Asset Quality and Cost Competitiveness of Global Pulp Mills

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Agenda

• Overview of different pulp grades and their usage in paper and packaging

• Cost competitiveness and asset quality of pulp mills

• Case study: WFU and the benefits of integrated pulp supply
Global wood-based market chemical pulp mills

Bubble size indicates mill capacity

Global pulp and paper grades

**THE RAW MATERIAL: PULP**

Chemical pulps
- Paper grade pulps (BEKP, BHKP, BSKP, UBSKP)
- Fluff and dissolving pulps ("specialty" pulps)

Semichemical and nonwood pulps
- Semichemical pulp (commonly NSSC)
- Nonwood pulps (bamboo, bagasse, reed, straw, etc.)

Mechanical and recycled pulps
- Mechanical pulps (BCTMP/APMP, TMP, GW, etc.)
- Recycled pulps (DIP, OCC and other recycled packaging)

**END PRODUCTS: PAPER AND PACKAGING**

Packaging grades
- Containerboard (linerboard and corrugating medium)
- Boxboard (FBB, SBS, CRB, URB, etc.)
- Kraft papers (sack, bag and wrapping papers)
- Specialty and industrial papers (release and label papers, filter and cigarette papers, etc.)

Graphic paper grades
- Woodfree papers (coated and uncoated woodfree)
- Mechanical papers (newsprint, coated and uncoated mechanical papers)

Tissue
- Retail and commercial tissue

Source: Fastmarkets RISI
Brief introduction to different pulp grades

CHEMICAL WOOD PULPS
- Paper grade, fluff and dissolving pulp are predominantly produced using kraft pulping technology, but sulfite mills also still exist
- Both hardwood and softwood fibers are utilized, and depending on end use pulp can be bleached or left unbleached
- Relatively low yield on raw material, roughly 45-55% for paper grade, lower for dissolving pulp

RECYCLED PULPS
- Recovered fiber processing technology depends on manufactured end product (usually cleanliness and brightness requirements)
- Lower value products typically use unbleached recycled packaging such as OCC and mixed papers as raw material, while recycled magazine and office papers (ONP/SGP, SOP, and pulp substitutes) are used in tissue, cartonboard and graphic papers
- Fiber yield varies widely between 60-99%, both unbleached and bleached pulps are manufactured

SEMICHEMICAL AND NONWOOD PULPS
- Semichemical pulping uses a combination of chemical pulping and mechanical defibration and has a higher 55-80% yield compared to chemical pulps
- The most common product is hardwood NSSC, an unbleached pulp for virgin containerboard
- Nonwood pulping typically uses a less intensive cooking process, but depends highly on used raw material
- Both bleached and unbleached pulps are manufactured

MECHANICAL PULPS
- Mechanical defibration of wood (logs or chips) using grinders or refiners, respectively
- High yield on raw material, 80-98%, but usually with high electrical energy consumption
- Chemimechanical pulps (BCTMP/APMP) have a chemical pretreatment to make defibration less electricity intensive and achieve higher brightness

Furnish and capacity share of global paper and packaging grades

Share of pulp grades used in global paper and packaging production

Global paper and packaging grades by capacity

Source: Fastmarkets RISI
Market snapshot: Graphic papers I

**A MAJOR MARKET IN DECLINE**

The global graphic paper market has lost 20% of its capacity since 2009, with all grades except uncoated woodfree declining.

- The majority of graphic paper capacity is located in Asia, followed by Europe and North America.
- Coated papers, which include both mechanical and woodfree grades, constitute around 30% of the total market capacity.
- Woodfree grades account for over 60% of the total graphic paper market capacity.
- Mechanical paper grades, i.e., newsprint, coated and uncoated mechanical, have been hit much harder by the loss of demand than woodfree grades.
- Graphic paper machine closures and conversions to packaging grades have become a trend.

![Graphic paper: Capacity by world region](chart)

- **Asia**: 45%
- **Europe**: 33%
- **North America**: 17%
- **Other (Africa, Oceania, Latin America)**: 5%

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Market snapshot: Graphic papers II

**FURNISH ANALYSIS**

Different pulps are used in the manufacture of graphic papers; chemical pulp is the most commonly used pulp type.

- On a global scale, chemical pulp is more often purchased than manufactured on-site, but regional differences are large.
- Mechanical and recycled pulps are used in almost equal amounts, while the use of nonwood pulp is minimal on a global scale.
- Both mechanical and recycled pulps are mostly produced integrated on-site.
- The amount of non-fiber components is significant in the overall graphic paper furnish, including fillers and coating pigments.

![Graphic paper: Global furnish mix](chart)

- **Chemical pulp**: 41%
- **Mechanical pulp**: 17%
- **Recycled pulp**: 16%
- **Nonwood pulp**: 2%
- **Non-fiber (coatings, fillers, etc.)**: 24%

![Graphic paper fiber furnish by pulp type](chart)

- **Integrated chemical pulp**: 21%
- **Purchased chemical pulp**: 28%
- **Integrated mechanical pulp**: 0%
- **Purchased mechanical pulp**: 0%
- **Integrated recycled pulp**: 21%
- **Purchased recycled pulp**: 27%
- **Integrated nonwood pulp**: 1%
- **Purchased nonwood pulp**: 0%

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Source: Fastmarkets RISI
Market snapshot: Tissue

MARKET AND FURNISH ANALYSIS

Tissue is an interesting market for market pulp producers for a number of reasons

• Global tissue capacity has increased over 55% in the past decade, by far the largest increase has been in Asian tonnage
• There is a high share of virgin pulp usage in the furnish mix
• There is high consumption of pulp per tonne (tissue products include minimal amounts of non-fiber components)
• There is a low level of integrated chemical pulp production at tissue mills, although recently some integrated operations have been commissioned

Market snapshot: Containerboard

MARKET AND FURNISH ANALYSIS

On a tonnage basis, containerboard is the largest paper and board grade

Different world regions have distinct product and furnish shares, but containerboard is predominantly an unbleached market with high share of recycled pulp in the global furnish

• North America has a very high share of virgin fiber, while on a global scale only 20% of containerboard is based on virgin fiber
• The share of containerboard products using bleached pulps is rather small, mainly some white top or fully white liner products

![Containerboard product share and furnish, by region](chart.png)
Market snapshot: Boxboard

MARKET AND FURNISH ANALYSIS

Boxboard is the second-largest packaging market
- Products in this category are very diverse, with both fully virgin- and fully recycled-fiber-based products being manufactured
- This means that within this grade, everything from the lowest quality recycled pulp to the highest cost chemical pulp can be utilized at mills
- In addition to fiber furnish, products may have coating(s) and a single or multi-layer structure
- Multi-layer construction is often used to optimize board characteristics and cost structure; for example, in the manufacture of virgin boxboard, the middle layer may use BCTMP to provide bulk, while chemical pulps are used in the top and back layers for strength and printability

Chemical pulp mills are complex industrial plants

MAIN MILL AREAS AND FUNCTIONS
- Wood yard (wood debarking, chipping and storage)
- Cooking (defibration of fibers, black liquor generation, etc.)
- Washing and pulp bleaching (for further brightening of pulp)
- Drying and finishing of pulp for transport (or internal consumption as slurry pulp at integrated operations)
- Recovery area (combustion of black liquor and recovery of chemicals)
- Energy island (generation of process heat and electricity, potential surplus)
- Auxiliary operations (preparation of process chemicals and treatment of effluents, etc.)
Pulp mills are extremely capital-intensive operations

**A MODERN, STATE-OF-THE-ART PULP MILL MAY REQUIRE A CAPEX OF US$1-2 BILLION**

- Fully greenfield pulp mill investments are rather uncommon and capital expenditure varies based on size, location and the need for mill site infrastructure (harbor or railway connections etc.)
- Securing raw material availability (investing in plantations) and the necessary infrastructure to transport it to the mill may also need substantial investment (forest roads)
- Typically, a pulp mill’s useful life (over 30 years) can be expanded by making replacement investments to certain areas of the mill; however, these can also cost hundreds of millions of dollars (a recovery boiler is usually one of the most expensive areas to replace)

**RECENT TECHNOLOGICAL DEVELOPMENT HAS INCREASED THE SIZE AND ENERGY EFFICIENCY OF NEWLY INSTALLED PULP MILLS**

- This has also benefitted older mills, as they can now install larger, more-efficient equipment than previously possible
- New technology has also enabled conversions from paper grade to dissolving pulp to be more lucrative; some conversions to fluff pulp have also been seen
- More demand for pulp mill by-products (lignin, tall oil and turpentine) may generate additional revenue for commodity pulp production

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**Cost competitiveness of chemical pulp mills**

**BLEACHED HARDWOOD AND SOFTWOOD ARE THE TWO MAIN MARKET PULP GRADES**

- BHKP market capacity is double the size of BSKP capacity
- Latin America has the highest share of global market pulp capacity, with fast-growing eucalyptus the main raw material
- Northern grade BSKP is mainly a product of Northern Europe, Russia and Canada, while the US South and Chile produce the southern variety
- Technical development over the last few decades has allowed the construction of much larger mills, providing economy of scale for more cost efficient production
Latin American mills dominate the lower end of the BHKP cost curve

IN THE PAST DECADE, LATIN AMERICAN BHKP MARKET PULP CAPACITY HAS RISEN OVER 80%

- Europe and North America are not very competitive in the BHKP market and generally operate smaller and aging assets
- Some Asian regions operate very modern assets, but fiber availability and costs remain the key factor for their competitiveness
- Mill closures have occurred in the BHKP market regularly, but producers are also carrying out grade switches to dissolving pulp
- In recent years, debottlenecking investments has been carried out at many mills to increase productivity and decrease consumption

Factors behind pulp mill cost competitiveness

PULP MILL COMPETITIVENESS IS A SUM OF MANY THINGS, BUT FIBER IS THE MAIN COST DRIVER

- Fiber type and supply: Use of fast-growing, locally sourced wood tends to contribute to lower fiber costs
- Many Asian mills have to rely on imported wood chips that are often more costly
- Energy prices, especially for fossil fuels, tend to be volatile, and most mills still use heavy oil or natural gas as the main fuel for the lime kiln
- For modern mills, sales of surplus energy in the form of electricity or heat may be a significant source of additional revenue, but this does require a suitable infrastructure
- Especially in high labor cost regions, economy of scale helps keep labor costs in control
Asset quality of global BHKP mills

LARGEST BHKP MILLS ARE LOCATED IN THE SOUTHERN HEMISPHERE

- Brazil has by far the largest capacity of market BHKP, followed by Indonesia, other Latin America and China
- These regions also have the most modern assets as indicated by their low technical age and high capacity per mill
- A high technical age indicates aging and weaker assets that may require significant investment in the near future
- A high direct cost, a combined metric of cash costs and capital costs, may indicate recent investment (high capital costs), especially if associated with a low technical age (modern asset)
- The combination of high direct costs and high technical age may indicate risk of closure or divestment; however, this is always case specific

Power of integrated pulp manufacture: A look at uncoated woodfree (WFU) production

INTEGRATED PULP SUPPLY SEEMS TO BE BENEFICIAL FOR WFU PRODUCERS

- Roughly one-third of commodity WFU is produced on machines with access to integrated pulp, while slightly more than one-third is semi-integrated (partly reliant on market pulp) and the rest is non-integrated (all purchased)
- The majority of the analyzed integrated and semi-integrated machines position themselves within the first or second cost quartile
- North America has the highest share of its capacity integrated or semi-integrated into pulp manufacture (over 90%), while Asia has the lowest share (around 64%)
Fiber is the key cost driver and for non-integrated WFU producers, the most volatile

**THE SHARE OF FIBER COSTS IN TOTAL CASH COST INCREASES IN LINE WITH THE SHARE OF MARKET PULP USED**

- Integrated chemical pulp production usually improves cost efficiency of paper production when analyzing it strictly on a cash costs basis.
- Naturally, current market pulp prices play a big role in the size of the gap between non-integrated and integrated machine cash costs.
- Currently, fiber costs account for 40-75% of total cash costs for WFU producers, depending on their fiber supply.

![Global WFU mill cost breakdown (%)](image)

**Market observations**

**GLOBAL PULP MARKETS ARE IN AN INTERESTING PHASE; RECYCLED, PAPER AND DISSOLVING PULP ARE ALL SEEING INVESTMENT ACTIVITY**

- Stricter legislation in China for recovered paper imports has caused some interesting consequences.
  - Investments into market recycled pulp capacity.
  - Greater interest in unbleached chemical pulp (which currently has relatively little market pulp capacity) has prompted some pulp mills to swing between unbleached and bleached grades, and even restart idled pulp lines.
- Continued decline of graphic paper grades has forced companies to realign their product portfolio to more packaging.
  - Conversions of paper mills and even the integrated pulp lines to serve packaging markets.
  - Some clean exits from the graphic paper business, even for mills with integrated pulping capacity (perhaps no drying capacity).
- More swing pulp capacity between paper and dissolving pulp grades.
Different paper and packaging grades have very distinct pulp furnishes
- Even within a single grade, the fiber furnish may vary significantly between recycled and virgin pulps
- Recycled pulp is the largest pulp grade, while containerboard is the largest paper and packaging grade

Largest and most competitive BHKP mills are in Latin America
- Fast-growing, low-cost fiber allows Latin America to dominate the low end of the BHKP cost curve
- Some regions in Asia also have modern BHKP assets, but usually have to rely at least partially on imported and higher-cost wood

Integrated pulp production benefits WFU producers
- Fiber is the key cost driver for WFU production and the benefit of integrated pulp is evident in the competitiveness of the mills

Further reading
- Developments in the China Pulp Market: Comprehensive Analysis and Outlook
- Analytical Cornerstone Cost Benchmarking Tool
  https://www.risiinfo.com/product/analytical-cornerstone-4-0-cost-benchmarking-tool/
- Asset Database
- Index Builder
  https://www.risiinfo.com/product/index-builder/