SYSTEMS SOLUTIONS

Controls for the Metal Container Industry

News and information from Systems Engineering Associates, Inc

Volume 4 • Issue 1A Winter 2004

Reducing Scrap on Rutherford Decorators

Decorators are one of the few machines in a can line equipped to intentionally blow-off cans and thus generate scrap. Bad cans are blown-off at label changes, when restarting the machine, and when a can miss-loads on a spindle. If a can miss-loads, a means of pulling the empty spindle away from the blanket is required. Otherwise that spindle will be printed and the next few cans loaded on that spindle will be printed on the inside (inside litho).

The Rutherford Decorator uses a carriage trip method that trips the entire spindle wheel to lift the miss-loaded spindle away from the blanket. Since the entire spindle wheel (carriage) is moved, the response time is relatively long. The response time is measured from trip initiate to when the spindle comes out of contact with the blanket. This is usually about 40 to 50 milliseconds or about 2 cans at 2000CPM.

This requires a very accurate trip in order to assure the empty spindle is not printed. The carriage should be tripped out on the spindle ahead of the bad can and tripped back in on the spindle behind the bad can. Ideally this would result in a three can blow-off for a miss-loaded can. One half printed can ahead of the bad can, the bad (silver) can, and one half printed can behind the bad can.

HSM-CD7 Decorator High Speed Logic Module

The problem is compounded with machine speed

(Continued on page 3)

Protecting Bodymaker Tooling

In order to prevent damage to the tool set on bodymakers, a die protection scheme is usually implemented. This verifies that the can is of full length and that a tear-off did not occur, such as when a cup miss-feeds. Ideally the machine would be stopped immediately by de-activating the clutch and closing the cupfeed. This makes sure no additional cups are feed into the machine and the punch is not driven through the tooling again. Thus preventing damage to the tooling that can occur if scrap is present in the die set. Without die protection, catastrophic damage to the machine would result.

Different methods of die protection are used, all incorporating a sensor and timing signal that verifies the can is present at some point in machine degrees. One method verifies the can is present on the take away conveyor after it has been or is being stripped from the punch. The problem with this method is that there is no guarantee that what the sensor

(Continued on page 2)

In This Issue...

Protecting Bodymaker Tooling

(Continued from page 1)

"sees" is a full length can. A tear-off with just the dome half of the can would satisfy this check. This results in a number of additional strokes made before enough scrap develops to cause the check to fail.

Another method looks for the end of the can while it is still on the punch as it is leaving the die set. Only the top or open end is checked with the assumption that the can must be full length if the top is "seen". The problem with this is that one tear-off scenario leaves a ring on the punch where the can was torn in two. This ring then satisfies the die protection check again allowing the machine to stroke multiple times before the check fails or damage occurs.

The best method uses two timing signals, one that checks the can as it exits the die set for it's full length. The timing signal begins when the sensor should be "seeing" the dome end of the can. The signal then finishes just before the sensor would quit "seeing" the top or open end of the can. The sensor must then "see" can the entire length of the can. This verifies the can is of full length and that no tear-off, which leaves a ring on the punch, has occurred.

The second timing signal is used to verify that the die protection sensor has not failed "on". If the sensor where to fail "on", the above die check would be satisfied. If a tear-off did occur, the system would not detect the fault and the machine would run until damage occurred. With the die sensor subjected to the harsh environment of the die set, die sensor failure detection is just as important as short can detection.

High Speed Die Protection…

With bodymaker speeds approaching 500SPM, the time to perform the short can detection shrinks to milliseconds (msec). At 250SPM, the short can sensor "sees" the entire can for about 25 degrees or about 16msec. At 450SPM, these 25 degrees occur in 9msec. Standard Programmable Logic Controllers (PLCs) can typically achieve scan times no faster then 5msec or so.

This means that at 250SPM only three checks of the can are made. At 450SPM, as little as one check is made. What's worse, the checks are made randomly along the length of the can since the PLC scan is not synchronized with machine timing. The length of the can is not really being checked but simply statistically sampled to see if can is present. A tear-off can pass this test resulting in multiple strokes before the system did happen to catch the fault or damage occurs.

Based on the high performance M4500 PLC family, the Systems Engineering bodymaker HSL packages achieve die protection scan times of 0.5msec, ten times faster than other PLCs. This means that at 250SPM, 32 checks are made on the length of the can. This is a resolution of 5/32" on a typical 5" tall 12oz can. At 450SPM, 18 checks are made, or a resolution of just over ¼". Implementing a full, high resolution, can length check along with die sensor fail detection, the HSL packages provide optimum die protection. This die protection performance is incorporated in all of our APM (Ragsdale), Standun, and CMB bodymaker HSL packages.

For more information circle 2 on the Fax replay form.

Solenoid Driver Increases Accuracy of Inside Spray

Inside spray machines need to apply a uniform coating of inside lacquer in the can. Too little, and the can does not meet coating requirement specs. Too much, and inside lacquer material is wasted. The amount of coating applied is controlled by the time the inside spray gun is "on" and the pressure in which it is applied. But even if the time the gun is activated "on' is consistent, the time lacquer flows from the nozzle may not be. This is due to variations in friction (clogging) and inertial affects of the gun spool. In order to optimize gun consistency, a solenoid driver is required to overcome friction and inertia of the gun spool.

The M273 is a high-speed solenoid driver that reduces the response time, both "on" and "off", and improves repeatability of +24VDC solenoids. Compared to a standard solid-state output, which applies and maintains +24VDC to the solenoid, the M273 applies a pulsed turn "on" voltage of 39 volts for a user adjustable number of milliseconds when the solenoid is first energized. It then drops to a holding voltage of 13.5 volts until the solenoid is de-energized. Improvement in solenoid response time from 50 to 100% can be obtained using this method.

The primary advantage of this is that when the

(Continued on page 4)

Reducing Scrap on Rutherford Decorators

(Continued from page 1)

changes. Just as the timing is advanced on an automobile ignition, the control system must "lead" the point the spindle is tripped at all speeds. Otherwise the empty spindle may be nicked, causing inside litho. Most control systems are not capable of achieving the required trip accuracy for a three can blow-off.

To insure that the miss-loaded spindle is not printed, many systems are set-up to trip out for extra cans ahead and behind the empty spindle. This generates even more silver and half printed cans. These bad cans, along with even more fully printed good cans, are blown-off at the pin chain blow-off. This can be up to 12 cans blown-off, of which only one was ever bad.

If the number of cans blown-off for each miss-load could be reduced, at the end of the year, the reduction in scrap would be significant. For example, if a decorator typically had 240 miss-loads per 24 hour period and blew-off 10 cans per miss-load, then reducing the number of cans blown-off per miss-load to three would result in a reduction of scrap of: 7 excess cans per miss-load X 240 miss-loads X 340 days per year = 571,200 cans. Over half a million cans per decorator scrapped because of an inadequate control system.

Description of Operation…

The HSL-CD4 and HSM-CD7 are high-speed control packages that are electronic upgrades for the Rutherford Decorator and Basecoater. These packages reduce excess blow-offs (scrap) by tripping and blowing off the minimum number of cans for each miss-load. In most cases, the number of cans blown off for a miss-load can be reduced to just three. Quality is also improved by the elimination of silver and partially printed cans down the line as well as eliminating inside litho problems.

The packages perform the high-speed logic portion of the machine control. This includes the detection of miss-loaded cans, speed compensated print trip and varnish trip control as well as three can (bad can) blow-off at speeds up to 2,400 CPM. The packages also provides select-a-can pin chain blow-off for print quality verification. This feature allows the operator to dial in a mandrel number and blow-off one can printed on that mandrel. Mandrels 1 through 24 can be individually blown-off this way to verify the print quality of each mandrel. This allows the quick determination of a cut blanket, etc.

New Features…

Some of the new features introduced on our latest CD4/CD7 include: extensive *Production Data Collection*, a *Communications Option*, and a *Built-in Keypad/Display*.

The *Production Data Collection* allows the collection of shift counts for both the current shift and last shift. These counts include the totals for the number of good cans printed, cans blown-off, miss-loaded cans (bad cans), restart blow-offs, manual blow-offs, select-a-can QC blow-offs, and the total trips per spindle. These can be used to determine whether most spoilage is due to label changes, miss-loads, or operator initiated blow-offs. From this information, methods to reduce spoilage can then be developed.

The *Communications Option* allows the shift data to be read by either a host Allen-Bradley, Modicon, or Siemens TI PLC. This information can then be passed on to higher-level plant monitoring systems for production analysis.

The *Built-in Keypad/Display* allows the operator and plant floor production personnel to view the collected data as well. This allows the people operating the machine an opportunity to rate its performance and make adjustments to reduce scrap. In addition, the Keypad/Display provides easy to use menus used to tune and set-up the machine for optimum performance.

Future Improvements…

Currently in development is the incorporation of analog feedback sensors to measure the actual response of the print and varnish trip. The system will then be able to automatically calibrate itself and adjust for any change in trip response. Thus as the response time changes due to mechanical wear, etc, the system will continue to provide optimum trip control.

This feature will also provide for an excess trip response alarm that indicates maintenance to the machine is required. It may be possible to implement a predictive algorithm to determine that maintenance should be performed on the next scheduled down day. Thus not only will the system reduce excess spoilage but unscheduled downtime as well.

For more information circle 1 on the Fax replay form.

Solenoid Driver Increases Accuracy of Inside Spray

(Continued from page 2)

solenoid is first energized, the initial pulse provides a turn "on" voltage considerably greater than the rated voltage of the solenoid. This causes no damage to the solenoid since the pulse is of a short duration. However it does provide a greater degree of energy to overcome the initial inertia of the spool. This moves the spool quicker and with a greater degree of repeatability.

After a user adjustable number of milliseconds, the voltage drops to a holding voltage which is lower than the rated voltage of the solenoid. This holding voltage is enough to maintain the solenoid energized, but at a lower energy level. When the solenoid is then de-energized, it will turn "off" faster because less energy needs to be dissipated from the coil. A transient suppressor is incorporated which allows the inductive EMF of the coil to drop to –39 volts. This contributes to a quicker turn "off" as the energy of the coil is dissipated faster.

The output of the M273 is rated up to a 5 Amp inrush current for 50 milliseconds with a continuous holding current of 3 Amps or 40 watts. The initial high voltage pulse is adjustable between 5 and 25 milliseconds. The M273 is designed to operate with +24VDC and –15VDC Power supplies. The M273 is ideal for any solenoid application requiring either a very fast response time or high degree of repeatability.

M273 Solenoid Driver

1 - *Reducing Scrap on Rutherford Decorators*
2 - *Protecting Bodymaker Tooling*
3 - *Solenoid Driver Increases Accuracy of Inside Spray*

For complete information, please circle the above number(s) of interest and fax back this form to:

Fax Number: (303) 421-8108

Name:________________ Title:________________

Company:________________

Address:________________

____

Phone:________________ Fax:________________

or call Mark Dixon at: (303) 421-0484
or email at: sea.mdixon@worldnet.att.net

Founded in 1965, Systems Engineering Associates, Inc. has been designing and developing control systems for the two-piece metal container industry from the industry's very inception. From the development of the very first machines to today's latest generation of equipment, Systems Engineering has been there to provide the highest degree of excellence in machine control.

"Systems" either has the solution or can develop the solution for your control system needs from supplying electronic sub-assemblies to complete control systems including start-up assistance, service, and customer training. Call us today for more information.

Systems Engineering Associates, Inc.
14989 W. 69th Avenue
Arvada, CO 80007
Phone: (303) 421-0484
Fax: (303) 421-8108
www.sea-seg.com

37
YEARS OF EXCELLENCE
1967-2004