OFFSHORE ENGINEERING DESIGN

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This is the second article in a series taken from the TAPPI Engineering Management Committees ROUNDTABLE discussion held during the 1997 TAPPI Engineering and Papermaking Conference in Nashville, TN.

Why would your company consider using offshore firms for engineering design, and what would you hope to gain by doing so?

Gerard Closset: We want to get the lowest effective project at the lowest possible cost. If you can have your engineering done offshore and can overcome the problems of communication in the form of distance, etc., and you can still get a quality product within the schedule you need with a cost advantage, then I think that's fine. I think there are some very good places such as India that we can get engineering done outside the United States.

Ben Thorp: Depending on the type of project, engineering is going to run 6%–10% of the total cost. I would want the finest engineering that I could afford so that I could drive down operating cost, long term maintenance cost, and construction cost. The leverage is in engineering to do all three, and I would want the very best. If the very best were in India, I'd go to India. If the very best were here in the United States, I'd stay home.

Gerald Closset: I'm referring to detail engineering not the kinds of tasks performed in the very front end of the project.

Tommy Thompson: We've considered offshore engineering design, and we're open to it. We haven't done it yet. We know that others have. If the right project came along then we would consider it. We would want to look at the track record with the emphasis on "are we getting good engineering?" We wouldn't want to risk the quality of engineering for small savings. That would be too big a risk.

Larry Crawford: We would use the contract in-house, in-company, and in-country. If the expertise of the fundamental engineering exists in the country, I would do it. I wouldn't bring it in here to do ours. I would use the process, the technology, the best available anywhere whether it was the United States or whatever the case might be. On one of my projects, we tried to move a western company to Poland, and it didn't work. The problem is you don't know the regulations, the people, or the standards. You certainly won't live long enough to communicate and understand them.

Gerard Closset,
Champion International

I frequently hear the following comment from pulp and paper companies, "Detailed engineering is a commodity." Do you agree or disagree?

Gerald Closset: I think detailed engineering is a commodity. What you do in the front end—business feasibility and conceptual design is not.

Tommy Thompson: Detailed engineering may be a commodity but if that commodity is not done right you have a major problem. If it's done right, fine. We've had bad engineering. For example, we gave an engineering firm too much work in a certain situation. They had many years of experience but we caught them in a busy period. The back end people were overloaded and they did not have the right staff. The project was delayed and we had cost overruns.

Larry Crawford: I think you have to have a project team of your own using your employees for overseeing to make certain you receive what you're paying for.

Gerard Closset: You need your own project's representatives to oversee those things. There is no question about that. Commodities can be done right also. You need

Ben Thorp,
Georgia-Pacific Corporation

to have them done right.

Elgie Harrison: If you treat engineering as a commodity all the time, what happens when you do need something slightly different is that so much rigidity in the commodity costs you a lot to change it. Somehow you've got to make sure that you have the flexibility long term.

Ben Thorp: About five years ago, I commissioned a detailed study of projects. On every job we examined, the conclusion was that 12%–20% of construction cost was rework due to engineering error. That is an enormous price to pay. I don't know if it's a commodity or not. I don't think in those terms. I don't think it makes any difference. What does make a difference is what you have to do to get a good job and to maintain a good job from beginning to end. 3-D CAD is a tremendous help, and there are other technologies that can help us even more.

Howard Johnson: I don't look at it as a commodity. I think that what any engineering firm will do for you is only as good as the people they put on your project and the expertise they bring to it. We're a small company, and we do not have enough project people to watch all the engineering in detail. You have to put a lot of faith in the engineering consultant you use.

Larry Crawrord: Engineering has to be right. It has been our experience that the first 5–8 months on the project—once you start it up—can totally destroy or make the project's ROI. Making that ramp-up curve is so critical.

If engineering is not a commodity, why do you bid for engineering services to get the low bidder?

Tommy Thompson: I think competition is appropriate to select engineering firms, but that doesn't mean that cost is the only factor. When you look for an engineering firm, you look for the team of people—the project manager, the process people, the people who do detailed engineering—consider their workload, their recent history, and how well they have done on previous projects. Then somewhere down through the process you look at cost.

Pedro Pedroso: Today the cost and the capital cost are very high. Cost is the number one factor. It may not be what you want to do, but that drives jobs down to the low bidder. That's where we get in trouble. The multiplier may not be the number one factor you look at, but that's why I bid it. I'm looking for the low dollar. A lot of the capital costs today in the industry are driving the engineering cost down. That's what you have to look at. You may say otherwise, but that's what you end up with.

Tommy Thompson,
Union Camp Corporation

Earlier, Ben Thorp mentioned a study of projects that revealed rework due to errors and omissions as high as 12%–20%. That sounds quite high. Would you tell us how you calculated that?

Ben Thorp: Yes, it was very difficult to get accurate estimates. When we asked the question to many firms that were involved in the process, the numbers we got were like 2%–5%. When we examined the project records and went to some studies that had been done by a third party firm, we actually made a proper count. You can make a proper count by looking at field change orders and classifying them the way the owner would classify them—not the way the field classified them. You find that there are huge changes going on with projects in the field that management may or may not be aware of depending upon how the project is run. So you need an actual count. You need to dig into project records. And do you ever get surprised!

Does this count include changes due to scope changes?

Ben Thorp: Absolutely—errors and omissions and scope changes. There are several kinds of scope changes. All those in this room that are involved in projects like to call a change a scope change because it makes our job easier. Determining whether a change is a scope change requires you to use some judgement. We use the following definition. If you should have known about the change, it is not a scope change.

Larry Crawford, International Paper Co.

We've seen a lot less skill level throughout the construction work force, and yet engineering is becoming less detailed. Combine those two situations and that's when you have the rework. Do you believe that the expenditure on the front end and more detailed planning and engineering will pay back big dollars?

Pedro Pedroso: Yes. Your in house team has a lot to do with ensuring that you get a more detailed scope of work. We need detail in house in all the different departments—engineering, production, and maintenance—to make sure you get the detail you need when you go in the field.

Gerald Closset: I don't think you can categorize all engineering under the same label. There are some aspects of engineering that are extremely important and add tremendous value. They can even contribute to competitive advantage for a company. This is more at the front end definition of a project. When it comes to detailed design, engineering takes on a different nature, and I view it as a commodity because numerous firms can offer it. It can be done very well, and commodities can be error free.

Howard Johnson: Again, I don't think engineering is a commodity. I think the individual on your job doing your design is most important and should be the number one priority in selecting engineering firms.

Tommy Thompson: In some situations, like EPC contracts, the engineering companies may end up sending people to the field to get the work done. From the viewpoint of the owner, if you're getting good quality at the price you agreed upon and you're not getting hit with surprises, then I'm not really sure that we should get into this. When we award an EPC contract, we should not tell a firm how to manage their business.

Ben Thorp: There is a need for lower total installed cost. We're no longer doing as much detail engineering work, and we have less skilled labor available to us in the field. All three of those things point to the need for more modular design and more modular construction. We need to bring things onto the job site in the largest pieces we can get and pipe them together there. I don't think we've done nearly enough of that. Our industry is the highest capital cost industry in the world, and we've got to do a better job in the arena.

Given that there are more retrofit projects in the United States as opposed to grass roots or greenfield, do you feel we're able to take advantage of things like the 3-D modeling and turnkey?

Elgie Harrison, Cedar River Paper Company

Howard Johnson: I think on turnkey that a greenfield project is probably your most desirable. You can also do others. We have a turnkey in progress for retrofitting one of our older recovery boilers to a bubbling bed waste fuel boiler. I can't tell you exactly how it's going to come out because we're not far enough along.

Larry Crawford: The more areas of the mill that you have to interact with, the more I think you should try to stay away from EPC—particularly vendor led.

Howard Johnson: We've done other smaller EPC or turnkey projects. We've done several generator rebuilds and modifications; we've also done machine modifications on a turnkey basis

Since not all engineering is equal, do you agree that the definition of engineering deliverables is extremely important when you bid engineering on a competitive basis?

Howard Johnson: I'm a proponent of bidding whether it is engineering, whether it is buying materials or consumables, or whatever. There are some cases where you do partnering, but you get to that point by competitive bidding. We must all remember that our products in the market are being evaluated, and we are in one of the most competitive situations we can be in. Why shouldn't our suppliers be in that particular situation? We can't deliver an inferior product just because we're getting beat down on price out there.

Ben Thorp: I'd like to be a little bit critical of us owners. We talk about driving to lower costs. We talk about

Howard Johnson, Bowater

wanting the "so called" European approach. I talked earlier about wanting a modular approach. All of these things are in conflict with something we do all the time. We say, "Gee, Mr. Vendor, what you have to offer is okay except we don't want those kinds of motors, those kinds of valves, or those kinds of PLCs." We want some strange brand of each incorporated in the design that drives up the cost. In the long run, we're going to pay for that. We must achieve low cost mentality within our organizations in the up front design so we get all this business straightened out. That's a huge problem for us.

Gerard Closset: I agree. We need to look at what's going to make the project effective. That's the bottom line. If you use different types of equipment than you've used in the past—assuming you know they are going to work, then I think cost has got to be the driver. That's a change in mentality that we have to internalize here. I've seen this in Southeast Asia to an amazing degree. Again, I didn't see anything inferior out there or anything that wasn't working well. But they certainly have achieved very significant savings by, for example, looking at all the generic supplies, pumps, valves, and steel. And it may be that we can get the lowest cost by furnishing these items for the vendors if they can't supply it for that low cost in their EPC package.

Pedro Pedroso: But you have to look at the long term too. If you don't standardize in the mill and you have several different types of pumps or multiple types of motors, what does it do to your spare parts? It just drives it up, and everybody wants to drive that down. It's a very happy medium that you have to balance there. If you try to standardize either mill-wide or corporate-wide—which is a little harder, that's where some of the savings come in.

Ben Thorp: And it's much easier to have these discussions on greenfield projects as opposed to retrofits. Do we want to pay a little bit more up front to get all these specialty things or are we willing to pay a little bit more on maintenance and in the end get a lower total installed cost? I don't think we've done a good job with life cycle analysis of these costs.

What kind of experience do you have on dealing with the so-called 'black box' you receive from control systems vendors?

Pedro Pedroso, Georgia-Pacific Corporation

Larry Crawford: On two projects in Europe, for components of DCS systems, we specified which two or three the vendor could pick from that we were comfortable with. Then we stayed on top if it throughout staging and checkout. I would never just go buy from him and let him put his unit in there.

Howard Johnson: We do the same thing. We specify up front what we want. Even though we specify the equipment, they've got their own control systems logic. So training up front for our operators and our maintenance folks is crucial.

Elgie Harrison: I believe the underlying issues go a lot deeper. We all seem to be able to spend more money on equipment than we have the capability of optimizing. So somewhere you have to start thinking about how you would standardize. Someone mentioned that equipment standardization in a rebuild is more difficult. You have to start somewhere. Either in a facility or a company, you need to start setting the standards and adhere to those long enough for those to start paying off. That way you would be able to get the synergies of having the people who are skilled across your facility or across your company start maintaining or optimizing that equipment.

Ben Thorp: It sure would help in the control systems arena if we came to not only national standards but also international standards. This business of interfacing two foreign systems is eating our lunch.

Sally Love, president of Paragon Consulting Group, was moderator of this Engineering Management Roundtable.