September 2006

CORRUGATING INTERNATIONAL

A TAPPI Publication for Corrugated Packaging Professionals www.tappi.org

TAPPI HAS SO MUCH TO OFFER

This is a great time of the year for TAPPI's Corrugated Packaging Division (CPD). Our annual conference will be held next week (September 12-15) in Cincinnati. See more details toward the end of this issue of Corrugating International (CI).

The conference theme is "Box Plant Boot Camp, Basic Training and Beyond". I strongly encourage the boxes plant managers who receive CI and the staff personnel who read CI and have influence at box plants that are within a day trip of Cincinnati, to get a carload of supervisors and make it to Cincinnati to absorb some of the excellent basic training that will be available.

- Get your questions answered by experts as the always popular Production Roundtable returns on Wednesday, September 13.
- Corrugating and Converting tabletop teaching sessions (6-8 concurrent 20-minute teaching sessions over a 2-hour time period) will be held on both Wednesday and Thursday, September 13 and 14.
- The CorrExpo exhibit will be held during the afternoon of both Wednesday and Thursday, September 13 and 14. This is your chance to talk with suppliers and learn about the latest developments in the corrugated industry.
- A Safety and Product Security session will also be presented twice on Thursday, September 14.
- For those wanting the latest information on "RFID and 'Smart' Packaging", a seminar will be held in Cincinnati on Saturday, September 16.

The educational opportunities abound. Even spending one day at the Cincinnati conference will allow you to more than pay for the trip. The knowledge you have gained will improve quality and productivity at any box plant.

There is a lot of good information in this issue of CI, as well. The articles by Bob Allen and Frank Cordier are the first two of five or six articles that will appear in the next three issues of CI that, when complete, will form a template for you to develop or improve your Lock Out/Tag Out (LOTO) process. We will be putting all of the LOTO articles together as a manual following their individual publication in CI. On the technical side, Michael Scharpe sheds additional light on ECT. The content of this issue of CI is further evidence of what TAPPI has to offer you, no matter what your role is in our industry.

David A. Carlson, Technical Editor, Corrugating International, ci@tappi.org

CORRUGATING INTERNATIONAL

A TAPPI Publication
for Corrugated Packaging Professionals

TAPPI people resources solutions

Vice President, Operations
SUSAN BLEVINS

Publishing Director
MARY BETH CORNELL

Technical Editor
DAVID A. CARLSON

Publishing Specialist
LISA HIGHTOWER

Corrugating International (ISSN-1525-4275) is published three times a year by TAPPI, 15 Technology Parkway S., Norcross, GA 30092, USA.

Send manuscripts for publication to the Editor at: Corrugating International, 15 Technology Parkway S., Norcross, GA 30092, USA. +1 770 446-1400, FAX/TWX +1 770 446-6947, www.tappi.org.

SEPTEMBER 2006 CONTENTS

ARTICLES

A Link Between Light-Weights and ECT Strength

Michael Schaepe and Roman E. Popil
Institute of Paper Science and Technology

Research conducted by Bill Whitsitt of Institute of Paper Chemistry (IPC) (ECT/Component Relationships, Report to the Fourdrinier Kraft Board Group, February, 1983) explored the connection between ring crush and ECT.

THE ANALYSIS WHITSITT PERFORMED INDICATED THAT A NON-LINEAR RELATIONSHIP EXISTED. He fit two straight lines to the data and developed separate equations for the prediction of ECT from ring crush, one for light weight boards (1) and one for heavy weight boards (2). Lightweight boards are constructed with linerboard less than 42 lb/msf and heavy weight boards are constructed with linerboard 42 lb/msf and above.

(1) $ECT = 0.8 * (Lin_1 + Lin_2 + a\,Med) + 12$

(2) $ECT = 1.27 * (Lin_1 + Lin_2 + a\,Med) - 6$

Where: Lin_1 and Lin_2 are the ring crush values for the linerboards (lbf/in)
Med is the ring crush value for the medium (lbf/in)
a is the take-up factor.

This relationship is shown in **Figure 1**.

Recent work lead by Roman Popil at the Institute of Paper Science and Technology has investigated the influence of linerboard bending stiffness and interflute buckling on ECT performance. Reviewing data generated in previous reports produced at IPC/IPST and especially those of Chuck Habeger and Doug Coffin, it was shown that the relationship between ECT and basis weight was weak, (**fig. 2**) that STFI was a much better predictor of ECT, (**fig. 3**) and that ring crush had a slightly higher correlation to ECT than STFI (**fig. 4**). Best, however, was STFI in combination with bending stiffness by applying equation (3) for predicting ECT:

(3) $ECT = C3\,(2SL + \alpha S_M)^b\,(BS/\,b_f^2)^{1-b}$

Where: S_L is STFI for the linerboards
S_M is the STFI for the medium
C_3 and b are constants
BS is bending stiffness
b_f is flute spacing
α is the take-up factor

This last relationship is shown in **Figure 5**.

It is understood that the ring crush test is a combination of compression and bending deformation as illustrated in the Handbook of Physical and Mechanical Testing of Paper and Paperboard by Johnson, et al., and that STFI more closely represents the true compressive strength of linerboard. In Quantifying the Relationship Between the Short Span Compression and Ring Crush Tests, G.R. Rennie found that SCT (STFI) = RCT (ring crush) + $0.005T/t^2$, where T is Taber Stiffness and t is apparent thickness.

Light weight linerboards have relatively low bending stiffness and this translates to low combined-board flexural stiffness. Furthermore, the critical buckling load for a vertically loaded plate (linerboard) is proportional to the geometric mean of flexural rigidity (typically represented by bending stiffness) divided by flute

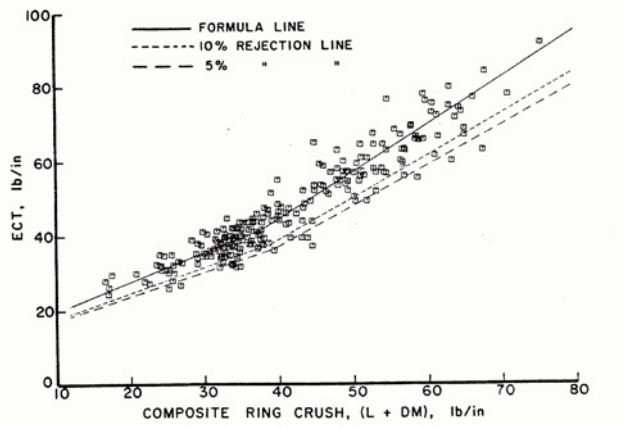


Figure 1: Whitsitt Relationship of ECT to Composite Ring Crush.

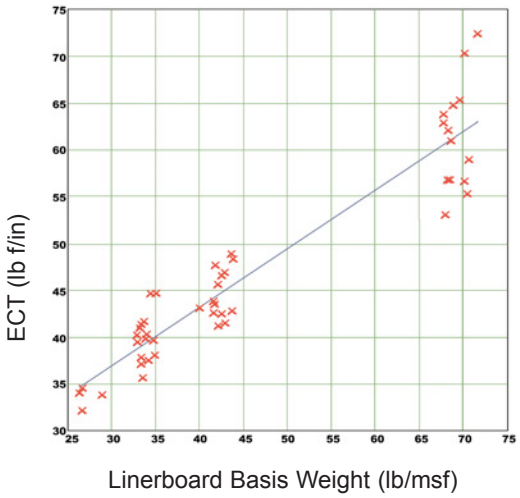


Figure 2) ECT vs Basis Weight

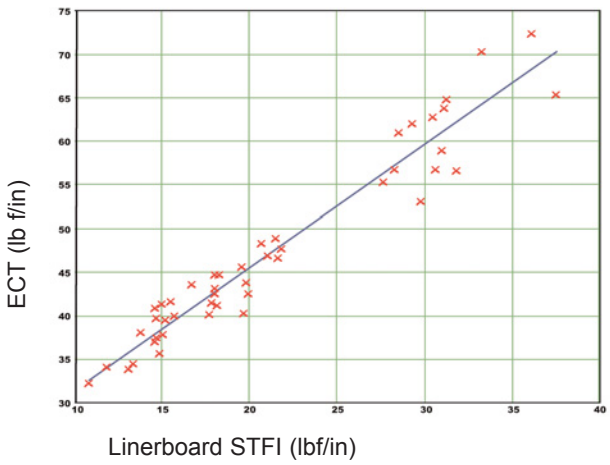


Figure 3) ECT vs STFI

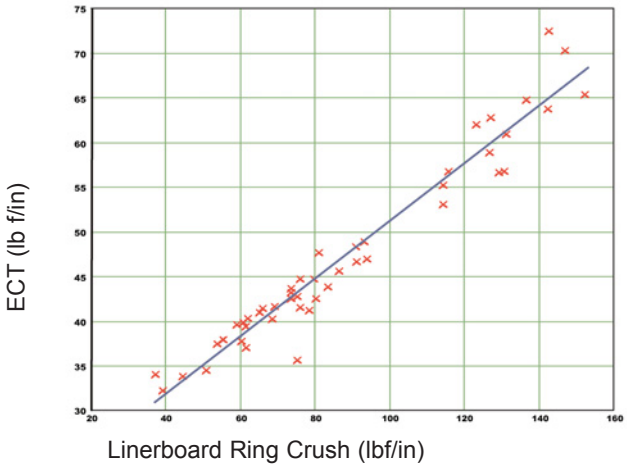


Figure 4) ECT vs Ring Crush

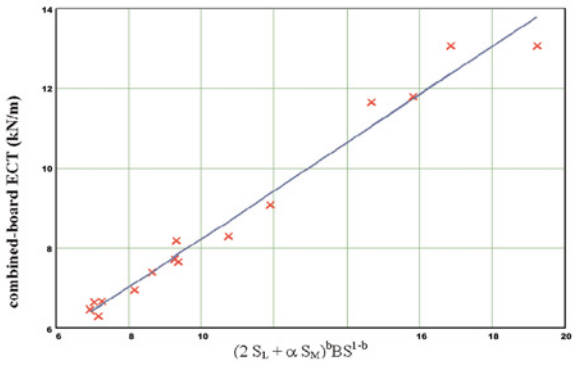


Figure 5) ECT vs STFI with Bending Stiffness

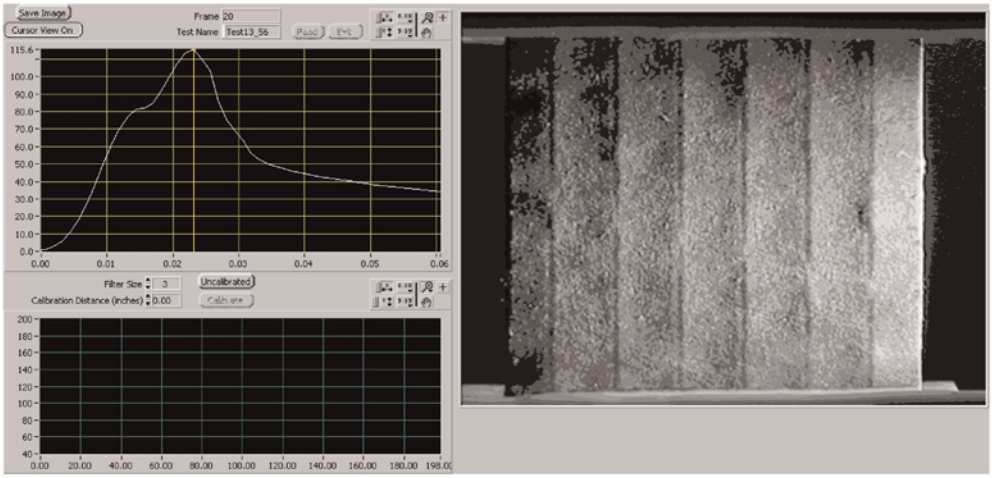


Figure 6) Negligible interflute buckling with 56-26-56 combined-board. Load displacement curve with the cursor corresponding to the photograph is shown on the left.

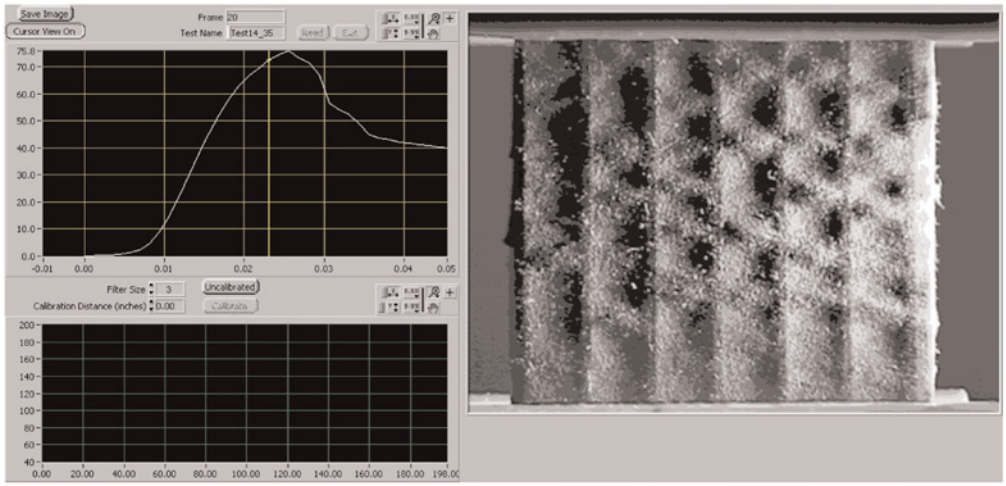


Figure 7) Considerable inter-flute buckling with 35-26-35 combined-board.
Load displacement curve with the cursor corresponding to the photograph is shown on the left.

spacing squared as shown in the following equation:

(4)

$$P_{cr} \cong \frac{4\pi^2 \sqrt{D_{MD} D_{CD}}}{b_f^2}$$

Where: P_{cr} is the linerboard critical buckling load
$(D_{MD}D_{CD})^{0.5}$ is the geometric mean of flexural rigidity (bending stiffness)
b_f is flute spacing

When STFI exceeds the critical buckling load of the linerboard, interflute buckling will occur and ECT will be adversely affected. This effect can be seen in the next two figures. **Figure 6** is a 56-26-56 combination with negligible interflute buckling observed. However, interflute buckling is clearly present in **figure 7** when the combination is 35-26-35. The result of interflute buckling in figure 7 results in a lower ECT than predicted from summing compressive strengths of combined board components.

The dual curves Whitsitt generated over two decades ago for the prediction of ECT from ring crush are the direct result of low bending stiffness and an increased tendency of interflute buckling prevalent with lightweight linerboards. Since Whitsitt completed his work, high ring crush linerboards have become common. The increase in vertical compression strength per unit weight has been achieved primarily through wet pressing. This has resulted in increased densification but lower bending stiffness with the outcome being a greater proclivity of interflute buckling with today's lightweight linerboards. **CI**

A Comparison of Lock and Tag Standards Between the United States and Europe

Bob Allen, Alliance Machine Systems

This is the first of several articles regarding Lock and Tag that will be published in Corrugating International over the next three issues. When complete, the articles will be combined into a manual for use as a guideline for those plants and companies who are putting together or enhancing their Lock and Tag compliance programs.

THE INITIAL CHAPTER OF TAPPI'S LOCKOUT/TAGOUT GUIDELINE IS A COMPARISON BETWEEN LOCKOUT/TAGOUT (LOTO) IN THE UNITED STATES AND EUROPE. THE LOTO STANDARD, THE LEGAL AUTHORITY, APPLICATION EXCEPTIONS, AUDITING INSPECTIONS, PENALTIES AND RELATED STANDARDS ARE COVERED.

In the United States the LOTO standards are governed by the Occupational Safety and Health Administration or OSHA and the requirements are codified in 29CFR1910.147. The legal authority for Lock and Tag is also OSHA. Also note that many states have specific standards that may be more stringent. An example would be, California's Cal/OSHA.

The main differences between the United States and Europe are the "Application and Exceptions". One of these "Applications" in the United States applies to the control of energy during service and/or maintenance of machines and equipment. The "Exception", which is somewhat restrictive, is that alternative safeguard measures may be used for minor service activities during normal operations that are routine, repetitive and integral to use, and also under the exclusive control of the employee. Note that "setup" is not considered preparation for normal production and is not allowed under the exception.

Compliance: Auditing and inspection are carried out by an OSHA inspector. Per 1960.31(b), an inspector can enter your facility at any time, but inspections usually occur because of an accident or someone registering a complaint. The penalties are usually financial. However, the inspector also has authority to shut down a machine. Fig. 1 shows that out of the top 25 OSHA violations in 2004 there are four that covered various aspects of Lock and Tag. Note that a total of 788 violations were for failure to establish an energy control program. There were 735 violations for failure to have a written energy control procedure, 593 for failure to have a training and communication program for employees, and 537 for failure to have an annual procedure inspection. Keep in mind, the areas where violations are common are important.

Fig. 1 was for all industry, however specific to the corrugated industry, Lock and Tag was the most commonly cited violation. There were a total of 41 citations from 14 inspections for a total penalty of around $156,000.

Fig. 2 lists several of the standards. The first two of course, relate to the Lock and Tag. The others are more related to guarding and would apply more if you followed the alternate use for this standard. One Standard that isn't listed is the ANSI B 65.1, which is for printing presses and it allows for the practice of inching of the print rolls.

Next is the European overview of LOTO. The European Committee for Standardization is CERN and it's the contributing Organization for techni-

	Subject	Standard	Total violations	$ Initial penalty	$ Adjusted penalty
8	**Lockout**/tagout-Establish an energy control program	1910.147(c)(1)	788	933,175	325,383
10	**Lockout**/tagout-Written energy control procedures	1910.147(c)(4)(i)	735	1,182,805	385,779
16	**Lockout**/tagout-Training and communication	1910.147(c)(7)(i)	593	778,513	251,978
21	**Lockout**/tagout-Annual procedure inspection	1910.147(c)(6)(i)	537	437,808	161,599

Figure 1: USA LOTO Overview. Penalties. Top 25 OSHA Violations in 2004.

USA LOTO OVERVIEW

- OSHA 1910.147; Control of Hazards Energy
- OSHA 1910.147; Interpretation Letter
- OSHA 1910.212; Subpart O, Machine Guarding
- ANSI B11.19; Safeguarding
- ANSI B11.TR3; Risk Assessment
- RIA R15.06; Industrial Robots
- NFPA 79; Electrical Standard for Industrial Machinery

Figure 2: USA Related Standards.

cal standards. The European LOTO requirement is the EN1037. It became active in 1995. The European Union countries subscribing to EN1037:1995 are listed in **Fig. 3**. The legal authority for each country is a state organization that enforces the CERN standards. An example is the ASL for Italy, VG for Germany and AVABB for France. The "Application and Exceptions" in Europe are a lot less restrictive than in the United States. The "Application" is that machines shall be provided with devices intended for isolation, for energy dissipation, for maintenance, for work on power circuits and for decommissioning. The "Exception" is, "when appropriate", for example: "for frequent interventions in danger zones, a risk assessment is used to determine built in safety measures to prevent unexpected startup".

An additional difference between the U.S. and European approach to LOTO is that signaling methods may be appropriate as a startup warning, and that signaling would be in lieu of a Lock and Tag. Also, the philosophy in Europe is to have the order of hazards reduction start with design, then to safeguarding and lastly would be procedural. Following the European philosophy, the last item on the list to do would be Lock and Tag.

Compliance and auditing is similar to the procedure followed in the United States. Compliance is completed by an inspector from the related country. Inspection can occur at any time, but usually occurs because of an accident or someone registering a complaint. Some countries mandate an inspection at machine installation. For penalties, there is a little bit of difference in Europe. If a problem is found, not only the employer, but the manufacturer may be liable for a penalty. Usually, three to six months is allowed to correct the problem. If the problem is considered dangerous, the machine can be shut down and all of the similar machines, all through Europe, would also have to be shutdown also.

Fig. 4 shows the list of European regulations related to LOTO and safeguarding. Comparing Fig. 2 and Fig. 4 you will find there are a lot of similarities between the U.S. and Europe. The bottom line is both Europe and the United States want to protect people and save money.

There are costs and benefits for companies as they comply with Lock and Tag regulations.

COSTS

- Implementation
- Training
- Potential Decreases in Productivity
- Safety Component Maintenance

EUROPE LOTO OVERVIEW

LOTO Standards. The European Committee for Standardization (CEN) is the contributing organization for technical standards.

Requirements coded EN1037:1995

Figure 3: Countries include: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Iceland, Italy, Luxemburg, Norway, Low Countries, Portugal, United kingdom, Spain, Sweden and Switzerland.

EUROPE LOTO OVERVIEW

- 98/37/EC; Machinery Directive
- EN1037; Prevention of Unexpected Start Up
- EN953, EN1088, EN999, EN294, EN811, EN349; Safeguarding
- EN 1050; Risk Assessment
- EN 954-1; Safety Related Parts of Control Systems
- EN 60204-1; Electrical Equipment of Machines

Figure 4: European Related Standards.

BENEFITS

- Minimize the Number and Severity of Injuries
- Reduce Insurance and Litigation Costs
- Minimize Non-Compliance Penalties

There are similarities and differences in the Lock and Tag regulations between the U.S. and Europe. As you put together your own Lock and Tag program, you will inevitably follow the regulations of the country in which your plant is located. However, a good suggestion is to look at regulations in other parts of the world and add the good ideas from those countries. **CI**

Energy Safe Procedure (ESP)

Frank Cordier, Smurfit-Stone Container Corporation

This is the second of several articles regarding Lock and Tag that will be published in Corrugating International over the next three issues. When complete, the articles will be combined into a manual for use as a guideline for those plants and companies who are putting together and/or enhancing their Lock and Tag regulations compliance programs.

ONE OF THE THINGS THAT WE FOUND AT SMURFIT STONE, AND ACTUALLY WE SAW THIS THROUGHOUT THE INDUSTRY, WAS THAT WHEN WE DEALT WITH OSHA ON LOCKOUT/TAGOUT CITATIONS THAT WE HAD RECEIVED AND GOT INTO THE INVESTIGATION OF WHAT CAUSED THOSE DEFICIENCIES AND THOSE CITATIONS, WE FOUND THAT REALLY IT WAS OUR OWN TERMINOLOGY THAT WAS LEADING THE OSHA INSPECTOR ASTRAY. For instance, if the inspector was talking to a machine operator and he said, "Well what do you do in case of a jam?" The operator would say, "Oh well we would lock the machine out." The inspector says, "Where?" And the operator would walk back to the nearest control button, say, "We lock it out here." Well that automatically caused a problem because, as you well know, or what we'll attempt to advise you in this chapter is that you cannot use control power to effect a Lockout/Tagout.

What it was, we found, turned out to be a matter of semantics. What we decided that we needed to do was to come up with a different term that we could use to train our operators that would differentiate between what they were doing to perform various tasks allowed under the exception in 1910.147, and Lockout/Tagout per se, which is always effected at the main control panel or main source of energy, be it pneumatic, steam, residual or any other type.

What I wanted to briefly mention was what we did at Smurfit Stone and the term that we use. Now one thing I want to make perfectly clear is that this system, called the "Energy Safe Procedure", is a term used within Smurfit Stone. If you talk to an OSHA inspector or someone from another company, they may not be familiar with that term. For instance, Temple Inland has an almost identical procedure, but they call it "Safeguard". All of the different companies work with these equivalent protection procedures, but they may have different terminology. I might say, too, that we have, within Smurfit Stone, successfully defended this "Energy Safe Procedure" in numerous informal conferences in the resolution of OSHA citations.

Let me go through basically where that "Exception" comes from and how we define the criteria that you have to put into place or you have to use in order to have an effective alternative procedure. Again, there are certain tasks where we have to maintain power to the machine. As Bob Allen mentioned in Chapter 1, the terminology used in the OSHA standard is that those production interruptions have to be routine, repetitive and integral to the use of the equipment. Such tasks would include clearing jams, minor cleaning, some lubrication, some adjustments and yes, they do include some setup processes, provided that in that setup process, at least control power is necessary. And as you know, in a lot of our presses, during setup, we need at least jog

power. The “Exception” to that is set forth in 1910.147(a)(2)(ii). What that tells us to do is that we have to use alternative protective measures. When I talked about the fact that we were able to resolve these issues with OSHA, we had to demonstrate that the alternate process or procedures that we had in place, under the "Energy Safe Procedure" or ESP, provided adequate protection to the employee. The Lockout/Tagout of the equipment is not required, provided that we define the nature of those alternative protective measures, and answer the question “do those defined measures protect employees?” The answer is “absolutely, under the unexpected startup of the equipment”.

In the instance of ESP or one of these alternative measures, you can use limited control power in that the machine is capable of being placed in a "stop" or "safe" mode. The switch is under the exclusive control of the employee at risk and, in most instances within Smurfit Stone, we have rewired the equipment so that it is actually a key switch. So, one of our alternative measures is that if the employee enters the machine to clear a jam, for instance, they would go to that nearest control switch, turn it to the "off" position, then put that key in their pocket. Essentially we then have that one employee, one key, one lock situation, similar to Lockout/Tagout.

The other thing that we have to do, and a lot of this is done by the circuitry, is that that equipment, when it's in that stop or safe mode, cannot be activated from any other portion of the machine; so even if this is down streamed, that would kill the power clear back, even at the main control.

THE KEY POINTS TO REMEMBER IN ANY ENERGY SAFE PROCEDURE ARE THE FOLLOWING:

1) You have to have a well defined procedure;

2) You have to have an actual written procedure that should be included as an addendum to your full Lockout/Tagout policy;

3) You have to demonstrate that you have trained the employees;

4) You have to document that training. Not only document the training, but make sure employees have a clear understanding of the procedure;

5) You have to demonstrate that you enforced that procedure and you deal with any violations;

6) The run control device has to be under the exclusive control of that person at risk;

7) Key stations must be used if the operator is out of sight;

8) The run control switch prevents the activation of the machine from any and all other run controls.

This is what an ESP procedure covers. We have, in a couple of instances, been successful in arguing it, if it's simply a push and pull switch, as long as that switch - and OSHA likes the term, "exclusive control" - is immediately at hand of the employee. I know that some companies set 15 feet as their requirement. Personally, I'm a little bit uncomfortable with just the footage type of definition of "exclusive control". For one thing, it has to be in line of sight. 15 feet might be possible, as long as that switch is in sight of that person while he is taking care of that jam or whatever the task may be. In other words, what our policy says is that no one else should be able to come up to that switch and reactivate it without the employee at risk being aware of it. For the most part, as I indicated, we tried to rewire and implement key switches wherever possible. That prevents activation of the machine from elsewhere.

Act Now or Pay Later

W. Henson Moore, AF&PA

History is being decided in Congress this summer. It will be an interesting opportunity to test the old adage that those who do not learn from history, are destined to repeat it.

Congress is debating our current energy crisis—believe it or not, I'm not talking about gasoline prices that seem to be dominating the media. I'm talking about the price of natural gas which is higher than gasoline. Recent natural gas prices were equivalent to paying $7.50 per gallon for gasoline. It's seriously hurting our industry.

Natural gas has nothing to do with gasoline; it is a clean, efficient, and formerly inexpensive fuel. Millions use it to heat their homes, schools, churches, and hospitals, and we all rely on it to keep America's factories and power plants running. But the price of natural gas has climbed steeply in the past six years, far outpacing inflation, and the price is now at least four times its historic average. These unnaturally high prices are hurting manufacturing which relies so heavily on natural gas. Since 2000, the forest products industry has closed 282 mills and permanently lost 189,000 jobs—and high energy prices are often cited as a reason.

So what about Congress? Well, the problem is uniquely one that Congress can completely solve on its own. The reason natural gas prices are so high is that for more than twenty years Congress has been encouraging consumption of natural gas, while at the same time, restricting access to supply. Doesn't make sense, does it? Well, Congress may be about to fix it by removing some of those restrictions. Senators Domenici (R-NM) and Bingaman (D-NM) have introduced legislation in the U.S. Senate to expand our exploration for natural gas in a small section of the Gulf of Mexico that is believed to enough natural gas to heat 5 million homes for 15 years. In the U.S. House, Representatives Jindal (R-LA) and Peterson (R-PA) have offered their own bills that propose different approaches to increase our natural gas supply. Voting should occur before the end of May, and America badly needs the bills to pass and for the President to sign them.

I mentioned learning from history—well that part does tie back to gasoline prices. Decades ago this country made a general policy decision that even though there was plenty of oil in Alaska and under the ocean off our shores we were not going to go after it in great quantities. We decided to import most of our oil from allies in the Middle East. Well, as you know, some of those allies are now our outright enemies, and none of them feel particularly good about us. And what has happened to us? As we come to require more and more oil, we are increasingly at the mercy of those former allies who can do with the price of oil what they please.

So once again, we find ourselves at a crossroads. We have enough natural gas under our feet and waters to keep America going for a century or more. Will Congress lift the restrictions on supply and allow American companies to go get this American natural gas to heat American homes

and keep American factories running, preserving American jobs? Or will they once again say, "no," and make us look overseas for natural gas? Many countries in the Middle East and Russia have booming natural gas industries, and they would all be more than happy to see us hand our future over to them, just as we did so many years ago with oil.

Congress needs to act now on natural gas or we will all be paying the price later. I encourage you to call your Senators and your Representative in Congress and tell them to put American natural gas to work for America. America's security and strength depend on it. **CI**

W. Henson Moore is a former Member of Congress from Louisiana and the former Deputy Secretary for Energy. He currently is the President & CEO of the American Forest & Paper Association. He wants you to know you can call the U.S. House of Representatives at (202) 225-3121 and the U.S. Senate at (202) 224-3121.

Wal-Mart: The New Jolly Green Giant

Alan Rooks, Former Editorial Director, *Solutions for People, Processes, and Paper*

What happens when the world's leading retailing colossus gets "touchy-feely"? I'm not sure, but if I were in the packaging business I would want to find out.

THAT'S ONE REASON THE AMERICAN FOREST & PAPER ASSOCIATION INVITED TYLER ELM, SENIOR DIRECTOR, CORPORATE STRATEGY AND BUSINESS SUSTAINABILITY, WAL-MART STORES INC., TO ADDRESS ITS PACKAGING GENERAL SESSION AT THE RECENT PAPER WEEK MEETING IN NEW YORK.

In his presentation, "Business Sustainability: A Competitive Strategy for the 21st Century," Elm explained how Wal-Mart is beginning to focus intently on business sustainability in general—and packaging in particular—as one of its key areas of interest. "Sustainability is the largest and most significant current initiative for the company," he said. "We have to be able to understand the exponential function of what it will take to care for 8 billion people on the planet by 2025, up from 6.3 billion today." Elm outlined the enormous challenges this represents, noting that, for example, one third of the planet does not have access to safe drinking water.

Corporations have enormous power and also enormous responsibility for dealing with sustainability issues, said Elm. Of the world's 100 largest economic entities, 42 are now corporations, not countries. Based on its economic activity, Wal-Mart would be the 19th largest country in the world and its employees, in total, would represent the fifth largest city in the United States.

Today, Wal-Mart is focused on developing integrated, sustainable business models. "Business sustainability is a new optic that we are applying to our company," he said. "We want people to ask questions they have never asked before. We want to look at how we use resources. Our goal is to produce sustainable economic benefits derived from improved environmental and social outcomes."

The Wal-Mart sustainability initiative focuses on three core areas: climate, waste, and products. The company's ultimate goals are to be supplied 100% by renewable energy, to create no waste, and to sell products that sustain resources and the environment. To that end, Wal-Mart hopes to make its stores 25% more efficient in seven years, develop a trucking fleet that is 25% more efficient in three years, achieve a 25% reduction in solid waste in three years, and to have 20% of its supply base aligned with sustainable products in three years.

Wal-Mart has identified 13 "sustainable value networks" and is "proactively developing them around key areas of the business," said Elm. Of these initiatives, two directly concern the pulp and paper industry and many others will involve input from the industry. One of the two "waste" value networks concerns packaging (the other is operations and internal procurement). One of the eight "product" value networks focuses on forest and paper. The three "climate" value networks focus on Wal-Mart's global

greenhouse gas strategy; energy, design construction, and maintenance; and global logistics. "Our goal," said Elm, "is to develop a sensing organization that is aware of the external business environment and is able to incorporate this perspective into business decisions to create long term value where business benefits are derived from improved environmental and social outcomes. We want to transition from a 'transactional organization' to an organization based on 'value-added relationships.'"

In the packaging area, Wal-Mart is focused on removing, reducing, and reusing packaging as well as sourcing packaging that is both renewable and recyclable. Like the other value networks, the process begins with issues identification, focusing on five areas: raw materials, processing inputs, manufacturing, transportation, and use and end-of-use. The process then moves on to an examination of business activities and identification of the different players in the supply chain.

As part of this process, Wal-Mart is sponsoring events such as the "Packaging Sustainability Summit," which is focused on identifying and incorporating innovations that enhance sustainability. For example, the company was purchasing chicken in waxed corrugated boxes, which are notable for their inability to be recycled with other boxes because of the external wax layer. This layer protects the box from the melting ice traditionally used to keep chicken and other products chilled in transit. Typically, wax boxes are not recycled and instead go to landfills. However, at the Packaging Sustainability Summit, Wal-Mart realized that since it had changed over to individually wrapped chicken that did not need to be packed in ice, it did not need waxed chicken boxes. It was able to eliminate 2.5 million wax boxes per year and replace them with recyclable corrugated boxes. In another example, Wal-Mart buyers recommended reducing the size of a toy tea set packaging, which produced major savings in corrugated packaging materials.

Elm closed his presentation with a quote from Peter Drucker: "Every single pressing social and global issue of our time is a business opportunity." That idea makes sense for Wal-Mart and its many suppliers, who increasingly live in the "valley of the jolly green giant." As Wal-Mart changes to meet its lofty sustainability goals, its suppliers—including pulp and paper companies—will have to change with it. **CI**

Ningbo Xiaogang: Epic Scale Mill has Big Future Plans

Alan Rooks, Former Editorial Director, *Solutions for People, Processes and Paper*

In many ways, the new Ningbo Xiaogang containerboard mill is a microcosm of today's Chinese paper industry. Like the industry it represents, it is carved out of a previously undeveloped area, is built on a massive scale, and has big plans for the future.

TO FIND THE MILL, YOU WEND YOUR WAY THROUGH A SPECIAL INDUSTRIAL ZONE, WHERE YOU ARE GREETED BY SEVERAL LARGE BILLBOARDS ANNOUNCING THE VIRTUES OF INDUSTRIAL DEVELOPMENT. One the most memorable billboard slogans is "Tiding over difficulties to achieve brilliance." The mill itself is located close to a half modern, half wreck of a small village—which includes a luxury hotel with a first class restaurant.

WORLD'S LARGEST CONTAINERBOARD MACHINE

The Ningbo Xiaogang mill houses the world's largest containerboard machine, and directly across from the mill is what may be the world's largest pile of wastepaper. The mill itself is truly epic, with the machine hall well over half a mile long. The five-headbox, two-shoe press, five-coating station Metso board machine produces gigantic rolls of 250-400 gsm white lined chipboard (WLC). The machine is 410 meters from headbox to winder. Design production is 2045 metric tons/day and 700,000 metric tons/yr. Most of the cartonboard is used to make packaging for consumer products. The boardmaking line exceeded its quality and production targets on several basis weights shortly after start-up.

With the two shoe presses, PM1 achieves 47% dryness after the press. The machine has eight stock lines feeding pulp for the various plies that are combined as chipboard. The mill uses about 90% recycled paper in its furnish. Ningbo Xiaogang produces some of the smoothest white-lined chipboard in the world, and uses CD coat weight control and a MetsoDNA automation system. The mill ships about 70% of its board in reel form and 30% in sheet form. The mill represents a total investment of 16 million RMB (US$ 2 million).

The new mill, located in the town of Xiaogang, Ningbo City, Zhejiang province, China, is managed by Ningbo Asia Pulp and Paper. The company received a license in 2000 to build the mill. Metso Paper supplied the new board production line in less than 18 months. Ningbo Zhonghua Paper Co. is the principal owner of the mill, with a 50 % ownership share. The remaining 50 % is divided between Asia Pulp and Paper China and Ningbo Ningshing Co., Hong Kong. The nearby Ningbo Zhonghua mill, built in 1985, has three machines with an annual capacity of 500,000 metric tons of coated paperboard.

The new mill has a power plant with two 62 MW turbines as well as a modern wastewater treatment plant. Recycled fiber for the mill comes from the United States (70%) and Japan (30%), while virgin pulp comes from Canada and the group's mills in Indonesia and Hainan Island, China.

Sea access was one of the deciding factors in choosing Xiaogang as the site for the new mill, and the company is building a new seaport there.

Pulp cleaning operations at the Ningbo Xiaogang mill. All photos by Alan Rooks

Wet end of the new PM1 containerboard machine.

The seaport provides immediate access to shipments of recycled paper and coal, the principal fuel for the mill. Ningbo Xiaogang also uses the port to ship about 35 % of its total production by sea to southern China.

HIGH QUALITY PACKAGING

The new mill produces high quality duplex and triplex WLC grades. Only the top layer is coated in duplex board while both sides are coated in triplex board, with the latter being used mainly for high-quality packaging (cigarettes, cosmetics, clothing, shoes, etc.). Duplex board is used for consumer products such as food packaging and tissue.

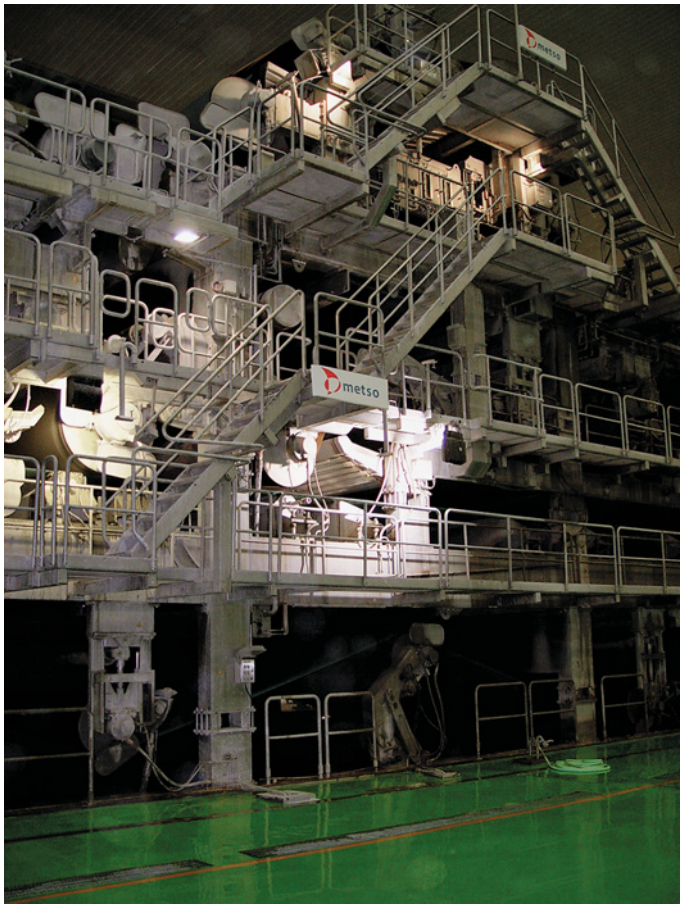
Most of the production from Xiaogang is sold to agents and large Chinese printing houses, with export markets expected to develop in the future. Board consumption in China, currently about 7 to 8 million metric tons annually, is growing 12 to 15% annually—faster even than the total Chinese economy.

MULTIPLE PULPING LINES

The duplex and triplex furnishes include about 10% virgin pulp and 90% recycled fiber and broke. Two virgin pulp lines supply short fiber (LBKP) and one line supplies long fiber (NBKP) pulp, using OptiSlush batch pulpers followed by HCCleaners, OptiFiner deflakers, and OptiFiner low-consistency refiners.

The virgin pulp lines have a total designed capacity of 710 metric tons/day, and are used mainly for the top and back layer of the board. Triplex board uses some LBKP in the back ply to increase its strength and efficient refining provides very good surface and smoothness qualities.

The five recycled fiber lines provide pulp from deinked wastepaper, old newspapers, mixed waste, sorted office waste, and old corrugated containers. The five lines have a com-



The Ningbo Xiaogang PM1 is the largest containerboard machine in the world.

Workers in the control room for PM1.

bined capacity of 2500 metric tons/day. The recycled fiber lines use OptiSlush drum or continuous pulpers, OptiScreen coarse and fine screens, OptiBright flotation cells, OptiDaf microflotation units and OptiFiner dispersers and low consistency refiners. Thickening, bleaching, and reject handling systems were also delivered by Metso Paper.

PM 1 is controlled with a metsoDNA system as well as dilution headbox controls using a basis weight profiler, IQCoatDryCD profiling with 2-row electrical IR and Metso coat weight profiling of topcoat stations.

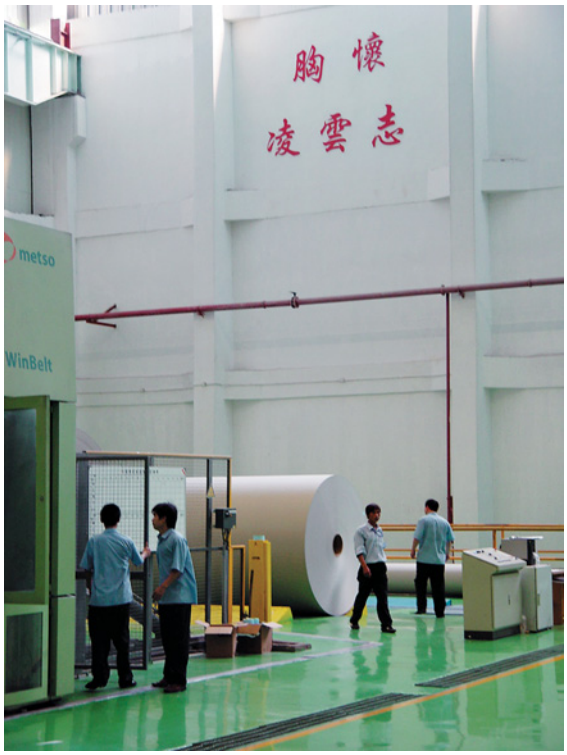
Construction of PM1 started in May 2003. The start-up began with stock preparation on Sept. 18, 2004, followed by uncoated paper production on Oct. 28 and coated board production on Nov. 23. WLC quality has been very good since startup, with excellent smoothness, gloss, and bulk, according to the mill. PM1 produced saleable quality WLC from the first roll.

FUTURE PLANS

The current mill site has room for three or four board machines and the company already has plans to create what it calls the world's largest papermaking city in Xiaogang. The company's target is to reach 5 million metric tons/yr of production at the site within five to eight years. While this seems like an astounding goal, the potential for future expansion depends on how fast the Chinese economy grows—and so far the economy has shown no signs of slowing down. **CI**

A vast collection of recycled paper and board in a storage yard adjacent to the mill.

Finished reel of WLC on PM1.



Workers on the dry end of PM 1.

Workers in the finishing operations on PM1.

TAPPI's 2006 Corrugated Packaging Conference:

Something for every corrugating/converting professional

Date: *September 12-15, 2006*
Place: *Duke Energy Center (formerly Cinergy Center) and Hyatt Regency Cincinnati in Cincinnati, Ohio, USA*

From "boot camp" basics to the hottest issues in packaging today, the 2006 TAPPI Corrugated Packaging Conference packs it all into three focused days. This year's theme — *Box Plant Boot Camp: Basic Training and Beyond* — reflects what is going on in the industry and sets the stage for targeted learning and problem-solving opportunities. This year's Corrugated Packaging Conference zeroes in on the needs of the people at the plant level — where day-to-day improvements can greatly affect production, performance, and profitability.

The 2006 program features 50% more opportunities for technical learning than last year. Technical and hands-on training and other educational opportunities are concentrated in three main areas: Converting/Converting maintenance; Corrugating/Corrugating maintenance; and HRD, safety, and product security.

An on-target program is only the beginning! This event also includes:

- **CorrExpo® 2006**, a trade fair featuring the latest technologies, services, and products
- **An Industry Q&A Roundtable**, sponsored by the Corrugated Packaging Division Production Committee.
- Working lunch **Committee Meetings** featuring informative technical presentations.
- A **"What's New Technology Showcase"** where attendees will discover their industry's most exciting new developments.

Host city Cincinnati, Ohio, provides an accessible and engaging venue for this important event, and a flexible and enjoyable spouse/guest program completes the picture.

The conference is organized to give attendees maximum flexibility, and to make it easy for organizations to send several employees to the conference. Participants may register for the full conference or attend a one-day track to minimize time away from the job. Significant group discounts are available for three or more box plant staff attending together. Make plans now to attend!

Registration Information

Individual TAPPI Member:	US$1,125.00
Individual Non-member:	US$1,690.00
Join TAPPI and save!	US$159.00

(Add applicable GST or HST for Canadian Membership)

Box Plant Group Registration:	US$150.00

(Per person, single day for three or more box plant staff.)

Single Day Attendance – Member:	US$400.00
Single Day Attendance – Non-member:	US$930.00

Or visit: www.tappi.org/06COR for more information.

JOIN LEADING INDUSTRY SUPPLIERS AT THE CORREXPO® 2006 EXHIBIT AND TRADE FAIR

Scheduled concurrently with the 2006 TAPPI Corrugated Packaging Conference at the Duke Energy Center in Cincinatti, Ohio, this huge exhibition showcases all the latest technologies and products for the corrugating industry. Attendees will:

- See what's new since SuperCorrExpo in 2004
- Find new and better solutions to plant problems
- Meet key supplier contacts
- Discuss production problems with the experts
- Experience the CorrPak® 2006 Competition Corrbie Awards — See innovative, resourceful products, and meet the vendors and converters who collaborated on the award-winning creations.

See a list of participating companies at www.tappi.org/06COR.

Suppliers: If your company has not yet registered to exhibit at CorrExpo® 2006, go to www.tappi.org/06CorrExpo to find out how you can be part of this great event. Booth space is filling up fast! Hundreds of corrugated and packaging professionals are expected to be on hand for this year's outstanding program; don't miss your opportunity to be a part of the CorrExpo® 2006 experience. For information on exhibit space or sponsorship opportunities, contact Sheila Frank at 732-649-1016, email: sfrank@questex.com or Heather Murphy at 631-675-0275 email: hmurphy@questex.com.

CORRUGATING CONFERENCE FEATURES FUN SPOUSE/GUEST PROGRAM

Attendees at the 2006 TAPPI Corrugated Packaging Conference & CorrExpo® are encouraged to bring their spouse or other guest to take advantage of a full and flexible Guest Program. Attendees may register online at www.tappi.org/06cor or, for more information about the tours, contact Karen Peter at 410-638-6238 or karenjp47@msn.com (put TAPPI Spouse/Guest on the subject line). Planned events include:

Spouse/Guest Get Acquainted

Tuesday, September 12, 2:00 p.m. – 4:00 p.m.
Renew old friendships and establish new ones at this casual gathering, while you learn about the tours being offered on Wednesday and Thursday.

Complimentary Continental Breakfast

Wednesday, September 13th, 8:00 a.m. – 10:00 a.m.
Thursday, September 14th, 7:00 a.m. – 9:00 a.m.
Friday, September, 15th, 8:00 a.m. – 10:00 a.m.

Highlights of Cincinnati Tour - $55.00

Wednesday, September 13, 9:00 a.m. – 4:00 p.m.
See some of Cincinnati's most well-known landmarks and most spectacular views. Enjoy lunch at The Golden Lamb, Ohio's oldest inn.

Kentucky Bluegrass Tour - $82.00

Thursday, September 14, 8:00 a.m. – 4:00 p.m.
Tour the Kentucky Horse Park, savor a southern lunch at the Holly Inn, and visit the historic Woodford Reserve Distillery where award-winning Kentucky bourbon has been produced for 200 years.

TAPPI SUPPLIERS HOST GALA EVENT

Exciting plans are underway for the Suppliers' Gala, an annual event funded through generous supplier donations. The event will take place immediately following the CorrExpo 2006 trade fair on Wednesday, September 13th at Duke Energy Center in Cincinnati, Ohio. The Supplier's Gala begins at 5:30 p.m. and is open to all Conference attendees and trade show visitors. Festivities include great food, beverages, fun, music and networking opportunities—it's sure to be a Conference highlight!

2006 Supplier Gala sponsors include:
(as of August 2006)

- A.G. Stacker Inc.
- ADI/PDM Trade Group
- ARC International
- Adhesive Mixing Equipment
- Albany International
- Alliance Machine Systems Intl.
- Alliance Technical Service Inc.
- American Baler Company
- Automated Conveyor Systems Inc.
- Balemaster
- Bay Machinery Company LLC
- BHS Corrugated-North America
- Board Converting News,
- Bobst Group Inc.
- C & M Conveyor
- Cascade Corporation
- CEMA
- Chicago Electric Company
- Converting Machines Inc. (CMI)
- Copar Corporation
- Corrugated Chemicals Inc.
- Corrugated Gear & Services
- Corrugated Replacements
- Corrugated Today Magazine
- Corrugating Roll Corp.
- CTI
- Curioni U.S.A. Inc.
- DICAR Inc.
- Donahue & Associates Intl. Inc.
- Erhardt & Leimer, Inc.
- Fosber America Inc.
- George M. Martin Comp.
- Haire Group
- Harper Machinery Corporation
- Harper/Love Adhesives
- Isowa America Inc.
- JB Machinery Inc.
- Kadant Johnson
- Kiwiplan Inc.
- MacDermid Printing Solutions LLC
- MarquipWardUnited
- Michelman Inc.
- Mitsubishi Heavy Industries Ltd.
- National Starch & Chemical Co.
- Nye Lubricants Inc.
- Pamarco Inc.
- Profero Systems Inc.
- Qualitek
- Ringwood Company
- Sauer Systems
- Stafford Products Inc.
- Stickel Steam Specialties Company
- SUN Automation Group
- Sun Chemical Company
- Terdeca CMG Group Inc.
- Valco Cincinnati Inc.
- Walla Walla
- Zenith Cutter Company

WHAT'S NEW TECHNOLOGY SHOWCASE

Do you need an early morning eye-opener? On Thursday, September 14, attendees at the 2006 TAPPI Corrugated Packaging Conference & CorrExpo® will wake up to eye-opening new technology from six of the industry's leading suppliers. The What's New Technology Showcase is an hour-long session, 7:15 am – 8:15 am, featuring specially-selected 10 minute presentations on some of the hottest developments in the corrugated packaging industry. For more details, keep checking www.tappi.org/06COR.

2006 TAPPI CORRUGATED PACKAGING CONFERENCE & CORREXPO®

Hyatt Regency Cincinnati/Duke Energy Center, Cincinnati, Ohio
Tentative Schedule of Events – *Subject to Change*

	Tuesday, September 12, 2006
7:30 a.m.	CorrExpo® Booth Set Up
10:00 a.m.	Registration
10:00 a.m.	Corrugated Classic - Registration
11:00 a.m.	Corrugated Classic – golf outing (lunch included)
6:30 p.m.	TAPPI Welcome Reception and Awards Ceremony
	Wednesday, September 13, 2006
7:30 a.m.	Conference Kick Off
7:30 a.m.	Industry Keynote – Jerrold Solomon
9:00 a.m.	Question and Answer Production Roundtable – sponsored by the TAPPI Corrugated Packaging Division Production Committee
10:30 a.m.	Session 1: Converting/Converting Maintenance Session Session 2: Corrugating/Corrugating Maintenance Session
12:30 p.m.	Committee Meetings and Working Lunch • FISCOTEC Committee - brief meeting • Production Committee - brief meeting, three technical presentations • HRD/Safety Committee
2:30 p.m.	CorrExpo® Exhibit and Trade Fair
5:30 p.m.	Supplier's Gala
	Thursday, September 14, 2006
7:15 a.m.	What's New Technology Showcase
8:15 a.m.	Session 3: HRD/Safety and Product Security Session Session 4: Corrugating/Corrugating Maintenance Session
10:30 a.m.	Session 5: Converting/Converting Maintenance Session Session 6: HRD/Safety and Product Security Session
12:30 p.m.	Committee Meetings and Working Lunch • CORBOTEC Committee - brief meeting, technical presentation • Engineering Committee - brief meeting
2:30 p.m.	CorrExpo® Exhibit and Trade Fair
5:00 p.m.	Supplier Advisory Committee
	Friday, September 15, 2006
6:30 a.m.	Awards and Scholarship Committee
7:30 a.m.	Corrbie Awards – TAPPI CorrPak® 2006 Competition
8:00 a.m.	Keynote Speaker – Joel Weldon - "COYOTE POWER - How to Thrive Not Just Survive"
12:30 p.m.	Steering Committee Meeting and Working Lunch
1:30 p.m.	CPD Division Chair Wrap Up

NEW FROM TAPPI PRESS

A fully updated CD-ROM titled **Corrugated Containers Waste Management: Waste Due to Warp**. Originally produced for video, this CD-ROM offers plant-proven solutions to warp and the resulting waste. Employees at many levels of production gain immediate insight into:

- Identifying different warp shapes
- Understanding the causes of warp
- Setting excellence goals for waste due to warp
- Prioritizing steps necessary to correct warp and waste

The CD-ROM features approximately 45 minutes of helpful instruction, a searchable glossary, printable study outline, and more. Participants can view the course at their own pace, starting and stopping as time requires. This TAPPI PRESS exclusive is offered at a special price for TAPPI members: **only US$113** (US$169 for non-members.) Site licenses are also available. Visit www.tappi.org for more details; simply enter Product Code CCWASTE-CD into the search window.

GAIN HANDS-ON EXPERIENCE AT TAPPI CORRUGATED PRESS HANDS-ON MAINTENANCE WORKSHOP

TAPPI's Corrugated Press Hands-On Maintenance Workshop provides on-site learning geared toward corrugated industry plant managers, superintendents, engineers, supervisors, maintenance foreman, machine operators and maintenance staff. Participants will acquire practical knowledge they can apply immediately. Designed exclusively for corrugated packaging manufacturers, this course will take place October 24-26, 2006 in Charlotte, North Carolina, using the machinery and plant facilities of Harper Machinery Corporation.

The Corrugated Press Hands-On Maintenance Workshop offers participants hands-on experience with real machines. Unlike DVDs, videos, and self-help books, the tutorial lets participants ask questions and interact with top converting industry experts. Georgia Pacific's Rick Croker, director of technical services and John Troyke, senior region engineer, as well as other experts and Harper Machinery personnel, will guide attendees through the tutorial.

For additional information about the Corrugated Press Hands-On Maintenance Workshop, visit www.tappi.org or contact TAPPI's Member Connections Center at +1-800-332-8686 (US), 1-800-446-9431 (Canada) or +1-770-446-1400.

LEAN MANUFACTURING: MACHINE TOOLING CALIBRATION COURSE

Date: Oct 17-18, 2006
Venue: Radisson Riverwalk Hotel, Covington, KY (near Cincinnati)

This direct, easy-to-understand course presents an aggressive approach to cost effective manufacturing including ink management, effective setup techniques and machine calibration. In this interactive two-day course, you will learn how to take the guesswork out of the process of running die cutters and flexo folder gluers. The course is ideal for senior operators, superintendents, regional engineers, production managers, quality assurance managers, maintenance engineers, managers, and superintendents. To learn more, visit www.tappi.org or contact TAPPI's Member Connections Center at +1-800-332-8686 (US), 1-800-446-9431 (Canada) or +1-770-446-1400.

SUPERCORREXPO®2008 IS ON THE HORIZON

Four years is a long time to wait… but we're already half way there! Following the amazing success of 2004's event, AICC (Association of Independent Corrugated Converters) and TAPPI will present SuperCorrExpo®2008, September 22-26, 2008, in Atlanta, Georgia.

This unique, week-long event will include running machinery and world class education provided by AICC and TAPPI. It's the largest corrugated packaging machinery show in the Western hemisphere, and it guarantees something for everyone in the corrugated packaging industry. Thousands of corrugating and converting professionals are expected to be there looking for new ideas, products and services. If your company is interested in exhibiting, remember that early opt-in is key at such a large event; more than 90 exhibitors have already signed on.

For more information about attending or exhibiting at SuperCorrExpo®2008, visit www.supercorrexpo.org; or call Eric Fletty at 1-770-209-7535.

Association News

ANNOUNCING TAPPI'S NEW MAGAZINE, PAPER360º

It's brighter… bolder… more relevant than ever to the issues you face at your mill or plant. Introducing *Paper360º*, a new magazine for the pulp, paper, packaging and related industries. Offering readers a full-circle view of the latest developments and hottest topics, this monthly publication's tagline says it all: Around the Industry, Around the World. Intrigued?

Paper360º will replace *Solutions!* as the official member magazine for both TAPPI and PIMA, and will incorporate readers' favorite elements from that publication while introducing a brand-new editorial structure. With a strong focus on mill productivity and career-enhancing knowledge, *Paper360º* content is organized into five editorial "pillars:"

- Trendspotting - (Analyzing ideas, issues and markets)
- SmartMill - (Ideas to improve mill operations and productivity)
- TechLink - (Tracking new product/process development)
- The Bottom Line - (Businesses and practices in a global context)
- InTouch - ("People" topics and Association News)

Look for the August 2006 launch issue of *Paper360º*, designed to meet your critical need for relevant, engaging information. **It's FREE to TAPPI members**; for membership information, contact TAPPI Member Connection Center at 1 800-332-8686 (US), 1 800-446-9431 (Canada), or 1 770-446-1400 (worldwide.)

NEW TAPPI WEBSITE: DEDICATED TO CORRUGATED!

When TAPPI launches its newly redesigned website, professionals in the corrugated packaging sector will feel right at home. They'll find their own dedicated section of the website, bringing together the products, services, and events TAPPI offers specifically for the corrugating audience. Set to launch in early September, the new website will make it easier for members and non-members to find what they need quickly and efficiently.

"We've created dedicated web environments for different industry areas, which gives users a customized experience," says Karen Roman of TAPPI's IT department. "This will cut the 'information clutter' and help users navigate more efficiently."

The new area will feature news and updates related to corrugated packaging, with easy links to corrugating-related events, papers, Test Methods and more. For updates, contact TAPPI's Member Connection Center at 1-800-332-8686 (US); 1-800-446-9431 (Canada); +1-770-446-1400 (Worldwide); or email to memberconnection@tappi.org.

CORRUGATED PACKAGING DIVISION CALENDAR OF EVENTS

September 12 – 15, 2006	**Corrugated Packaging Conference & CorrExpo®2006** Duke Energy Center Cincinnati, Ohio, USA www.tappi.org/06COR
October 11-14, 2006	**AICC 2006 Annual Meeting** Sheraton Chicago Hotel and Towers Chicago, Illinois, USA www.aiccbox.org/meeting/meeting.asp
October 17-18, 2006	**Lean Manufacturing: Machine Tooling Calibration Course** Covington, Kentucky, USA (Greater Cincinnati area) www.tappi.org/06LEAN
October 24-26, 2006	**Corrugated Press Hands-On Maintenance Workshop** Harper Machinery Corporation Charlotte, North Carolina, USA www.tappi.org/06CORRMTC
September 22-26, 2008	**SuperCorrExpo®2008** GWCC Atlanta, Georgia, USA http://supercorrexpo.org/