The Changing Face of Corrugated Printing

Adapting to Change in Shifting Markets

Rely on us.
State of the Industry

► Today, the US is the largest global consumer country of packaging
► China is expected to surpass the US by 2017
  ♦ China to become largest consumer of corrugated this year (Freedonia)
► India will enter the Top 10, with demand doubling in the next 5 years
► Estimated Overall Growth Rate of 3% in the US
► Total Global Market CAGR of 4+% (PIRA); 5.7% (RISI)
  ♦ US and Western European markets saturated
  ♦ Consumption shifts to emerging markets
    • China, India, South America
World Packaging Consumption by Region

The Rationale for the Shift

► Population of China – 1.34 Billion (19.2%)
► Population of India - 1.21 Billion (17.1%)
► Population of the United States - 0.315 Billion
► Average Income Differences
► Burgeoning Class of Consumers
Global Packaging Market by Region – 2016 estimate

- **Western Europe**
  - CAGR 2011-2016 ~1%

- **Eastern Europe**
  - CAGR 2011-2016 ~4%

- **Middle East**
  - CAGR 2011-2016 ~4%

- **Africa**
  - CAGR 2011-2016 ~5%

- **North America**
  - CAGR 2011-2016 ~1%

- **South / Central America**
  - CAGR 2011-2016 ~5%

- **Asia**
  - CAGR 2011-2016 ~6%

- **Australasia**
  - CAGR 2011-2016 ~1%

Source: PIRA International Ltd. - 2012
Shifting Manufacturing
The Markets of Europe and The United States

A Flint Group Perspective
~ 30% of the packaging market is corrugated

Source: PIRA International Ltd. - 2012
Consumers Buying Preferences

- Buying what you know best (Brand)
- Buying what appeals to you (Packaging)
- Buying the least expensive (Price)
Corrugated Packaging Market - Trends

► More focus on brand and cost effective packaging

► Sustainable - made of reclaimed/recycled and high fiber content material

► Conversion from analog to digital plate making
  ♦ Estimate that Eastern and Central Europe 95% Digital
  ♦ Southern Europe, Italy and Spain, cost driven

► Two sectors: Transit (Shipping) and Retail (Marketing)
Higher print quality demands

More point of sale advertising - increased use of multi-color halftone printing

Increased productivity and efficiency requirements

Move of production from western to eastern countries
  ♦ Primarily for cost reductions and shift of markets
Two sectors – Different Drivers

► The Box as a Shipping Container
  ♦ Commodity Products
  ♦ Raw Material Costs

► The Box as a Marketing Tool
  ♦ Added value through packaging – perception of quality and innovation
  ♦ Branding & Marketing
  ♦ High quality, multi-color designs
  ♦ Retail Ready Packaging
Transit Packaging – Plate Trends

- Liquid photopolymer losing share to sheet
  - Conversion from analog to digital plate processing

- Needs for plates with lower hardness to achieve area coverage

- Over all cost pressure
Transit Packaging – Low Cost Packaging

► Strictly price oriented
► Simple text and line work, one and two color
► Low line screen ruling
► Only ink transfer required
Retail Packaging – Quality Printing

- Almost all digital printing plates
- Higher pigmented inks
- Higher screen rulings
- Increased number of colors
Retail Packaging – Trends

- Tendency to harder plates – high print quality with medium hardness plates
- Mix of plate thicknesses due to regional differences, trend to thickness 3.94mm and thinner (0.155”, 0.112” and thinner)
- Conversion to preprint – increased number of press installations
- Increased requests for bigger sizes
- Entry of Flat Top Dot technologies in the last two years
Business Drivers – Retail Packaging

► **Demographics**
  ♦ Changed advertising and consumer behavior

► **Growth in the emerging markets**
  ♦ New consumers

► **Brand owner’s demands on quality**

► **Shorter product lifecycles, new brands**

► **Sustainability – new regulations**
Finally getting back to pre 2008 levels after > 12% Decline 2007 - 2009

Optimistic Growth Rate of 3 - 4% through 2016 (Pira), 5.7% (RISI)

Continued market consolidation and capacity reductions

Growth from Food and Beverage Markets

Sources: RISI 2012
PIRA 2012

FlintGroup
Flexographic Products
Packaging Strategies

► Big Box Stores
  ◆ RRP
  ◆ POP

► The shipping container as the display

► What’s next?
  ◆ Food vs other products
  ◆ Display stores
  ◆ Amazon Model
  ◆ Best Buy strategy
The Challenges
Consolidation and Centralization

► Acquisitions and Consolidation
  ◇ Taking capacity out of the market
  ◇ Closing redundant facilities
  ◇ Bigger integrateds
    • IP
    • Rock-Tenn

► Large integrated purchaser of printing plates
  ◇ Currently buying from 69 different plate suppliers
  ◇ Wanting to consolidate # of suppliers and negotiate volume related pricing
  ◇ Looking to reduce the total number of suppliers to 8
The Challenges for the Industry

► Other packaging in lieu of corrugated containers
  ♦ P&G – seal-tight plastic in lieu of corrugated containers
  ♦ Wal-Mart – packaging reduction initiatives

► Other printing technologies to improve graphics quality
  ♦ Litho lam
  ♦ Digital
  ♦ Preprint
Focus on Where the Costs Really Are

- Manufacturing Costs: 50%
- Substrate Cost: 40%
- Supplies: 4%
- Inks: 3%
- Plate Costs: 1%

Addressing the impact of a down press or substrate waste
The Challenge for the Plate Supplier

► Products that just work
► Consistent quality, consistent imaging
► Static vs. dynamic processing inputs
► Tougher plate products
► Plates that run cleaner and last longer on press
► Products optimized for the process
New Tougher Plate for Corrugated Printing

The Problem
**Influences on Corrugated Plate Chipping**

<table>
<thead>
<tr>
<th>Job</th>
<th>Main Exposure</th>
<th>Plate Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>♦ Relief depth</td>
<td>♦ UVA Irradiance</td>
<td>♦ Polymer Composition</td>
</tr>
<tr>
<td>♦ Design</td>
<td>♦ Main Exposure Time</td>
<td>♦ Conventional vs. Digital?</td>
</tr>
<tr>
<td></td>
<td>♦ Vacuum Kreen</td>
<td></td>
</tr>
</tbody>
</table>

**Processor**

- Processor Design (Batch vs. Incremental)
- Washout Time
- Brush Age and Condition

**Washout Solvent**

- Type and Composition
- Balance
- Solid Content
Optimization of Plate Processing Parameters

Description:
► 0.250” plates were made with different plate parameters (BE, FE, washout, etc.) using regular 0.120” relief and also deep > 0.180” relief

Key Findings:
► Regular relief is possible without chipping, but not on a consistent base
► The deeper the relief the more severe the chipping gets
► An increased main exposure time reduces chipping

Conclusion:
► Nothing definitive in the Processing Steps
Testing

Different Brushes in the Processor

Description:

► Some of the brushes were replaced with brushes that had longer bristles. The idea was this could have a positive effect on the chipping

Key Findings:

► The longer brushes had no negative effect on the washout speed.
► The plates were still chipping

Conclusion:

► No luck with this approach!
Testing

Modified solvent blend

Description:
► A modified test solvent was blended to make the plate swell less in the processing step

Key Findings:
► First results looked promising but chipping could not be completely eliminated.
Modified Formulation of the Plate

![Modified Formulation of the Plate Diagram](image-url)
Conclusions

► Some of the approaches had a level of success but could not ensure elimination of chipping

► Adjustments to plate making parameters will reduce (or solve) the chipping

► Modified formulation shows significant promise

► In testing at a few customers
Why Change A Good Thing?

► We believed we could do better

► Needed better relief control (back exposure)

► Improve overall image quality

► Improve color stability of the plate
The NEW nyloflex® ACE – Physical Properties

► Basically the same
  † 62 Shore A (DIN 53505), same as previous nyloflex® ACE

  † Designed for solvent, water and UV curable flexographic inks

► Improved overall image quality and color stability, with a brighter green color
Similar Physical Properties to ACE

- No change in digital black mask layer
- Improved exposure latitude
- Improved solvent resistance
- Comparable dot gain curve to Original ACE
The NEW nyloflex® ACE – Customer Feedback

“...label printing job with the NEW nyloflex® ACE Digital ran 200,000 ft, no stops for cleaning were necessary.”

“We printed 1,000,000 ft of pet food bags without cleaning (normally we stop to clean after 500,000 ft); We were able to run the job 175 fpm faster and saved 7.5 hours in press time!”

“We ran 70,000 lbs of film substrate on the potato chips job with only one set of NEW nyloflex® ACE Digital where previously we needed to replace the plates after 30,000 lbs.”

“A difficult hygiene packaging job 650,000 ft could be printed without stopping for cleaning - consistent print quality over the whole production run.”

“High speed flexible packaging job, 1,650,000 ft printed without cleaning.”

“110,000 ft diapers job showed excellent ink transfer and reduced ink consumption for achieving target density.”

“We printed 1,500,000 ft and no cleaning of the plates was needed.”

“As a leading printer of confectionary bars we ran 1,500,000 ft and no cleaning of the plates was needed.”
### The NEW nyloflex® ACE - Cost Savings Calculator

Please fill in the input in the green fields - customer's data shall be entered.

Yellow fields are option fields - please choose the appropriate option.

White fields: no input change possible.

Orange fields are result fields.

<table>
<thead>
<tr>
<th>Data</th>
<th>Current Plate in Use</th>
<th>NEW nyloflex® ACE</th>
<th>Results</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Presses</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Shifts</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours per Shift</td>
<td>8 h</td>
<td>8 h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. Working Days / Year</td>
<td>260</td>
<td>260</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press Downtime</td>
<td>5%</td>
<td>5%</td>
<td>e.g. Maintenance</td>
<td></td>
</tr>
<tr>
<td>Currency</td>
<td>US $</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVG Press Cost / h</td>
<td>500 / h</td>
<td>500 / h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVG Job Size (linear ft / linear m)</td>
<td>linear ft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVG Press Speed</td>
<td>800</td>
<td>800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop to Clean Every... (linear ft / linear m)</td>
<td>250,000</td>
<td>500,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This image is from FlintGroup, Flexographic Products.
Example: Stopping the press 1 Less Time

The NEW nyloflex® ACE - Summary Cost Savings Calculator

<table>
<thead>
<tr>
<th>Data</th>
<th>Current Plate in Use</th>
<th>NEW nyloflex® ACE</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop to Clean Every... (linear ft / linear m)</td>
<td>250,000</td>
<td>500,000</td>
<td></td>
</tr>
<tr>
<td>Waste per Year due to Start-up / Change-over (linear m / linear ft)</td>
<td>107,000</td>
<td>107,000</td>
<td>linear ft</td>
</tr>
<tr>
<td>Yearly Capacity without Start-up / Change-over Time (linear m / linear ft)</td>
<td>267,424,000</td>
<td>267,424,000</td>
<td>linear ft</td>
</tr>
<tr>
<td>No. Cleaning Stops / Job</td>
<td>2.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Cleaning Stop Time / Job</td>
<td>0.80 h</td>
<td>0.40 h</td>
<td></td>
</tr>
<tr>
<td>Time savings due to Fewer Cleaning Stops (h / Job)</td>
<td>-0.400 h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Savings due to Fewer Cleaning Stops per Job</td>
<td>-200.00</td>
<td></td>
<td>US $</td>
</tr>
<tr>
<td>Costs for Cleaning Stops per Year</td>
<td>214,000</td>
<td>107,000</td>
<td>US $</td>
</tr>
<tr>
<td>Cost Savings due to Fewer Cleaning Stops per Year</td>
<td>-107,000</td>
<td></td>
<td>US $</td>
</tr>
</tbody>
</table>
UV – LED: No Longer the Future of Flexo Plate Making Technology . . . It’s Here!

Making Products and Technology that Just Work
UV LED Technology

- UV LED is used for everything from currency authentication to hardening nail polish

- UV LED Technology has become the de facto imaging technology for many industries using photo-curable products

- Inks, adhesives, coatings . . . and photopolymer plates! nyloflex® NExT
Benefits of UV LED

► Consistency – targeted wavelength, on or off
  ♦ No warm up
  ♦ No degradation over time
  ♦ Resistant to vibration and impact

► Energy efficient
  ♦ Low wattage, low power usage
    • uses 20% of the energy of mercury lamps
  ♦ Long lasting, > 10,000 hours, newer technology > 50,000 hours

► The plate you make today will be the same as the one you make tomorrow, next week, or next month
Minimum Dot Evaluation

Sep. 20, 2012 ≤ 0.0001 variation in dot diameter Oct. 11, 2012

Nov. 1, 2012 Nov. 15, 2012

4000dpi - 175lpi - 0.4% Circular Dot
Midtone Dot Evaluation

4000dpi - 175lpi - 30% Circular Dot
Midtone Dot Evaluation

Sep. 20, 2012

Oct. 11, 2012

Nov. 1, 2012

Nov. 15, 2012

4000dpi - 175lpi - 30% Circular Dot
Midtone Dot Evaluation

- Consistent dot shape and size
- Clean reverses between dots

Oct. 11, 2012

Nov. 1, 2012

4000dpi - 175lpi - 30% Circular Dot
Reverse Evaluation

Sep. 20, 2012

Oct. 11, 2012

Nov. 1, 2012

Nov. 15, 2012

Flint Group
Flexographic Products
Reverse Evaluation

- Strong, consistent dot shoulders
- Clean reverses down to plate floor

Nov. 1, 2012

Nov. 15, 2012
Excellent Reproduction

nyloflex® NExT

The NExT top model
Superior Print Results

nyloflex® NExT

The NExT top model
nyloflex® NExT Positives

► Proven exposure technology
  ♦ No warm up, no degradation over time
  ♦ Speed adjustments can customize plate structure

► Consistent plate making results

► Easily integrated into the work flow

► Open system
  ♦ Can be used with any supplier’s standard digital plate

► No consumables in the process
Adapting to the Market Feedback

► Long Exposure Times

♦ UV LED Only
  • Excessive time required to image plate

♦ UV LED + Lamps
  • Better, but still somewhat long

► Modified Plate Products

♦ New ACE LED
  • Designed specifically for UV LED
  • Brings exposure time into more typical range
  • Same performance
  • Product for corrugated in development
Making Products and Technology That Just Work

Thank you

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