

Impact of capital spending on paper industry profitability

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IT HAS BEEN NOTED LONG AND OFTEN that the paper industry is the most capital intensive of all U.S. industries. **Figure 1** illustrates the high percentage of capital spending as a percentage of sales for the paper industry compared with all manufacturing industries. This in itself is not as significant as the fact that the industry has returned only 6.0% on shareholders' equity during the past five years. This record is the worst among all 20 of the industry groups tracked by *Forbes* magazine in its annual comparisons of industrial performance, as shown in **Fig. 2**. In short, massive infusions of capital into the industry have led to shareholder returns on the same order as no-risk returns on Treasury bills (6.9%).

Perhaps even more disturbing is the downward trend in earnings of 14 of the industry's largest competitors. **Figure 3** contrasts the 1985–1990 period with 1991–1995, marking a clear falloff in return on equity.

Many reasons for this condition are well known. Three reasons not often discussed for this poor financial performance will be reviewed:

1. While capital project proposals are submitted to management in good faith, many do not use objective financial and technical analytical tools. By inference, most do not achieve their promised return (the inference being that no management group would knowingly fund projects which earn 6.0% return!).
2. Paper companies have allowed a major element of the profitability

equation to escape their control, relying to excess on engineering prepared by our consultants and on technology developed by our suppliers. There is little to distinguish among companies other than operating efficiency and investment timing.

3. We have relied too heavily on capital solutions for improving manufacturing operations and have not emphasized enough the benefits of operating excellence or low/no capital projects. Given the relative lack of risk inherent in capital investments that reduce cost, particularly when compared with the high risks on both the investment side and product pricing uncertainties, it is remarkable that the industry continues to fund risky expansions while foregoing more certain cost reduction opportunities.

Table I contains a glossary of financial terms used in this article.

DISCUSSION

Project analysis

Over the past 10 years, International Paper has explored acquisition of many companies, affording a close look at different types of capital project analytical methods. Almost none of the systems employed have been identical, nor do they reflect what reasonable people would judge to be the ultimate goal of project analysis: Given the assumptions employed, how will a given project impact shareholders' equity?

ABSTRACT

When capital investments are critically analyzed within a framework that reflects financial reality, many large facility expansions are shown to be marginal investments. Capital investment alone is a difficult path to achieving facility profitability, while no/low capital options that improve cost and productivity have more leverage on ROI. Large capacity expansions at high capital investment are more risky, entailing both engineering/construction risk as well as being highly sensitive to product pricing assumptions.

Application:

Paper companies must take better command of their investments, all the way from the R&D stage to the project concept and detail scope, through managing consultants in the engineering and construction phase, and finally through the start-up process itself.

Let's use as an example a proposal to install additional bleached market pulp capacity at an existing mill. The key elements of the proposal are:

- 500 incremental a.d. tons/day
- New fixed capital of US \$390 million (US \$780,000 per daily incremental ton)
- Manufacturing variable cost reduced by US \$25/a.d. ton.

In many instances, we have found financial methodology to be no more sophisticated than a simple Return on Investment (ROI) (net after-tax earnings in the first full year of operation, divided by the book value of the asset). While this method may be adequate for comparative screening analysis of one proposal against another, it does not address the basic question: Should this project be funded?

In **Table II**, alternatives for project analysis parameters are displayed. Method A is a simple system,

Shareholders' equity

- The book value of a company at a given point in time. Computed as total assets less total liabilities.

% Return on investment (% ROI)

- A measure of profitability (%) produced by assets for a given time period. Computed as after-tax earnings for the given period divided by the net book value of assets for the same period.

% Discounted cash flow ROI (% DCF-ROI)

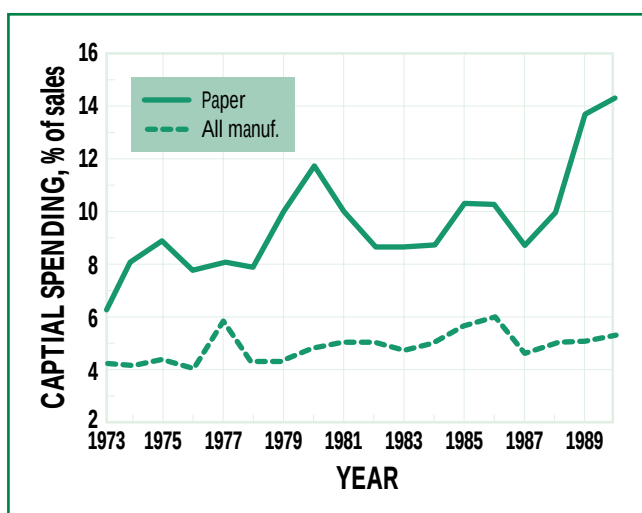
- A measure of the rate of return (%) the cash flows of an investment produce over the life of the investment; the "break-even" rate one could pay to finance a project; the rate that produces a net present value of zero when annual cash flows over the life of the investment are discounted.

Trendline pricing

- A time-related forecast which uses past price information to determine project prices.

Earnings before interest and taxes (EBIT)

- Earnings before interest and income taxes for a given period, typically a year.

I. Glossary of financial terms

I. Capital spending as a percentage of sales

while Method B is a very conservative analytical framework.

Under Method A, a net ROI of 27.3% and a discounted cash flow ROI (DCF-ROI) of 19.3% are forecast. Under the more conservative Method B, the corresponding financial indicators are 4.5% and 3.4%. While the merits of any one analytical methodology can be debated, it is clear that Method B contains a number of features that

pricing assumptions drive the project return more than any other parameter. For financial analysis purposes, one can legitimately argue whether 10 years or 20 years is the correct parameter. In either case, it is far more important to properly introduce pricing assumptions into the analysis. For example, in the case under consideration, using Method B, it can be calculated as a sensitivity that a 10%

and 20% difference in product price mean a 6.6 and 14.9 percentage point difference in project DCF-ROI. In the latter instance, an unacceptable 3.4% return become a highly acceptable 18.7% DCF-ROI.

Major investments in pulp and paper machine capacity are typically made for a 40-50 year technological and competitive life cycle. In the case of product pricing, no one can successfully forecast price on a year-to-year basis, much less accurately gauge the situation 5-10 years down the road. For that reason, historic trendline pricing is one neutral analytical technique. In historic trendline pricing, product pricing history is taken and recast in current-year dollars (1995 in the example case). Then, a trendline is established that best fits the data, and that trendline is extended to the end of the project life for financial purposes. The historic trendline in no way represents a pricing forecast for any specific period. It is simply an acknowledgment that, given the lack of knowledge about the future, we have no better assumption than to presume that the future will be no different than the past.

Using the 1970-1995 actual Producer Price Indices, **Fig. 5** shows the historic trendline for northern bleached softwood kraft pulp prices in constant 1995 dollars.

This methodology frequently leads to a situation where the trendline price in the year the project is prepared can be US \$300/ton higher or lower than the actual price, but for long-term planning purposes, the trendline is the realistic approach. Any project will look good when the pricing assumptions used are above trendline; only the best projects survive the rigorous analysis posed by the use of trendline pricing.

Method B is based on historic trendline pricing of products, with inflation-free treatment of costs. Selection of this basis does not require speculation on both inflation rate and

product price but simply requires a long-range pricing scheme that would be net of inflation. Historic trendline pricing meets this requirement.

In similar fashion, Method B assumes that American Forest and Paper Association (AF&PA) historic operating rates for different products will hold true in the future. In any given part of the cycle, this assumption can be too optimistic or too pessimistic, but over time it will likely be correct. It is frequently argued that a new investment is much more likely to operate at a high rate, even when the overall industry operating rates are low. In a single-mill company, this argument can be valid; in cases where the same product is made at multiple mills, the downtime might well be taken at the highest-cost facility within the company, so that the net impact on the company's overall financial statement is affected by the operating rate assumption.

In general, we find it better to use conservative analytical methods to judge projects. Almost any method will work to screen one project against another, while conservative methods will best answer the question of should a project be done at all.

Lack of proprietary technology

In commodity product manufacture, the marketplace forces of supply/demand dictate pricing. The only other factors remaining in the financial formulas then become capital invested and manufacturing cost.

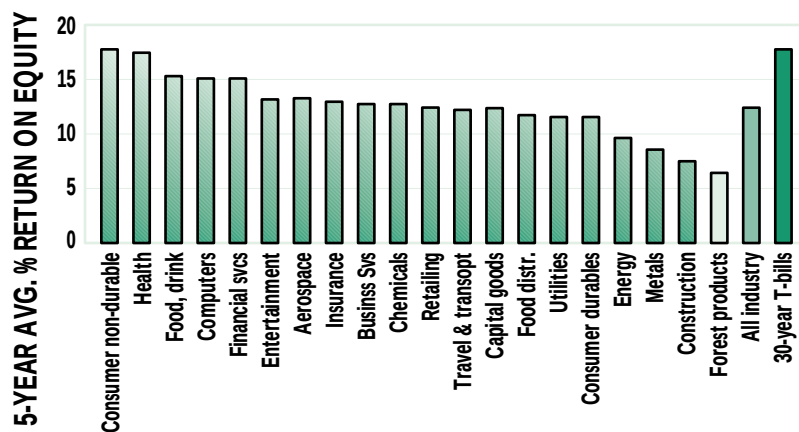
We find there are major differences among mills with respect to operating skills, but to a large extent manufacturing costs are driven by scale, age, and the type of technology employed. Of these, management can fix operating skills by investing in people, training, and talent. In our current paradigm, the other factors are typically fixed with capital.

In recent years, engineering has come to be a commodity purchased from some excellent industry consul-

nants. Clearly, there is leverage in capital effectiveness in selecting the most cost-effective design, by picking the machinery supplier who submits the lowest-cost bid, and by managing the engineering and construction well. However, in the end, if we all are subject to the same pricing, if we all use the same supplier-developed technology, and if we all use the same select group of engineering consultants, then we should all expect pretty much the

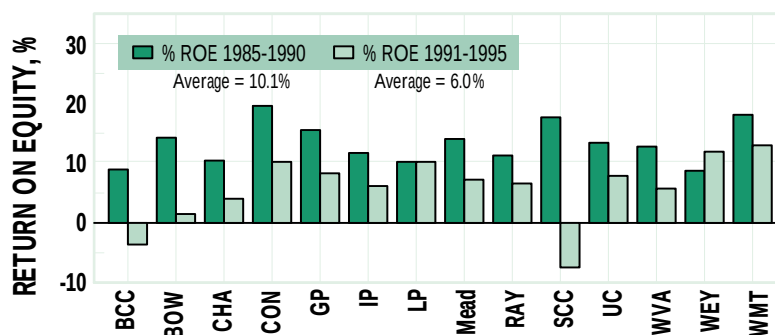
same results.

In general, this industry is not noted for developing technology, but what has been accomplished is largely

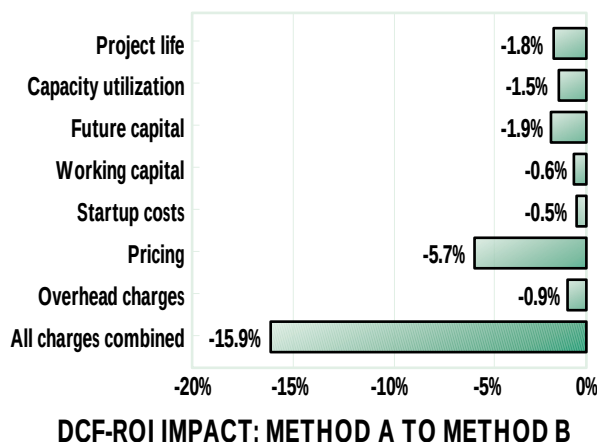


Source: Forbes Magazine

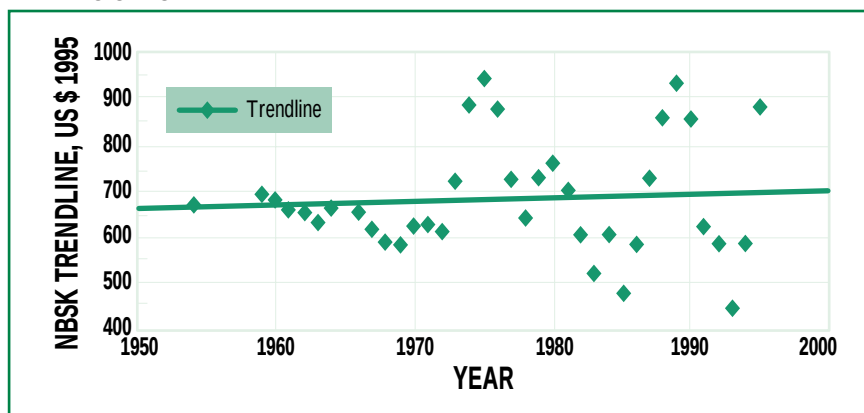
2. Five-year return on equity, by industry



3. Decline of paper industry performance



4. Impact of assumptions on results



5. Historic trendline pricing, northern bleached softwood kraft trendline based on constant 1995 dollars

Item	Method A	Method B
Book depreciation and project life	25-year depreciation 25-year project life	10-year depreciation 10-year project life
Inflation	Not applicable	Inflation-free (no change in cost over the project life of any cost component)
Days per year operation	350 days/year	AFPA operating rate for specific product (89% in example)
Future maintenance capital	0%	3% of new fixed capital
Incremental working capital	US \$0	10% of incremental sales
Startup costs	US \$0	Calculated on first principles and expensed
Sales price	1995 forecast with no erosion	Historical trendline price for 1995
Incremental overhead costs	0%	1.5% of new capital
Net ROI	27.3%	4.5%
DCF-ROI	19.3%	3.4%

II. Financial assumptions in capital project analysis

the result of supplier R&D. **Table III** collects the major machinery and chemical process developments in the pulp area and illustrates the point. All machinery in common use in the pulping process has been developed by machinery suppliers. The equation is a bit more balanced when looking at chem-

ical developments. It points to areas where companies should be investing in growing rather than shrinking their R&D departments, as appears to be the current trend. Further, we find it essential to maintain experienced in-house engineering expertise to challenge the consultants, and indeed

all design assumptions, and to collaboratively arrive at the optimum engineering solution. To do this properly, we can't afford to be either less experienced or less expert than the consultant.

Figure 6 more vividly illustrates the themes described above. In the left-hand graph are collected from public information the published capital cost per ton figures for new white paper machines. In the right-hand graph, comparable data are shown for new deinking plants, where companies have invested in the development of proprietary processes in recent years. One conclusion to draw from this display is that while there is considerable capital effectiveness leverage available on a paper machine project (the factor mentioned earlier, plus buying machinery during a market downturn), there is a far more profound impact on capital effectiveness in developing proprietary process technology.

Finding noncapital solutions to profitability

There is no single tool that adequately measures the financial performance of a facility, but net ROI, which includes the impact of income taxes and depreciation (but not interest), is suitable. To measure the impact of a single investment on the facility, we typically look at DCF-ROI; manufacturing cost competitive position; and the impact on long-term facility net ROI (a single project can look great, but if the long-term facility ROI is not attractive, one might look for other options at that facility and employ the capital elsewhere). In general, we find that capital spending alone is not an attractive route to improve facility profitability, but it must be matched with an aggressive cost reduction and productivity improvement program.

To illustrate the role of capital vs. other routes to profitability, we have modeled a hypothetical 1500 tons/day mill that makes only 42-lb linerboard, as shown in **Table IV**. Several cases

have been analyzed using Method B to illustrate alternatives for improving profitability, as summarized below. **Figure 7** shows the historic trendline price of 42-lb linerboard, with an annual erosion rate of -0.7%.

The Base Case represents the facility earnings (inflation-free basis) before interest and taxes (EBIT), assuming that none of the mill costs change, that the assets depreciate on a 10-year basis, and that the only other impact on EBIT comes from the erosion of pricing. **Figure 8** shows a curious artifact of financial analysis: Because trendline pricing erodes inflation-free revenues on the basis of 0.7% per year, EBIT gradually declines. However, depreciation is decreasing faster than pricing is eroding, so therefore we see that the mill ROI gradually increases over time in the “do-nothing” strategy.

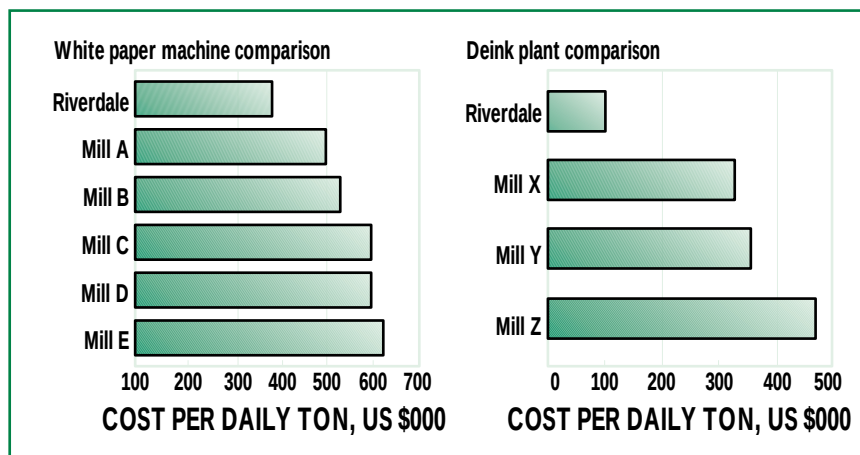
However, “do nothing” is not an option, because no mill can operate long without spending capital for maintenance and for mandatory regulatory spending. As a facility ages, these costs tend to increase, but for purposes of this analysis, maintenance, environmental, safety, and other no-return capital is fixed at US \$18 million per year. The result of this one assumption takes the facility severely downhill on both EBIT and net ROI, as shown in **Fig. 9**. The Base Case curves are redrawn for comparison to the real-life base, which will be labeled the True Base Case. In this analysis, doing only the minimum required spending leads to an unacceptable condition in both EBIT and ROI.

Figures 10–13 show the results of three separate routes to profit improvement (Figs. 10 through 12) and the impact of combining all three routes (Fig. 13). The individual scenarios are overlaid against the lines of the True Base Case.

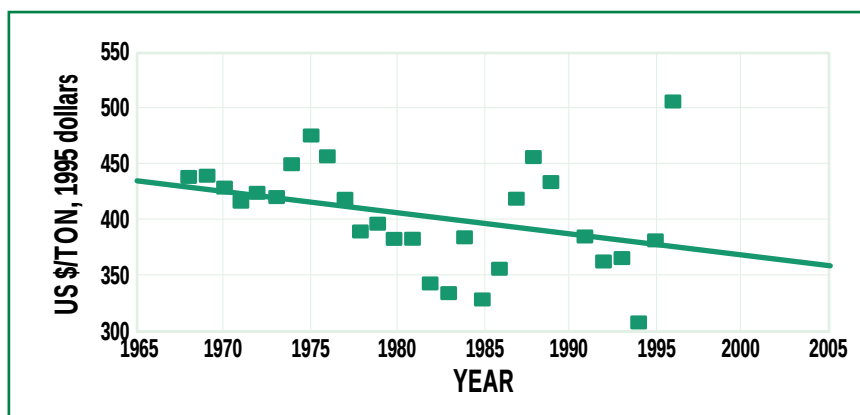
- Figure 10 is the resulting calculation of a mill investing US \$12

SUPPLIER	MECHANICAL	CHEMICAL
SUPPLIER	Continuous digester (Kamyr)	Extended delignification (Kamyr)
	Pressurized screening (Bird)	Low energy batch pulping (Sunds)
	HC oxygen bleaching (Kamyr)	Anthraquinone (C-I-L)
	High shear mixers (Kamyr)	
	MC pumps (Kamyr)	
	MC oxygen (Kamyr)	
	Diffusion washers (Kamyr)	
	Low level washers (Impco)	
	MC ozone (Kamyr)	
INDUSTRY	MECHANICAL	CHEMICAL
INDUSTRY		Chlorine dioxide (CIP)
		Chlorine dioxide substitution (CIP)
		Oxidative extraction with peroxide (IP)
		High consistency ozone bleaching (U-C)
		Polysulfide pulping (Mead)

III. Technology is largely supplier-developed and industry-shared



6. Capital effectiveness of projects



7. Historic trendline linerboard pricing, 42-lb linerboard

- Mill producing 1500 tons/day of 42 lb. linerboard
- 1995 net sales = US \$350/ton, or US \$184 million/year
- Manufacturing cost = US \$250/ton (includes US \$20/ton depreciation)
- Mill book value = US \$150 million
- 1995 net ROI = 20.0%
- 1995 earnings before interest and taxes = \$40 million

- Base Case = 1995 production and cost level with trendline prices carried forward (Fig. 8)
- True Base Case = Base case plus US \$18 million/year maintenance and environmental and safety capital with 0% DCF return (Fig. 9)
- Case A = True Base Case plus US \$12 million/year capital with 20% DCF return (Fig. 10)
- Case B = True Base Case plus 3% annual cost reduction with US \$0 capital (Fig. 11)
- Case C = True Base Case plus 3% annual productivity increase with US \$0 capital (Fig. 12)
- Case D = Combination of all cases (Fig. 13)

IV. Linerboard mill analysis

million per year, every year, in projects with an average DCF-ROI of 20%. EBIT continues to improve beyond the 1995 level, but net ROI declines to 11.3% after 10 years, indicating that even an aggressive investment program cannot offset the decline in pricing coupled with annual maintenance/regulatory costs.

- Figure 11 presents the analysis of an aggressive cost reduction program, where 3% per year in real cost is removed from the manufacturing cost. In this scenario, EBIT and net ROI decline less than the True Base Case, but both are inferior to the investment case (Fig. 12). The proper conclusion is that even an optimistic cost reduction program with no capital requirement is not sufficient to maintain a high ROI.
- On the other hand, Fig. 12 suggests that a 3% real productivity gain (again, with no capital investment)

is a more lucrative practical path to profit improvement than either capital investment or cost reduction. In real life, productivity gains often come at the expense of higher manufacturing cost, but in this analysis we have assumed no change.

It is critical to recognize this case was built on the assumption of no capital. In real life, productivity gains of 1–3% are possible without major capital. Much of industry capacity expansion typically comes, however, in the form of big chunks of capacity, normally at a high unit investment and overall cost. Large projects entail both an engineering/construction/startup risk and an even larger risk of failed product pricing assumptions. In many cases, the large capacity expansion itself ensures the collapse of the very pricing assumptions upon which the project was sold to management.

- Figure 13 is the extreme case of a facility that accomplishes all three routes to profitability simultaneously. While not typical, this case is instructive, because it is the only instance within the scope of this study where the facility remained at the initial 20% ROI level.

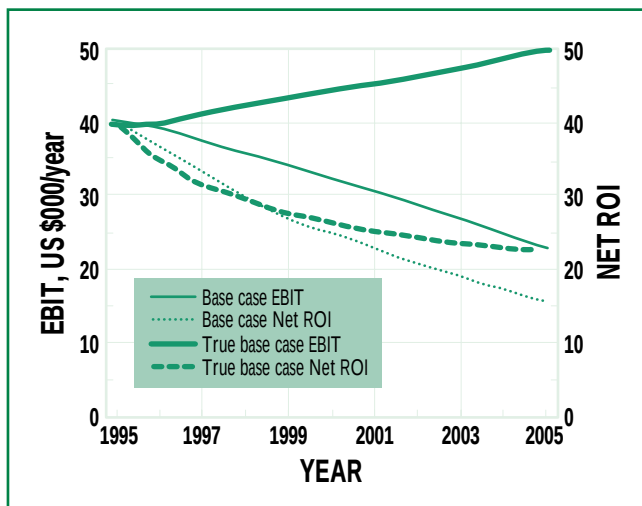
For a mill with annual sales of US \$175 million, the assumption of US \$18 million True Base Case capital spending with zero return puts the rate of spending at near the industry average. Looking at increments of “High Return” (20% DCF-ROI) projects on top of that base spending, and looking at net ROI (Fig. 14), suggests that in the short term, one simply cannot invest enough capital at 20% DCF-ROI to restore mill returns to the 1995 level.

The other extreme—no improvement capital—is also not an attractive scenario. It appears that some optimum combination of a specific capital investment allotment for margin improvement, a cost reduction focus, and especially an ongoing productivity improvement program, are necessary to maintain facility ROI. Figure 15 shows one of the most important priorities a facility manager must excel in: managing a portion of the nonproductive capital spending toward high-return projects. In this case, we show the impact of converting 10% and 20% of the US \$18 million of nonproductive capital to cost reduction projects with a 20% DCF-ROI.

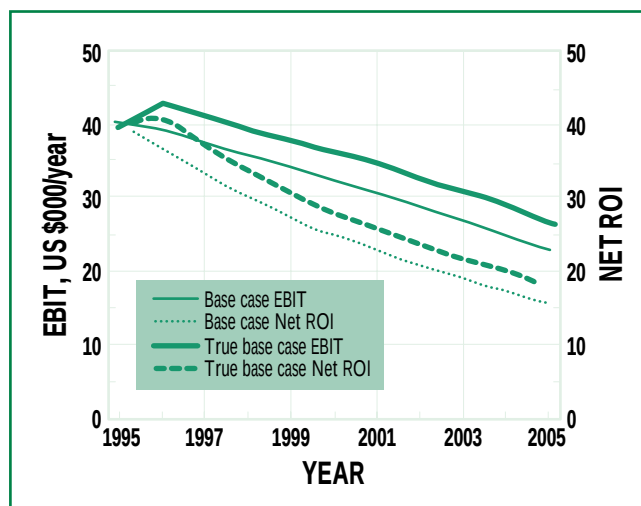
The type analyses performed above are at the heart of managing a facility for profit margin and ROI. Capital investment alone is seldom the most lucrative route to achieving facility financial goals. This fact is highlighted in Fig. 16, which plots % ROE vs. % capital expenditure per unit of sale (Capex) for the 14 paper companies shown earlier in Fig. 3. The correlation coefficient (R^2) for a linear regression is only 0.14. One might anticipate that a better correlation would be obtained by plotting the capital spending in the 1985–1990 period against the % ROE in the later period of 1991–1995 (the theory being that the investments pay off later, rather than sooner). Instead, in Fig. 17, the correlation coefficient drops to 0.04, worse than found by considering the entire time period.

KEYWORDS

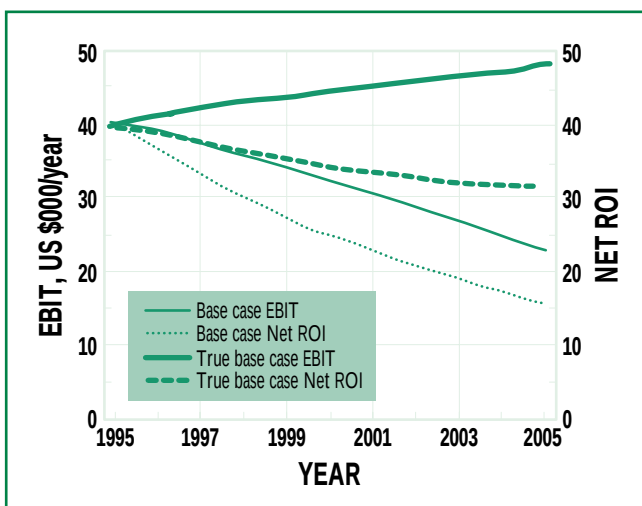
Capital, capital projects, capitalized costs, costs, forest products industry, investment, management, paper industry, return on investment, technology, trends.



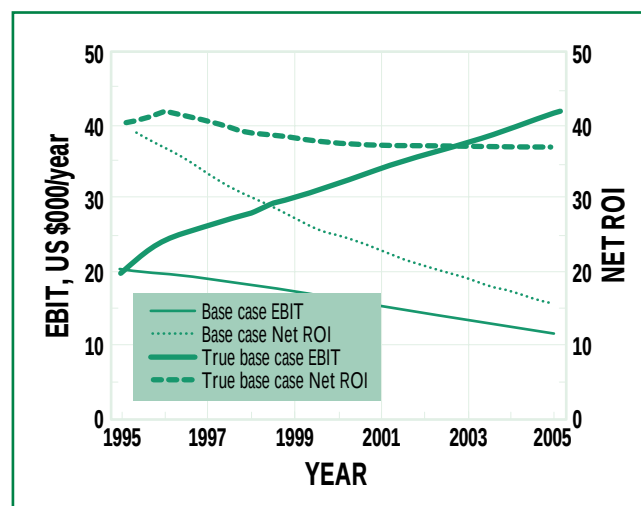
10. Case A: Invest US \$12 million/year at 20% DCF



11. Case B: 3% annual cost reduction at zero capita



12. Case C: 3% annual productivity increase at zero capital

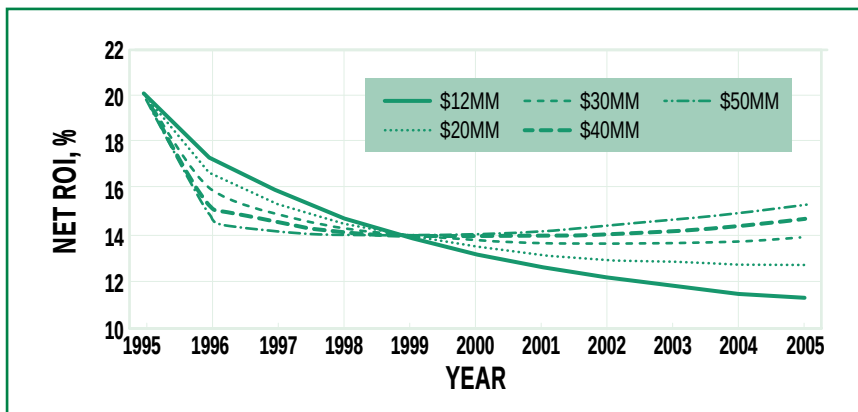


13. Case D: Combine assumptions of Cases A, B, and C

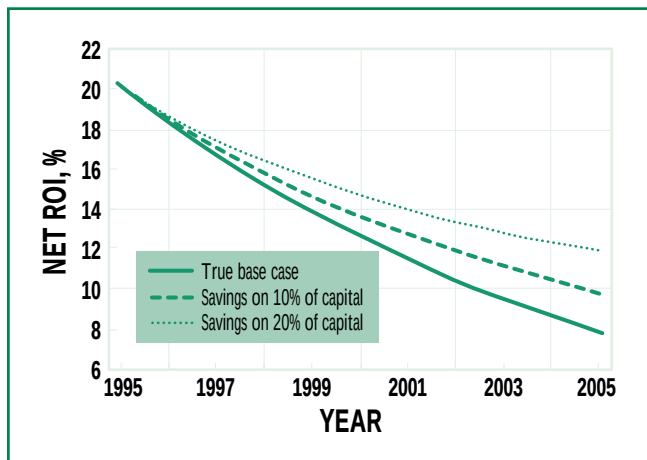
CONCLUSIONS

Several conclusions can be drawn from the foregoing analysis:

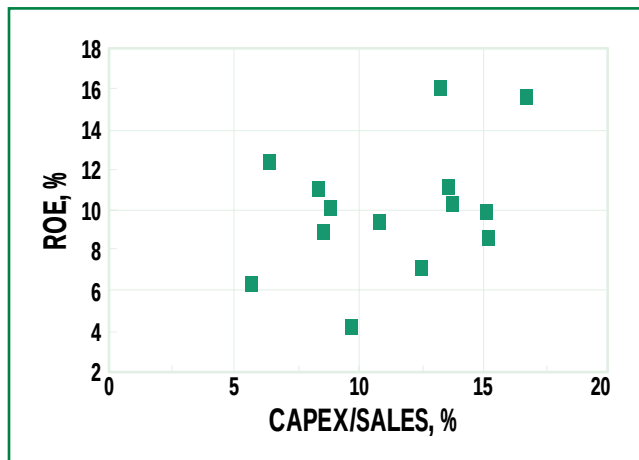
- When capital investments are critically analyzed within a framework that reflects financial reality, many large facility expansions are shown to be marginal investments.
- Realistic product pricing is essential to clearly delineate the winners from the losers.
- Capital investment alone is a difficult path to achieving facility profitability, while no/low capital options that improve cost and productivity have more leverage on ROI. Large capacity expansions at high capital investment



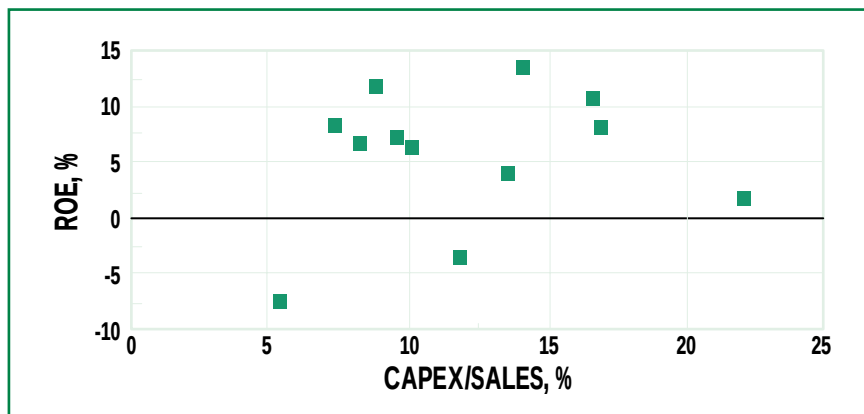
14. Linerboard mill analysis, Case A: % net ROI with added capital at increasing level with 20% DCF return



15. Linerboard mill analysis, impact of savings projects on True base case net ROI % (US \$18 million/year capital spending)



16. Industry performance, % ROE vs. 10-year Capex



17. Industry performance, 1985-1990 Capex vs. 1991-1995 % ROE

are more risky, entailing both engineering/construction risk as well as being highly sensitive to product pricing assumptions.

- Proprietary technology is a seldom-used alternative to achieve step-change improvement in project returns.

- Paper companies must take better command of their investments, all the way from the R&D stage to the project concept and detail scope, through managing consultants in the engineering and construction phase, and finally through the start-up process itself. If all these steps are defaulted to our consultants and our suppliers, there will be little to distinguish one paper company from another, and we will continue to earn 6% ROI. **TJ**

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