

The Right Tools For The Job: Implementing FEL

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Last week we examined Front-End-Loading (FEL) - the project management process that involves developing sufficient project definition so that owners can make investment decisions, minimize risk and maximize the potential for success, and how to begin the process. This week moves on to a discussion of the next two phases of an FEL process and breaks down the cost-benefit analysis for the process.

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FEL II: Preliminary Engineering / Financial Justification

Approval of the FEL I package allows for the project to proceed through the first gate into the FEL II phase, the process which formalizes the scope of what must be done to make the project a success.

FEL II begins after the preliminary business case has been presented to senior management, who have the authority to authorize funding to proceed into the next phase. Depending upon the scope of the project, the FEL II phase may take from one to three months.

The core focus of the FEL II phase is to “freeze” the project’s scope and eliminate many of the assumptions and risks identified during FEL I. Other important activities in this phase include the assignment of an overall project manager, assembly of a project team, and identification of key stakeholders, who should, but without a structured program, often don’t, participate in project development.

FEL II also moves the engineering design ahead to a point where it becomes possible to validate the business case, identify and quantify key risks, and forecast the necessary capital commitment within a much narrower range. The cost estimate is refined to an accuracy range of approximately +/- 25%.

In addition, the final FEL II package will typically include a milestone schedule as well as a procurement strategy, specifications for long lead equipment, and a preliminary start-up plan to establish requirements for commissioning, qualification and verification.

A well-executed FEL II can produce dramatic cost savings. During a recent project for the design of a cereal production line, the conceptual design of a complex dust collection system included ten stainless steel platforms for equipment access. The 30 - 40 foot long platforms would span over five conveyor systems and each one would require ten handrail gates. Determined to simplify the overall design before freezing the scope, the engineering team modified the ductwork layout and blast

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gate locations. This change made it possible to eliminate seven of the platforms and cut \$471,640 from the construction budget.

FEL III: Basic Engineering / Financial Budget

A completed FEL III concludes the capital appropriation request process with the submission of supporting documentation to the senior management and approval committees.

During this phase of work, the level of engineering definition is generally progressed to between 30% and 50% complete. The overall time frame for common food industry type projects is one to three months, again depending heavily on project complexity. The overall project execution plan should be well defined at this point, including the establishment of an overall project schedule with a critical path logic worked out, a finalized cost estimate and the associated financial modeling.

The Start-Up Plan, developed during this phase, includes supplier and operations staffing requirements, materials planning, final definition of success criteria, and a schedule for the commissioning, qualification and verification (CQV) phases of the start-up.

Often the FEL III phase will provide fewer opportunities for cost savings since the basic project scope has already been established and a relatively well developed design is only being further refined. Any savings in this phase is more likely to be related to risk reduction that comes with increased definition. Major design alternatives should have been vetted during FEL II. Nevertheless, FEL III can still wring significant costs from the project.

One area of opportunity for cost savings at this stage is in the development of the construction strategy. An example of this type came up recently in a food plant project which required the complete demolition and replacement of an upper level concrete floor - with minimal impact on operations. The engineering team, in conjunction with the contractor, developed a strategy to implement suspended truss forms which did not require support posts from below. The forms could be relocated to install the new floor one bay at a time with little to no interference to the existing plant operations on the lower levels. This solution avoided the removal of process equipment in order to provide the shoring support required by a more typical forming approach. By figuring out the construction strategy during the FEL III phase of the project and including all the appropriate stakeholders, the owner was able to avoid approximately one month of production down time.

Cost - Benefit Analysis

Implementing the FEL process through capital appropriation and into a project control budget (+/- 10%) may require 35% - 50% of the overall engineering budget.

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While hardly an insignificant commitment, this figure ensures that the owner, contractors, vendors, and suppliers all have the appropriate information necessary for good planning, estimating, and project execution.

In the food processing industries engineering design typically accounts for 7% to 15% of the total project cost, depending on a wide variety of factors. For this example, assume an \$8 million dollar project with approximately 10% engineering cost so that the total engineering fee would be almost \$800k. If the FEL process required an investment of 40%, which would be \$320k – that is just 4% of the overall project value. In fact, the FEL process is typically identified as 2% to 5% of the project's total installed costs.

On the other hand, poorly defined engineering, scope omissions, incomplete estimating, unplanned downtime, and extended start-ups can quickly and easily account for 3% of the total installed cost. For this reason, following the FEL process becomes a low risk and cost effective approach.

In fact, using the FEL process can benefit a project by lowering the overall cost — often by as much as the costs of executing the FEL process itself.

According to a 2009 survey whose results were published in the CII Value of Best Practices Report, owners using front end planning spend on average 8% less than owners who never or infrequently use this method. This result is quite significant when expressed in terms of a major company's capital plan.

A separate study of front end planning benefits conducted by Research Team 213 of the Construction Industry Institute reviewed a sample of 609 projects with a projected total value of \$37 billion. Their analysis indicated that proper use of front end planning resulted in 10% less cost, 7% shorter delivery periods, and 5% fewer changes.

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