Having lost their technology leadership, North American paper companies must develop a sound reinvestment strategy or face further declines in long-term business

Invest to Improve: North America Struggles To Maintain its Global Cost Competitiveness

By **ROBERT KINSTREY**

If one looks back several decades, North America was the world leader for paper production. During the mid-1990s, North America production was almost equal but still slightly ahead of Europe and Asia. Although North America is still ahead in production today, it is struggling, and many say it has lost its technology leadership position.

Observers are quick to point out Asia's advantage is due to cheap wood and labor. Observers point to Europe and state that European companies modernized their mills during the last part of the 20th century, and now they have a competitive edge due to quality and cost.

Figure 1 shows recent changes in worldwide capacity.[1] So what is happening in North America? How did the industry move from leader to playing catch-up, and does it have the vision to catch up?

WHO'S TO BLAME? It has been said that the paper industry's problem is the fault of Wall Street. Companies are paying too much attention to the short term—i.e., stock prices and analyst comments—rather than looking out for the long-term competitiveness of the company. A common adage says, "Pay attention to the details, and the big things will take care of themselves." Unfortunately, it appears the North American paper industry has not paid attention to the details: what it takes to remain competitive!

The North American paper industry is complex, so this article will focus on three different grades—tissue, coated free-sheet, and linerboard—rather than all grades. Each of these grades has specific and different drivers with correspondingly different business models.

The tissue business in North America is changing not because of imports, which are impractical due to the product bulk and density of products, but due to a technology shift. U.S.-based manufacturers are now seeing several foreign tissue companies setting up converting facilities and building mills in the U.S. Since 1987, 46 new machines have been installed to support the demand and desired quality. Capacity has increased 15.7% in the past five years.

Linerboard has suffered due to the changing manufacturing scene in North America. During the past five years, production has decreased by 1.8 million tons or 7.2%. This segment has had its customer base erode due to the transfer of non-durable goods manufacturing (as well as many other products shipped in boxes, such as shoes and textiles) to foreign locations such as Asia. North America once exported linerboard. However, today boxes are now being made close to the manufacturing plants, so more linerboard is being manufactured in Asia using old corrugated containers imported from North America.

The new Asian linerboard machines are state of the art. The 19 North American linerboard machines that have been retired during the past 13 years were old and inefficient. Today, Asia produces 71.81 million tons of wrapping and packaging grades, a 107.1% increase from six years ago. The North American linerboard segment attempted to improve its competitive position in the 1990s when nine mini-mills were built and six large machines were installed for a total of 15 machines. However, as pointed out above, this industry segment has lost a large portion of its customer base.

Coated free-sheet (also called coated woodfree papers) has faired a little better than linerboard but still has undergone capacity adjustments. Imports have eroded once-lucrative markets, and some commercial printing houses have moved to Asia where labor is cheap. Coated free-sheet producers are also seeing some traditional customers switching to coated

FIGURE 1. *Changes in worldwide capacity (1995-2001) for major grade sectors*

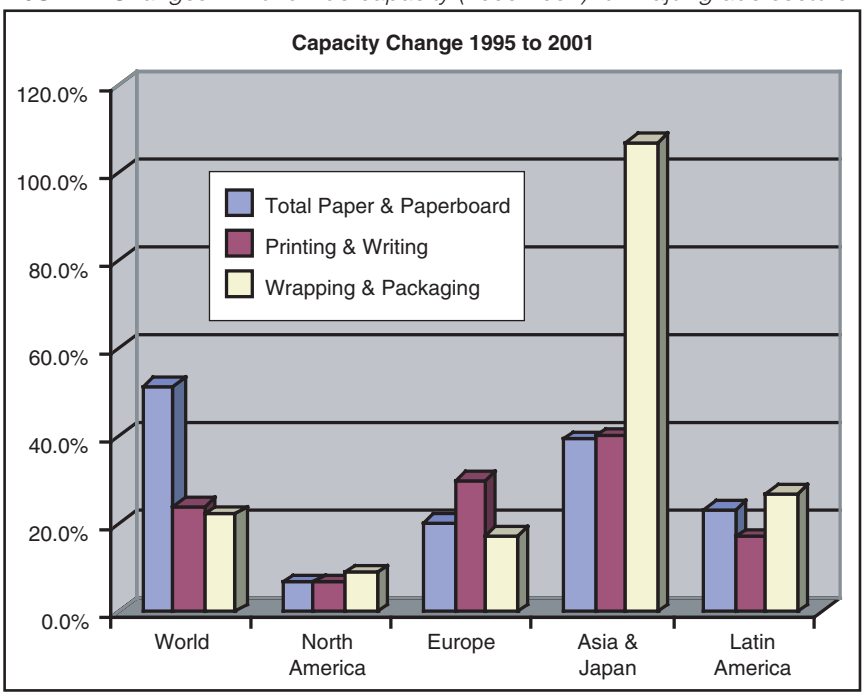


TABLE 1. *The number of paper machines shut down in North America[2] has far exceeded the number of startups, but capacity has still climbed during the past two decades.*

	Shuts 1980-89	Shuts 1990-03	New 1980-89	New 1990-03
News	5	7	19	8
Printing & writing	73	137	44	24
Packaging & converting	44	56	2	10
Tissue	46	70	30	39
Paperboard	44	77	17	34
Construction paper & board	94	11	2	2
Total	**306**	**358**	**114**	**114**

groundwood in an effort to reduce costs.

Worldwide, the coated free-sheet segment has seen significant change and improvement, with 38 new machines being installed since 1987. In North America, eight new machines were installed during the past 15 years, and five of those have already been rebuilt. North American production capacity has increased 1.8% since 1990.

The condition of the North American industry can, to some extent, be gauged by the retirement and installation of machines, as shown in Table 1.

Even though the number of shut machines has greatly exceeded the number of new machines, capacity in North America has increased during the past two decades. Today there are about 1,100 machines operating in North America with an average age of 1962 and a technical age of 1972 (Figure 2).[3] However, North America's 43% capacity increase since 1982 is no match to the worldwide increase of 73% (Figure 3).

The paper industry capital spending seems to be boom or bust, as shown in Figure 4.[4] Today, because of demands to improve short-term profitability, the industry has cut capital expenditures to the point where it is below that required to maintain its facilities,[4] i.e., below 75% of depreciation (Figure 5).

HOW DID WE GET HERE? Figure 6[5] looks at capitalization as it relates to competitiveness. There are five scenarios:

Regenerate: Investing in a development technology that will give a company a significant competitive edge, allowing it to improve its profitability and reinvest. Examples include the development and implementation of the short dwell coater and hot soft calenders.

Improve: Spending money over time and improving quality and/or costs relative to the competitive aggregate. Examples include many tissue companies that replace Yankee dryer machines with thru air dried (TAD) units to improve quality as required for premium products. A portion of the coated free-sheet segment was represented by the "regenerate" curve but today is following the "improve" curve and has been investing in dilution control headboxes, improved forming, improved coating units, and online calendering. In addition to the quality improvements, the machines have also improved productivity through speedups and dryer modifications.

Maintain: Spending just enough money to maintain quality and costs at the existing competitive position. Linerboard mills invested in shoe presses in the 1980s to improve strength/quality but have not done much since that time and are on the bottom portion of the graph. The new machines are on the top portion of the curve, but a majority of this segment is on the bottom part of the diagram.

Operate: Spending is just sufficient to efficiently operate the asset, with facilities gradually becoming less competitive and eventually having to be closed unless the spending trend is changed. Older tissue machines that are being sold after being displaced by TAD machines are now servicing the lower-quality market segments where just enough money

FIGURE 2. *Currently, there are approximately 1,100 machines operating in North America with an average age of 1962 and a technical age of 1972.*

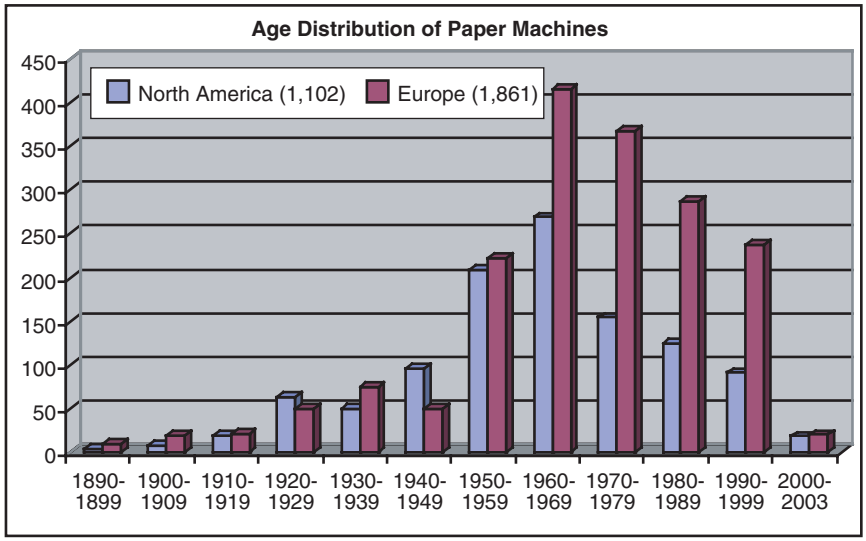
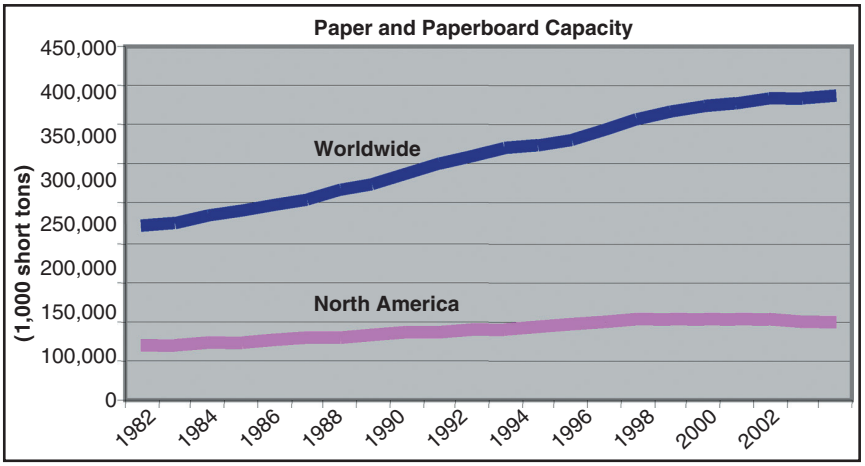


FIGURE 3. *North American capacity of paper and paperboard has increased 43% since 1982, while global capacity has increased 73% during the same period.*



is being spent to keep the machines operating at a given efficiency.

Stabilize: Initial spending is below the 75% level, and the facility sees a rapid decrease in productivity and quality and requires an infusion of money just to stabilize the poor operating condition. Older linerboard mills that did not invest in shoe presses (as well as some old, slow printing and writing machines) are struggling to survive, balancing cutting costs with poor operation efficiency. Eventually they will be forced to shut down.

Where is the industry today? During the past 10 years, North America has fallen behind Europe in technology adoption. Many mills in the U.S. are in the lower half of Figure 6. For the U.S. industry to regain its competitive edge and leadership, companies are going to have to develop an investment strategy to get its mills into the upper half of the curve. Companies are going to have to invest in technology and replace inefficient machines with ones that can produce superior quality.

BUSINESS MODELS.[6] In the future, there may be three different models for investing and deciding on projects. The models will be based on business models that in turn are based on the market segment being served. The three models may be:

- Tissue
- Market-driven (or niche) grades
- Commodity (linerboard and common printing and writing)[7]

The first two models, since they are market driven and sensitive to "brand" recognition, will require specialization of processes to achieve desired customer-required attributes. Tissue has special issues because of specific performance characteristics and its low density (generally considered a regional product rather than a global product). The commodity business model will be based on cost—i.e., how inexpensively the product required by the customer can be made.

Each of the models will generate different types of projects with different approaches and will require different relationships and skills. Relationships among manufacturers, engineering firms, and equipment suppliers are going to change and will be different based on the models discussed above. The relationship between engineering companies and equipment suppliers will also change.

Commodity model: The focus will be on delivering a product to the customer that complies with requirements (but the product is not required to be significantly different from competitors) and competes on price. Equipment and processes are "off the shelf," and mills are generic. Specialized engineering is not required nor desired. Existing plants will emphasize process improvements to reduce costs (optimize use of materials, staffing, energy, etc.), and new plants will emphasize overall lower costs (manufacturing, installation/construction, and maintenance).

North American vs. European Reinvestment Strategies

North America	Europe
•Independent engineering – detail engineering is extensive due to needs of construction crafts	•Engineering – detail design is subcontracted and minimized
•Short-term focus on profits (stock value)	•Invest in business for the long term
•Extensive use of corporate/mill-specific specifications; pump foundations and pipe hangers are custom engineered	•Generic specifications and codes specify designs for items like pump foundations and pipe hangers, eliminating need for engineering
•Design focused on product flexibility requires additional equipment and costs	•Design focused on specific market segments minimizes equipment
•Machines designed for minimum installed costs	•Machines designed for minimum operating costs
•Construction labor not as efficient - Stick build (nails, plywood, and 2 x 4s) forms that are thrown away - Labor not as well educated, requiring supervision - Direct-hire laborers do not practice their craft when laid off - Tasks not as well planned, with lack of discipline due to large site size - Crawler cranes are expensive, thus not utilized throughout entire project	•Construction labor more productive - Use of modular, reusable forms for concrete work, which install quickly - Tradesmen well educated, requiring little supervision - Small, specialized teams work full time honing their skills - Tasks must be well planned due to site size limitations - Tower cranes are inexpensive and are used extensively throughout the entire project
•Companies continually modify standard equipment, increasing costs with minimal, if any, benefits	•Companies accept standard vendor-supplied equipment
•Project loaded with all costs, raising total installed cost	•Project accounting not all inclusive, lowering apparent total installed cost
•Government interference	•Government incentives

FIGURE 4. *North American paper industry capital spending has been highly cyclical during the past two decades.*

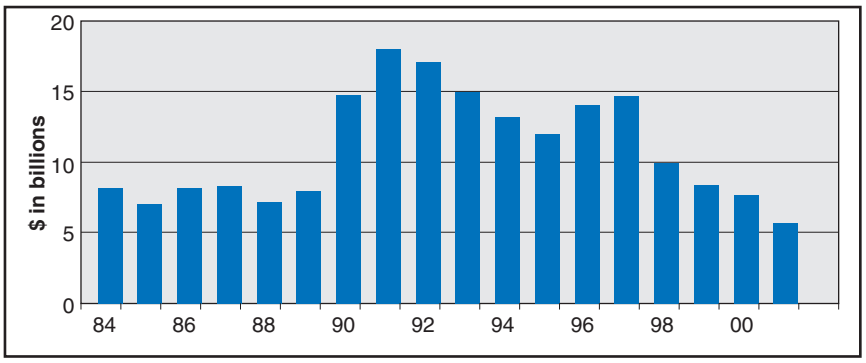
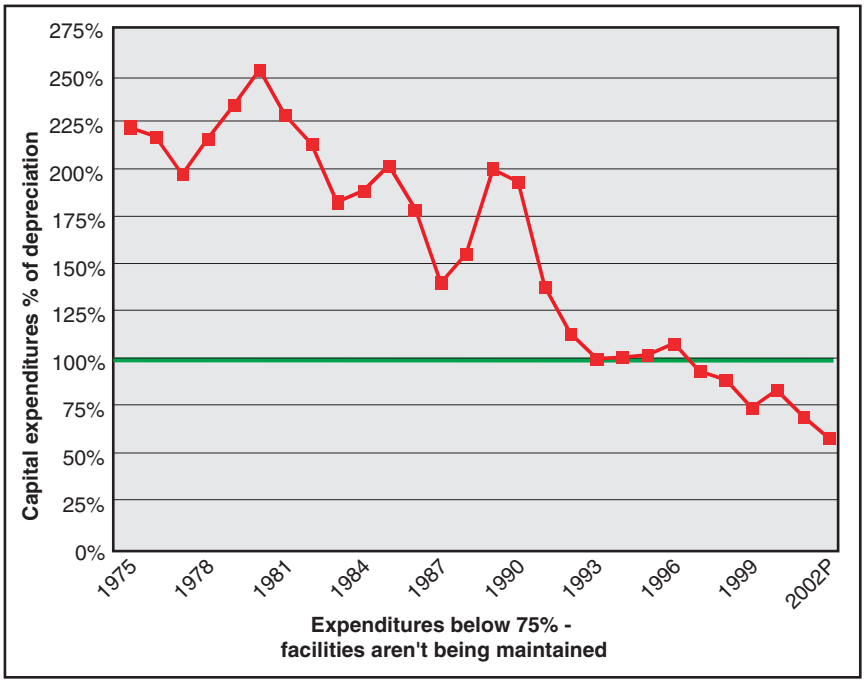


FIGURE 5. *The cuts in capital spending in North America have reached a point in recent years where they are below that required to even maintain facilities.*



New machines will be built not to add capacity but to replace inefficient capacity and then only if the project covers the cost of capital through "real" savings and quality. Commodity producers will not require sophisticated engineering help since processes will not be customized. Engineering support will also be considered a commodity. Owners will expect equipment manufacturers to supply the best technology guarantee at minimum life cycle cost to produce the required product. For commodity-based projects, the engineering firm's client may well be the equipment supplier.

Market-driven (niche) products model: The focus will be based on delivering a specialized, performance-based product to a specific group of customers. Equipment and processes will be modified as required to develop unique attributes. Time from product development to market will be critical. Specialized process engineering will be required; projects will be held highly confidential and must be completed quickly.

Machines and processes will have to be adaptable and designed for short runs and high (repeatable) quality. Niche producers will require their engineering partner to have the necessary skills required to understand the uniqueness of their products and be able to specify equipment and processes as required. Whether or not the engineering skills are internal or external is still a question and somewhat dependent on the anticipated level of project activity.

Equipment suppliers will be required to develop equipment technology, but the process application of technology will be based on the manufacturer's product development group. The paper producers will probably be the engineering firm's clients for market-driven projects.

Understanding clients' needs and their customers' requirements will be at the core of good project development and management. This starts with the principles developed by the Construction Industry Institute (CII) for "Front End Loading" (FEL) as shown in Figure 7. It is FEL 0 and 1 (strategic thinking) of a project where business, technology, and product come together to formulate the project plan. If partners are to help with strategic thinking, they must have a strong understanding of business and technology. Few firms excel in both today.

Based on the strategic work, FEL 2 and 3 develop the project scope and define the metrics that will characterize the project's success. The cost of the work that is done through FEL 3 is generally less than 1% of a project's total cost, but applying the CII "Best Practices" during these phases will significantly improve the project's success.

The scope is frozen, and then detail engineering is performed in Phase 4. The diagram below outlines the phases of a project. CII data prove its validity, but discipline of implementing the process is still not widely used.

REINVESTMENT COSTS. As stated previously, the U.S. paper industry must invest if it is going to survive. In the process of reinvesting, the industry must choose projects wisely and must be able to perform them in the most cost-effective manner possible.

It has been said that machine pro-

FIGURE 6. *This diagram examines the investment impact on competitiveness over a facilities lifetime.*

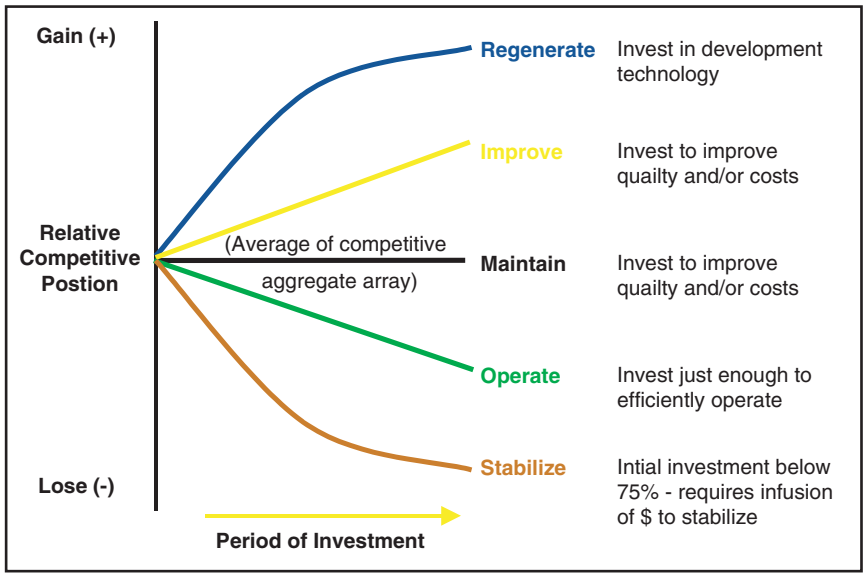
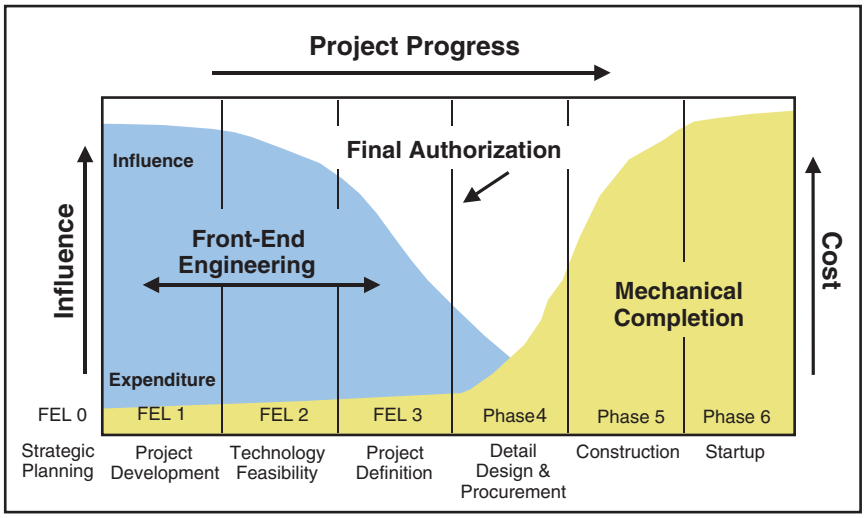


FIGURE 7. *The Construction Industry Institute's cost influence diagram shows the impact that strategic thinking and careful planning have on the cost and success of a project.*



jects in Europe cost from 15 to 20% less than the equivalent project in North America. Why is that? The sidebar "North American vs. European Reinvestment Strategies"[8] summarizes some of the differences that account for these savings.

Both CII and the Independence Project Analysis (IPA) have been recommending that companies use standardized specifications as a means to reduce project costs. This is one of several "best practices" recommended by IPA and CII. Companies that implement project procedures to utilize "best practices" for both defining and implementing projects have demonstrated that they can result in significantly lower project costs.

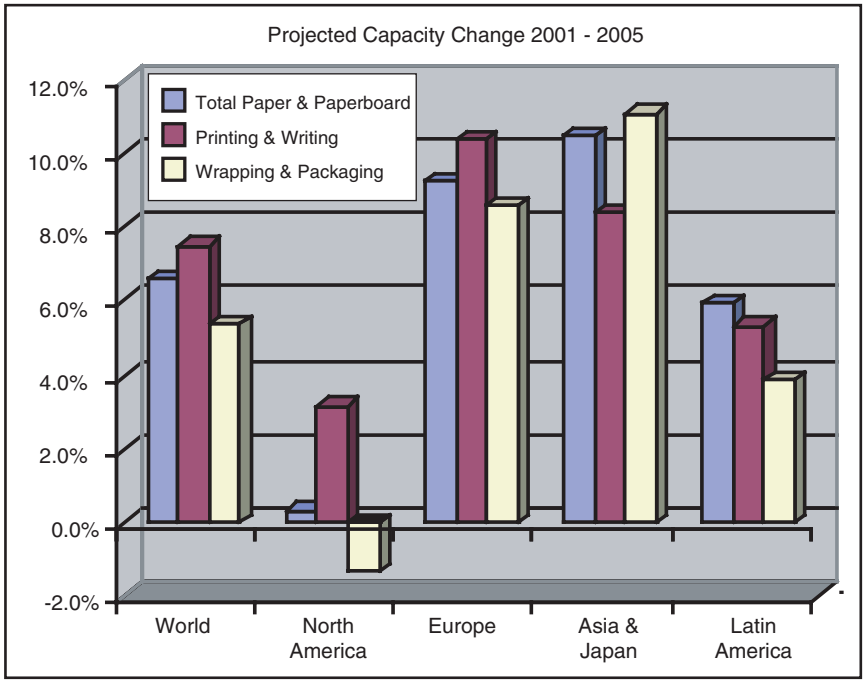
WHERE ARE WE GOING? HOW DO WE DECIDE?

During the next four years, worldwide capacity (Figure 8) for wrapping and packaging grades is projected to grow 5.4%, a reduction from the previous six-year growth of 22%. North American capacity for these grades is projected to decline 1.3%. Capacity of printing and writing grades is projected to increase 3.2%[9] for North America.

Capacity in Asia (including Japan) is projected to increase 11.1% and 8.4% for wrapping and packaging and printing and writing grades, respectively, compared with the previous period's growth of 107% and 40%, respectively. During the next four years, Europe is projected to increase its printing and writing capacity by 10.4% versus the past period growth of 30%.

If North America does not do something about improving costs, quality, and productivity, the decline could be worse than predicted. The North American paper industry needs to increase capital spending above the maintenance level as a short-term minimum and develop a long-term reinvestment plan to be implemented within the next five years or sooner. The investment plan must be based on sound market research, devoid of emotions, and supported by government leaders. For the plan to succeed, something must be done to prevent the continual erosion of our domestic customer base. n

FIGURE 8. *The projection for worldwide capacity changes (2001-2005) gives one indication of how competitive the North American paper industry will be in the short term.*



1. Information based on AF&PA No. 37 and No. 43 Annual Capacity Surveys.
2. Information from AF&PA No. 43 Annual capacity Survey and Fisher International database.
3. Information from Fisher International database (database does not include many small specialty mills).
4. Information courtesy of Paperloop Inc.
5. Interview with Fred Christiansen, Jacobs Engineering, Greenville, S.C.
6. Bob Kinstrey, "Engineering in 2015," *Solutions!*, October 2003.
7. Group discussion during meeting of the Sloan Center for Paper Business and Industry Studies (CPBIS), Institute of Paper Science and Technology (IPST), Atlanta, Ga., July 24, 2003.
8. Information based on private discussions with several people who have knowledge of U.S. and European projects.
9. Information from AF&PA No. 43 Annual Capacity Survey.

ROBERT KINSTREY *is director, process technology, Jacobs Engineering, Greenville, S.C.* *This article is based on a presentation at the 2003* Pulp & Paper Week *Global Outlook Conference, New York. The author would like to thank Fred Christiansen and Annette Gillum of Jacobs Engineering for their help and insight in preparing this article.*