process or machine from multiple locations in your factory.

Data collection in C-more - Log alarms, messages and controller data directly to a file on a USB flash drive or CompactFlash card mounted in a C-more panel (depending on model). The devices can be exchanged when full, or the data can be accessed via FTP or emailed from the panel if on an Ethernet network.

Remote access from anywhere - Use the remote access feature of Ethernet-enabled C-more panels to view and control your system from anywhere via the Internet. Across town, or across the globe - Productivity3000 and C-more give you complete control!

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

www.productivity3000.com

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