Planning a capital project

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International influences accentuate the need for proper project planning through the use of the best available technology. Today, there is also a need for stronger financial stability, and there is a move toward high quality at a marketable price.

Planning a project in today's economic climate requires skills more sharply tuned to future developments and profitability than to present cost and returns, especially for industries or companies operating with a narrow profit margin. The next generation of planners must possess a keen sense of future direction on every component of a project. They must consider not only conventional market trends and raw material, operating, and capital costs, but also future environmental issues, tax incentives, subsidies, tariffs, changes in profit and hurdle rates, equipment costs, labor stability, and technological developments.

Marketing study

Should you expand production, modernize to cut operating costs, or enter new markets? To answer these questions, reliable data are essential. Depending on the project size, in-house information may be sufficient. However, for expensive projects, in-house data may be an insufficient foundation on which to risk the project's success and the company's financial stability; therefore, a more thorough market study may be in order. The market study should provide you with sufficient data to make informed judgments about the future. The success or failure of a project can depend on the validity of your assumptions, forecasts, and judgments. Some things to consider include:

1. Product: Confirm your product selection by completing the feasibility study.
2. Product quality: Quality must equal or exceed the competition. Plan for the future by anticipating future quality demands.
3. Forecasts for supply, demand, and price: Justify future production based on price forecasts. Discounts may be necessary to enter established markets.
4. Economic and market trends: Current trends can be important indications of future conditions. For instance, the increased use of color by newspapers created a trend towards improved newsprint quality.
5. Raw material forecasts: Use raw material cost forecasts, not present costs, to calculate future profit margins.
6. Available markets: Decide which markets to sell in, whether regional, domestic, or international. There may be differences in price, quality, specifications, transportation costs, warehousing needs, accounts receivable, and inventory.
7. Foreign competition: The most important factor in foreign competition is the currency exchange rate (**Fig. 1**). Some of the recent surge in the U. S. paper industry is surely the result of the weakening dollar making foreign goods expensive.
8. Technology: Observe trends based on current new technology, such as the increased use of cheaper fiber sources to replace kraft pulp.

Site selection

Selecting a project site for expansion may depend on available real estate or the demolition of existing facilities. The water, power, and process demands may be straightforward, but the site selection for a greenfield mill can involve the examination of many other factors.

For a new mill or for a major expansion, the availability of electric power and its costs must be considered. The power demands of the process indicate the importance of low-cost power in site selection. High-energy processes, such as thermomechanical pulping, must have reasonable power rates for the project to be viable, because a high percentage of the manufacturing cost is electrical power.

In considering wood resources, examine the following:

- Projections for plantation growth
- Local sawmill operations
- Remote woodyards
- Purchased chip possibilities
- Quality control of logs and chip sizes
- The age of wood before and after cutting
- Long-range projections
- Competition.

An adequate water source is important, but so is quality.

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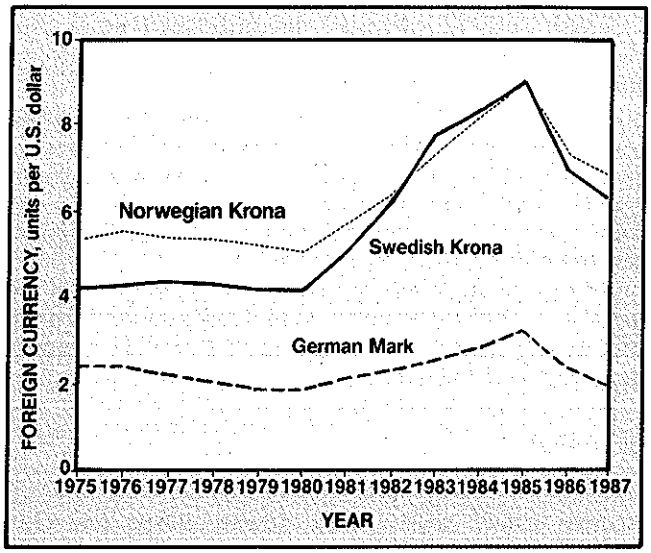
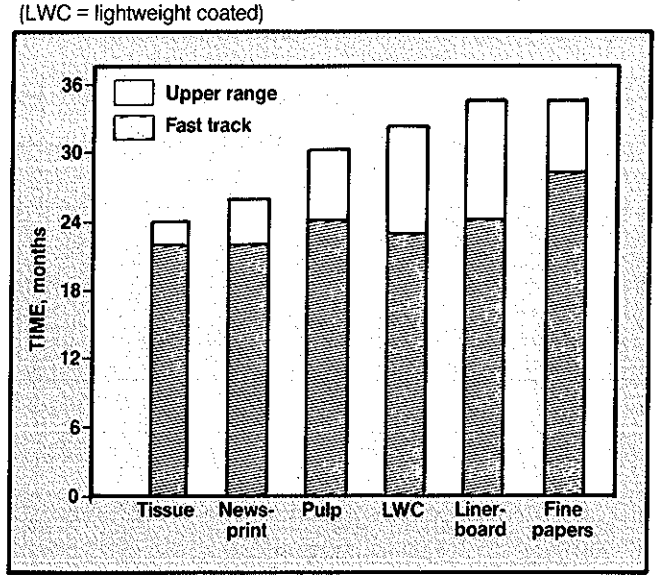
1. Foreign exchange rates



2. Time from release of the purchase order to startup for new mills (LWC = lightweight coated)



Some wells, reservoirs, municipalities, and rivers may be high in chlorides, iron, calcium, and magnesium.

As for transportation, raw materials and final products can be shipped by truck, rail, or barge. Construction requirements of truck and rail services should also be studied.

The labor pool should not be overlooked. Evaluate the availability, the skill, the work ethics, and the stability of the labor pool.

Permits are also important. Market timing of a new product or expansion can be derailed by the time required to secure the necessary permits. Study the requirements from state to state. Know the environmental impact procedures involved in meeting the requirements of all agencies involved.

Local tax incentives can make a difference. Industrial revenue bonds and environmental bonds may be available, along with property tax concessions. Investigate the willingness of the state and local municipality to provide other incentives, such as land and road donations, landfill use, municipal waste treatment, and fire protection.

Finally, any new manufacturing facility faces the potential for opposition from a local coalition. This opposition may originate from environmental, political, or labor factors. These coalitions can delay or stop the state permit process. In planning the project, provide precise and timely information to the public.

Fiber study and testing

Wood supply characteristics

The general characteristics of the wood supply can vary widely between wood species and can vary geographically for any particular wood species. For a new mill, the wood supply is not likely to be quantified in sufficient detail. For an expansion, the wood supply is known, but if significant growth in production is planned, the increased demand for wood may change the mix, age, size, and quality of the wood furnish. In either case, a study of the available wood supply is appropriate.

Wood species. Determine the species of wood within the deliverable distance of the mill. The survey should include estimates of the species mix and the age, size, and growth rates of the trees.

Wood sources. Some areas may have access to plantation grown trees, sawmill chips, or purchased chips in addition to naturally grown trees. These sources should be considered and evaluated as to their effect on pulp quality.

Availability. The estimated long-term availability of fiber will have a substantial effect on wood cost. Has reforestation been adequate to meet future demands for fiber?

Infrastructure. Does a wood supply infrastructure need to be set up, or does one exist? What is the availability and experience of local logging contractors and the labor pool?

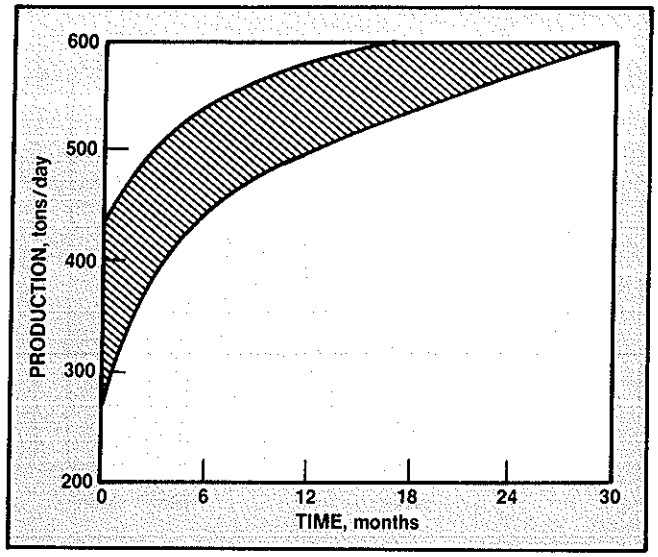
Suitability for the pulping process

After the wood supply characteristics have been determined, testing should be carried out to determine how suitable the wood supply is for the proposed pulping process. Each fiber source may exhibit different responses to mechanical, thermal, or chemical energy, affecting properties such as yield, bleachability, and strength. These factors affect manufacturing costs and can strongly influence the project's feasibility.

Early vendor involvement can frequently provide the means to perform this testing. Many major equipment suppliers operate research facilities that are sometimes available to customers for trials. Research facilities are located worldwide, but costs can vary depending on availability and whether the trials lead to the purchase of equipment. Research trials can also be attractive in that performance guarantees can be established for the full-scale process equipment.

As an alternative to using vendors, private pilot plant facilities are available. Also, full-scale trials can sometimes be arranged, but this involves transportation of a considerable amount of wood, generally enough to provide

3. Typical startup curve for a 600-ton/day machine



three or four days' production.

With any of the available methods of testing, it is important to get a representative sample of the fiber supply. This sampling can be as important as the testing itself, for if the wood sample is not representative, the results do not reflect future operations, and incorrect conclusions may be formed.

Permitting

Major mill expansion projects will require that the current environmental permits be examined. For instance, an increase in production will likely require compliance with "new source performance standards." In general, all operating permits must be reviewed and reissued. Greenfield mills may require extensive preparation time to obtain permits. Local, state, or federal agencies may also require an environmental impact study, which can take anywhere from two to nine months to complete.

Permits for raw water facilities, mill effluent discharge, and air emissions will be required. Other necessary permits could be for environmental impacts touching archaeology, solid waste, hazardous waste, and transportation.

If wells are used, can certain aquifers be tapped, or are existing restrictions in effect? Should river water or municipal water become available, what is the quality, cost, and guarantee for uninterrupted service? What source of water for extinguishing fires will satisfy the insurance underwriters? What are the economical alternatives for waste treatment? Are long-duration holding ponds, chemical costs, and operating costs within practical limits?

In preparing to apply for permits, identify all air emission points in the mill, including boiler stacks, lime kiln stacks, all TRS (total reduced sulfur) emission points, steam, vapor discharges, chemical boil-off, and dust from coal and bark-handling systems. Be especially concerned with SO_2, TRS, and chlorine sources. Although not restrictive at present, there is a trend toward strict regulation of TOCl (total organically bound chlorine) emissions. Consider processes that reduce the need for chlorine, such as extended delignification or oxygen delignification. As for SO_2 and TRS, these gases are already heavily regulated.

Consider a third-party consultant for accumulating background information and assisting with any public hearings, press releases, or correspondence with governing agencies. Using experienced people in this area can help anticipate the duration and quantity of information required for securing the permits.

Make a strong effort to gain public acceptance of the project. It is wise to designate a single spokesman for press releases or public discussions and to provide accurate information to the public.

Schedule

Schedules for design and construction are critical to the success of any project. They indicate where and when resources can best be used to meet the startup date. The schedule should indicate tasks that are on the "critical path," which means that the deadlines for these tasks cannot fail to be met without affecting the startup date. Resources can be directed toward these tasks to ensure their timely completion. Schedules can indicate when equipment purchases need to be made, providing the basis for developing a cash disbursement curve.

Design and construction schedule

The design and construction of the large greenfield mills in the United States can be a lengthy process. Expected construction durations from the date of purchase order for the paper machine to mill startup are shown in **Fig. 2**, where the fast-track schedules represent a paper machine delivery of 15–17 months. "Fast track" means a timely decision-making doctrine at the beginning of the project to ensure an orderly progression of equipment, engineering, construction, training, and startup. Using a fast-track schedule, one machine for lightweight coated grades in the United States recently started up 23 months after release of the purchase order for the machine.

The duration of construction schedules will have a strong influence on total cost as a result of escalation and project financing. This explains the need to shorten construction and startup schedules as well as to create a return on capital as quickly as possible.

Startup timing

Once a mill completes construction and checkout, the race is on to achieve the design production rate within the shortest time. Obtaining typical startup data and projecting production rates can help establish production goals for managing the acceleration in production to full design capacity. Such curves exist for different paper grades and should be fully understood before making a full commitment. These curves, like the one in **Fig. 3**, are also used for establishing performance guarantees, warranties, and sales forecasts.

Timing with mill shutdowns

Projects within existing mills should be scheduled not only with design and construction teams but also in parallel

to mill operations. Thus, tie-ins, shutdowns, demolition, and construction must be scheduled together to minimize downtime. Downtimes to complete some typical mill projects are:

- Add top wire to paper machine: 8 days
- Replace press section: 26 days
- Replace paper machine: 90 days.

Design and construction

Any approach to the design and construction of a project can be successful, provided that a good team is assembled. The team consists of the owner's representatives and the engineer and contractor.

Careful selection of the team members will reduce engineering errors and delays, and construction reworks and costs. Depending on the design and construction approach, the project team's functions may be delineated by the owner, engineer, contractor, or equipment vendor. These approaches may be classified as: conventional, lump sum, turnkey, and vendor turnkey.

Conventional

The conventional U.S. approach has been to purchase engineering with a time and expense contract and to hire a contractor with a cost-plus contract. These contracts provide the flexibility to add or delete work as the project scope is developed. With these contracts, careful monitoring of budgets is essential to prevent project overruns.

Lump sum

Engineering and construction can be purchased with a lump sum contract. With lump sum contracts, a detailed scope is required. A paper machine rebuild is a difficult project for this type of contract. With a rebuild, the scope often seems to expand to cover the forgotten or unforeseen items, and renegotiations would then be necessary to finish the job. A new paper machine in a new site would be more appropriate for a lump sum contract.

Turnkey

Single source responsibility is provided with a turnkey project. One purchase order is written for the entire project. A detailed scope definition is required for this approach to be successful. The specified equipment is never the problem; it is the unspecified auxiliary equipment that the owner discovers is not of the quality he would like or is different from the mill standard.

Vendor turnkey

A vendor turnkey package is a proposal offered by an equipment vendor, in which the vendor offers to provide all engineering design and construction services within a given limit. The advantage with this type of approach, as with all turnkey projects, is that the responsibility rests with a single source. In Europe, it has been common for vendors to offer such packages. With the European invasion of the United States by equipment manufacturers, vendor turnkey packages are now being offered more frequently here.

When considering a vendor turnkey proposal, it is important to define the boundary limits in such a way as to minimize additional work. Frequently, the pumps, tanks, piping, and bridges necessary to provide the basic utilities to the boundary limits are not included in the vendor's package.

Equipment sources

Suppliers outside the United States

The forest products industry in some countries is a major contributor to the gross national product. To promote growth, these countries have been more aggressive at trying new ideas. The results have been the development of some progressive technologies and equipment.

Foreign suppliers first established a major foothold in the U. S. market in the early 1980s by providing quality equipment at competitive prices—thanks to the strength of the dollar.

Today, any design project should include considerations for equipment and technology available worldwide. Many developed countries market pulp and paper equipment that could be the best match for the project, but when evaluating the performance and cost of this technology, you should consider the following items:

1. Metallurgy: Become familiar with the standards—for instance, SIS, ISO, and DIN as they compare to the ANSI and ASTM U. S. standards. SIS 2343 and AISI 316L may be considered interchangeable, but their compositions differ.
2. Welding: Check shop practices for compliance and certification of TIG or MIG welding and for stress-relieving major fabrications.
3. Piping: Metric connections may or may not be compatible with U. S. standards.
4. Fasteners: Specify U. S. standards, if metric fasteners and metric hydraulic and pneumatic connections are not acceptable.
5. Structural: European construction standards allow for some tolerances in anchor bolt dimensions by field measuring the bolt requirements and using a field-set anchor bolt with grout.
6. Electrical: If starters, wiring, and controls are furnished, check your requirements for NEC, IEEE, or ISA standards. You may want to specify the mill standards or U. S. suppliers.
7. Shipping: Check that all shipping costs, insurance, and import duties are included in the terms to deliver equipment to the job site.
8. Technical support: Startup and equipment services are available for most items imported to the United States. Check the kind of response that can be expected for problems and the availability of spare parts. Should a critical process component fail, how long will it take for replacement parts?

Vendor shop drawings are required on a timely basis for engineering efforts to proceed. Slow shop drawing delivery and turnaround can cause havoc with engineering and construction schedules. Negotiate this item in the terms of the contract, and tie the payment schedules to engineering information received.

Many foreign companies have subsidiaries or sister

companies located in the United States. Therefore, technical support may be readily available with backup from the home office overseas. This arrangement will provide good customer interaction should warranty or performance questions arise.

U. S. suppliers

Equipment suppliers in the United States have responded to foreign competition and, to the benefit of the paper industry, are now providing equally progressive ideas.

Equipment suppliers in the United States can easily be checked for references and recent installations. Financial information can give you an idea of whether the company is strong or on the edge of bankruptcy. Be sure to inquire about the delivery track record, which could indicate whether a company is well-managed or has problems such as union strikes or an inadequate staff.

U. S. equipment manufactured offshore

Several U.S. companies have subsidiaries or sister companies outside the United States in such countries as Mexico or Brazil or in the Far East. Manufacturing common U.S. equipment through these sister companies can provide a savings on equipment cost. The offshore manufacturer delivers the specified equipment to your job site with the same warranty, nameplate, spare parts, and performance as the item made in the United States. The only difference is that it was made offshore and imported.

Feasibility study

In the feasibility study, the information gained in all of the various reports and surveys is used to examine the proposed project. Taken into consideration are the site selection study, the wood study, the construction and manufacturing costs, the marketing plan, the anticipated permitting effort, the schedule, and the financing arrangements. Questions must be answered that can affect the success of the project:

1. Are the financial, economic, and technological risks commensurate with the potential profit?
2. Are the assumptions valid? How sensitive are these assumptions in forecasting profits? To the schedule? To success in general?
3. Is the project likely to meet the goals of the company?
4. Is there sufficient technical and managerial talent within the company?
5. Does the return on equity exceed the cost of capital or the hurdle rate?

The feasibility study is a major undertaking. A full-time task group should be assigned for this purpose. Outside consultants can frequently provide a more objective viewpoint and may, therefore, be quite beneficial to the study. A simultaneous analysis by a consultant can also provide a measure of security that the conclusions and recommendations of the study are correct.

Conclusion

Of the general technical steps involved in planning a capital project, financial planning is possibly one of the most important items in a successful project. All participants should develop their own checklists for a well-executed plan. These checklists should be combined into a master plan that can be both flexible and simple.

Received for review June 1, 1987.
Accepted March 13, 1988.
Presented at the 1988 Engineering Conference.