Recovered Fibre's Impact on Linerboard Characteristics

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Leading Edge Corrugated Technology

- Automatic web tension controls
- IR temperature sensors at six locations
- Crews, quality personnel, or lab technicians that conduct temperature audits every shift.
- Moisture sensors at two locations and a manual moisture analyzer for combined board at the dry end of the machine
- Speed sensitive warp arm adjusters on the preheaters and preconditioners.
- Precise glue applicator gravure rolls.
- Containerboard from only two paper machines with specific fibre length and sheet formation.
- Automatic load controls on the double facer
- Concise recipes (machine settings) for each board combination
- Controls to monitor and adjust adhesive temperature and viscosity

Corrugator Variations

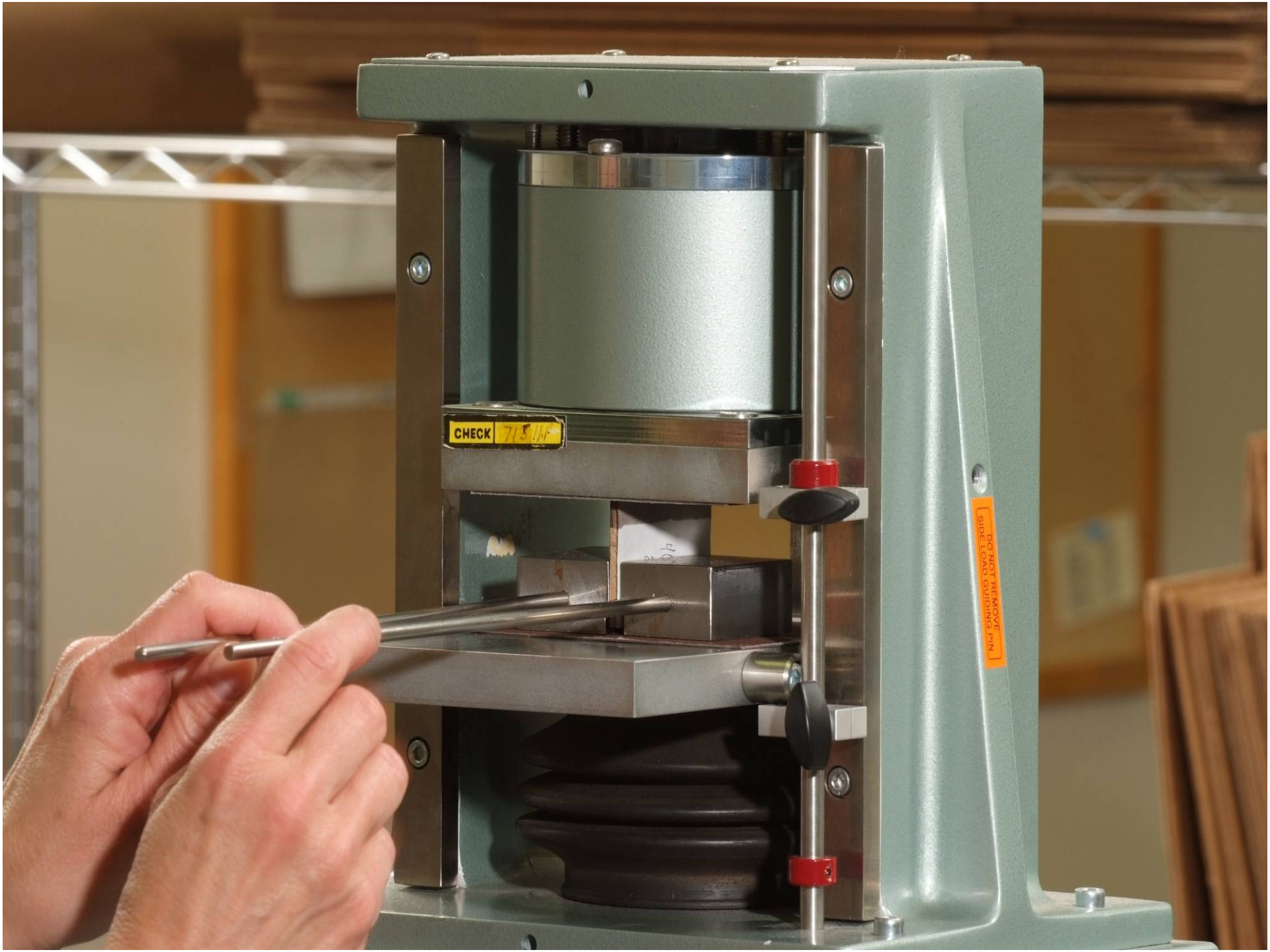
- Wide range of ECT values from same board combinations
- State of the art corrugator adjust better to "different" containerboard properties
- Twenty unique identifiers to each product
- Basis weights are very poor predicators of ECT and box performance

ECT: Incoming Strength

Remember:

this has been a minimum requirement, you must produce or receive sheets with typically 15-20% more ECT value than what you ship out the back door…

and past studies have shown corrugators vary by 40% in their ability to deliver a given ECT from the same components


CHECK
DO NOT REMOVE
SIDE LOAD GUIDING PIN

Trends in Corrugated Today…

over the last twenty years…

- Average ECT values have declined 14%
- Average Stiffness has declined 30%
- Average fibre consumption has declined 21%
- Average box compression has declined 10%
- Average recycled content now 43%
- Yet, we are still packaging the same products!

Do we really know our customers' needs and expectations?

What We Were Seeing in the Field

- Reduced Fibre
- Better papermaking
- Wide variation in corrugators abilities to obtain max ECT from containerboards
- Reduced over packaging created less room for sloppy processes
- Converting drops ECT below minimums

Demand Drives For Recovered Fibre

- General Economy
- Disposal Costs
- Recovery Costs
- Industry Operating Rates
- US Supply
- US Demand
- Usable Fibre to the Headbox At the Mill

The Question Of “Recycled” Content

- More knowledge about quality of primary and secondary fibres
- US mills vary in their stock preparation systems for screening and fractionating
- What is the design of PM’s wet end?
- What is your promise of box performance?

AF&PA Board Definitions:

- Kraft: **a furnish containing not less than 80% wood pulp produced by the sulfate process.**
- Recycled Linerboard: **a furnish containing less than 80% wood pulp and used as facing material when combining paperboard for conversion into corrugated or solid fiber boxes.**
- NSSC: **a furnish containing not less than 75% wood pulp, the predominant portion of which is produced by a semichemical process.**
- Recycled medium: **a furnish containing less than 75% wood pulp and used as the fluting material when combining paperboard for conversion into corrugated boxes. Also includes container chip and filler board.**

Average NA Cash Cost Linerboard

• Fibre	$156
• Chemicals	$22
• Energy	$67
• Labor	$47
• Materials	$46
Total Cash	$338/mt

Not including interest, transportation and depreciation

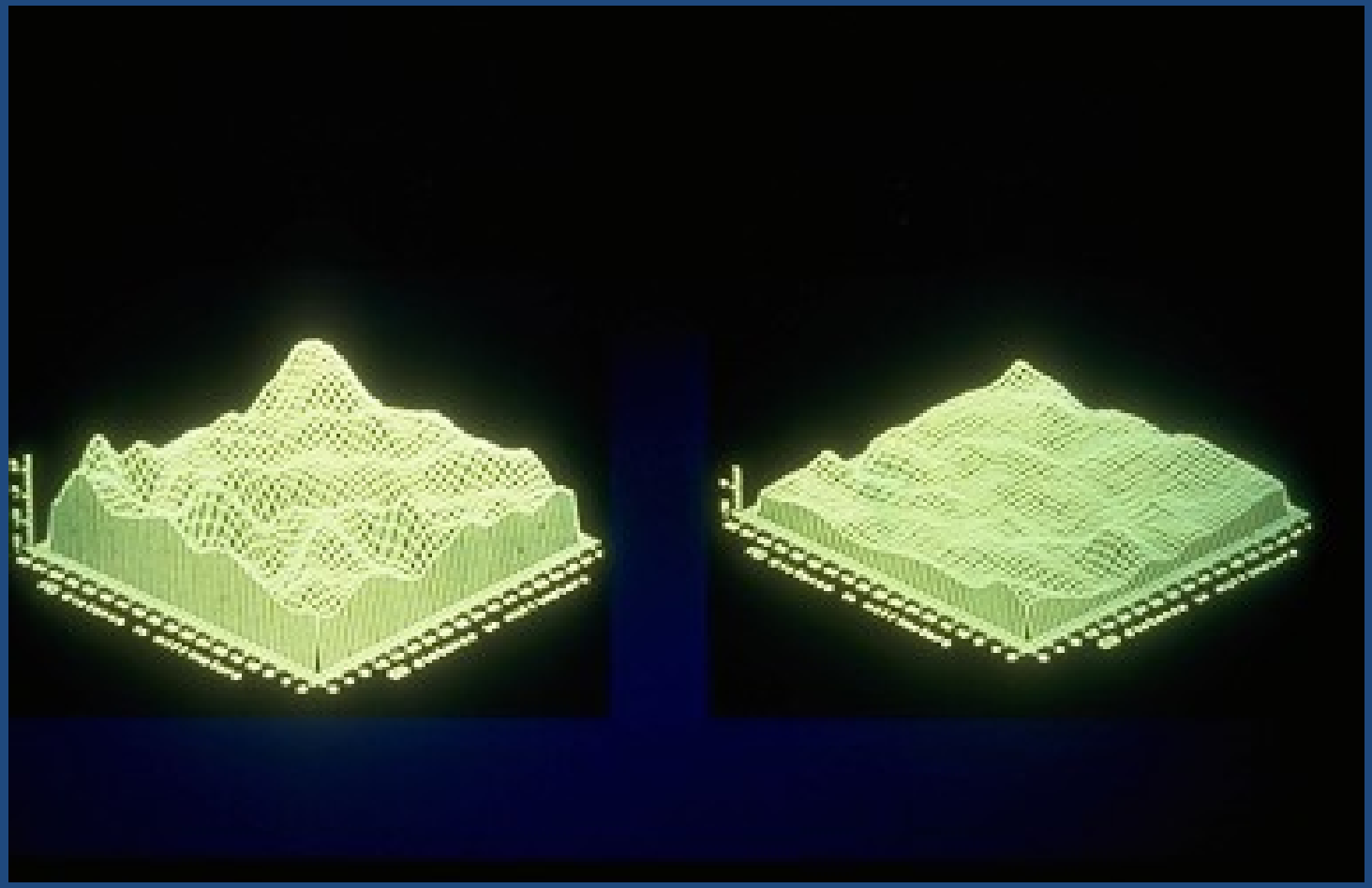
Source: RISI Q2 2008 per MT

Difference in Fibre Costs

- North American cost "virgin" pulp fibre
  $61-$149/ton, average was $111/ton
- North American cost recovered fibre
  $27-$105/ton, average was $56/ton
- Difference was $44 to $122/ton
- Does not include black liquor tax credit
- When secondary fibre $140/ton-
  virgin fibre is cheaper

Source: RISI Containerboard Benchmarking Study 1Q2009

Surface Profilometry-Topography



A European Perspective

- No uniform shipping standard
- Lighter weight packaging works in distribution
- Recovered fibre content average 85%
- Four different levels of containerboard quality both linerboard and fluting (maybe five)
- Not sold on basis weight or fibre type
- Sold on basis of stacking performance potential
- As many as 18 grades of medium

Sources: FEFCO, Web Sites

A European Perspective

- Kraft grade about the same as US
- Testliner 1 about 15% below US Mullen and compression
- Testliner 2 about 25% below US
- Testliner 3 about 40% below US
- Recycled Fluting Medium 2 about 20% below US concora and compression

Sources: FEFCO, Web Sites, AF&PA

The Question Of “Recycled” Content

- More knowledge about quality of primary and secondary fibres
- US mills vary in their cleaning systems and fractionation ability to classify and sort fibres?
- What is the design of PM’s wet end?
- What is your promise of box performance?

Range in US Ring Crush Strengths

- 33# linerboards…..59-71 #/6in
- 35/36# HP liners…72-80#
- 42# liners……71-98#
- 42# HP liners……..99-108#
- 47# HP liners……..94# (one mill's target)
- 56# HP liners……..120-136#
- 23# fluting……22-36#
- 26# fluting……26-43#

Source: AF&PA's Containerboard Continuous Baseline Report and Mill Specs

Typical Ring Crush Values
35/36# Substance

Location	CDRC pli
• Mexico	50
• Chile	58
• Philippines	50
• China (Kraft)	75
• United States	77
• Western Europe (Test 2)	52
• Canada	70

Comparing Linerboard Properties

Physical Property	Schoellershammer	Hamburger	SCA Packaging
GRAMMAGE	√	√	√
CALIPER			√
BURST STRENGTH	√	√	√
SCT OR RING CRUSH MD AND CD	√	√	√
TENSILE STRENGTH MD AND CD			√
TENSILE STIFFNESS MD AND CD			√
MOISTURE AVERAGE	√	√	√
GURLEY POROSITY			√
ZDT			√
ROUGHNESS BENDSTEN			√
COBB 60 SEC	√		√
DENNISTON OR WAX PICK		√	
FRICTION			√

Sources: Company Web Sites

It’s not DLK and OCC anymore!

- Old newspapers: 6 or 7 or 8
- Mixed office waste
- Sorted office waste
- Municipal landfill waste
- Starbucks coffee cups?

Different cost structure/cleaning

State Of the Art: Linerboard

- IP's Newly rebuilt Pensacola mill
- New technologies
- 100% virgin fibre
- 3500 fpm (fast)
- Sweet spot 20-23# liner (lightweight)
- Their 23# like the industry's 35# HPL

Source: Glenn Landau, Vice President Containerboard International Paper, International Containerboard Conference November 14-15, 2008

INTERNATIONAL PAPER

Lightweight Containerboard: Panel Discussion

Glenn Landau
Vice President & General Manager
International Paper

Domestic Linerboard Production

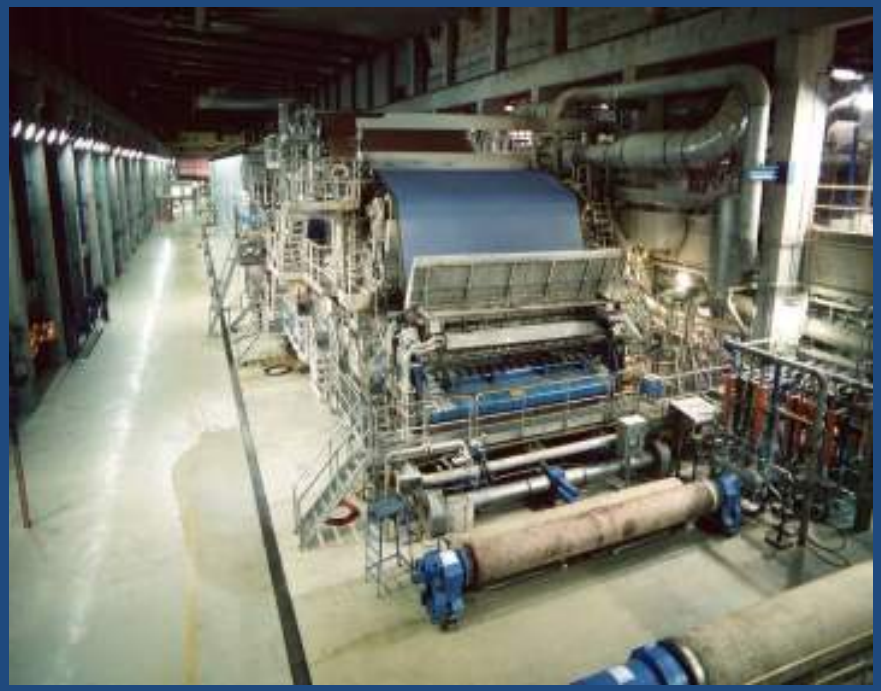
Trend To Lighter Weight But No Step Change

(M Short Tons)	2000	2007	CAGR%
<26 lb.	25	150	29%
26 lb.	500	450	-1%
27 – 32 lb.	275	700	14%
Total LWCB	800	1,300	7%
33 lb.	1,100	725	-6%
34 – 37 lb.	3,000	4,250	5%
38 lb.	250	50	-20%
42 lb.	4,100	3,150	-4%

Pensacola Conversion

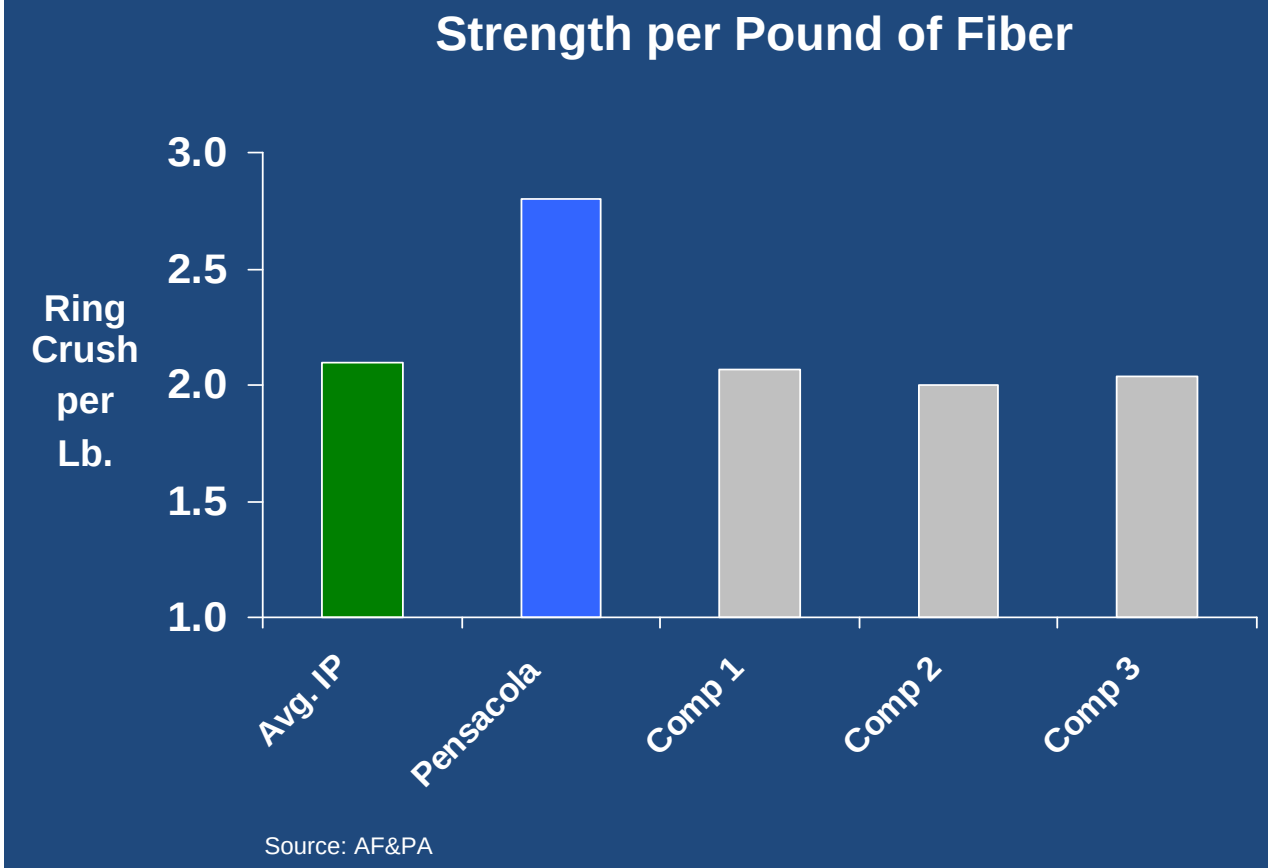
World Class Lightweight Kraftliner

- **Converted 350M tons UFS to 500M Containerboard**
- **High Performance Liner**
- **23# - 35# Design, Capable of Much Lighter**
- **State of the Art Technology**
  - ✓ **Refining**
  - ✓ **Forming**
  - ✓ **Pressing**
  - ✓ **Controls**



Pensacola Conversion

Equal Performance with Less Fiber

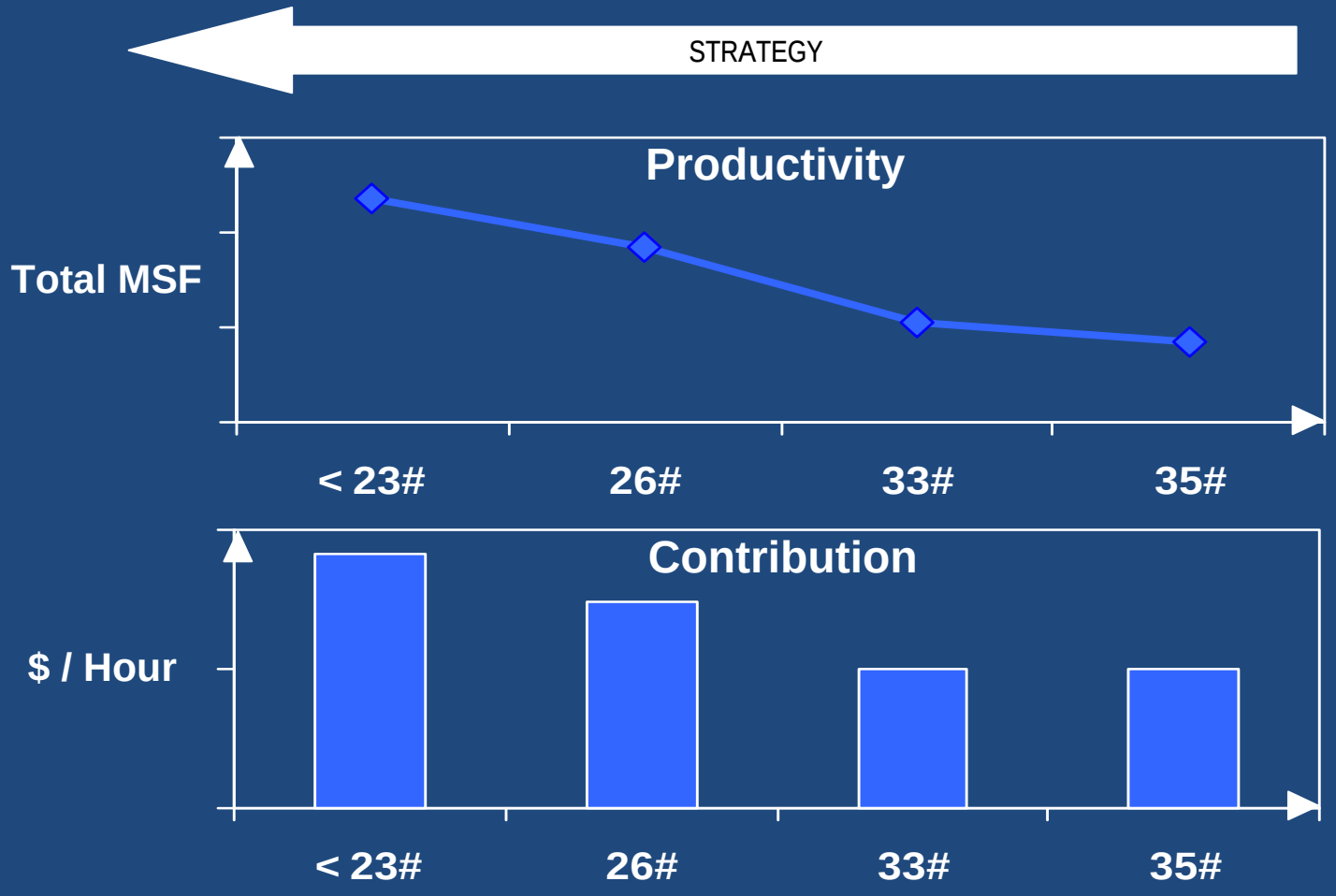


Source: AF&PA

- 100% Virgin Fiber
- Improved Refining
- Uniform Profile

Pensacola Conversion

Greater Productivity at Lower Basis Weights



IP Strategic Rationale

- Significant Pent-Up Demand ☑
- Few High Quality / Low Cost Assets ☑
- Performance vs. Basis Weight ☑
- Sustainability ☑
- Business Case ☑
- Balance Supply to Meet Demand ☑