PANELIST PRESENTATION

Environmental Dredging

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What I want to demonstrate here is the willingness of industry to respond to requirements in the market, to the demands that you have. As far down the food chain as a dredging contractor is, we relish the opportunity to get up in a forum like this.

We face a number of challenges in dredging and handling of dredged sediments. One is positioning, or controlling exactly the location of the dredge in the waterway or channel. Another challenge is removal of the material as efficiently as possible, without resuspension or removal of additional material that would have to be treated. Still another challenge is transport, which involves safely transporting the material to the disposal site or treatment facilities, usually on land, with as little exposure as possible to people and the rest of the area.

Our company has had a number of firsts in the dredging industry. There has been quite a revolution in our industry. In the early 1980s, the U.S. Congress decided to allow private industry to compete in the development of our nation's waterways, especially the entrance and navigation channels. Since the early 1980s, close to $500 million has been invested in equipment to satisfy the waterways development needs.

I will discuss a project that came on line in the early 1990s. Private industry was allowed to innovate and develop a solution to the problem of Bayou Bonfouca, from 1892 to 1970 the site of a South Louisiana creosote plant. In 1970, the plant caught fire, and much of the product spilled into the bayou; 169,000 yd^3 of material were contaminated over a 55-acre area. In 1982, the site became available for Superfund cleanup; it was the largest Superfund project ever attempted at that time, and it still may hold that record.

A dredge was built specifically for that project. It is 140 by 45 ft and uses spuds, laser positioning for control, computerized excavation, and real-time telemetry. We actually could see, in real time, exactly what was going on with the dredge from our corporate headquarters. This allowed us to help troubleshoot and monitor the operation.

Positioning challenges, winds, currents, waves, tides, and everything else you can think of on the waterway are parameters that you have to design around. Vessel movements, or generally traffic in a navigation waterway, demand greater precision. In this project, we needed to remove contaminants from varying depths; it was not like a navigation channel, where we would dredge to a certain elevation and our job is accomplished. We needed to identify, through site characterization, the extent of the contamination and its elevation, and then remove only the contamination and not everything else around it.

We did that by developing a three-dimensional (3D) model of the sea floor. We used the laser positioning systems now available, getting tremendous accuracy, down to centimeters. We basically took a computer-aided design drawing and dressed it up a little bit. The drawing depicted both the existing elevation and the elevation to which the sediment had to be removed. That was put into a 3D model in the computer, and the dredge operator was able to see the bottom while moving down the waterway.

The operation involved monitoring seven locations on the dredge bucket and comparing the x and y coordinates for those seven locations to seven x and y locations on the channel. The z dimensions were compared, and the operator could see exactly where he was in relation to where he needed to be on the channel. The spud system jacked up the barge slightly to stabilize it and eliminate many of the problems such as wind, current, and tide.

The equipment monitored itself, which was very helpful because our engineers could remain at headquarters and troubleshoot the equipment. As a result, we were extremely pleased with the accuracy of the equipment. Through measurements done prior to beginning the project, we had to demonstrate the accuracy of the equipment to the owner. We actually got down to .05 ft (15 cm) repeatability. I would not guarantee that type of accuracy; it was purely coincidental that, through the measurements, the repeatability of the system was down to .05 ft.

The other types of equipment considered for this project included the cutterhead dredge. It was not satisfactory, given the turbulence, trash, and debris. The client did not want water added to the system; the treatment of the water would be very expensive. Trash and debris would get caught up in the suction pipe and cause additional problems. We also considered the matchbox type of operation. Again, the sediments were not suited to this equipment. It is really best suited to very soft sediments that can maintain a laminar flow entering the suction head and then cause it to go into turbulent flow as it gets into the suction pipe. Although that unit would have removed the material at 80 to 100 percent solids by volume, it was not appropriate.

The backhoe dredge that we chose removed the sediments almost intact in an in situ situation, with a minimal resuspension ratio. It also tolerated the very large obstacles, such as the pickup truck and Mercedes-Benz we pulled out of the waterway. Very little additional water was introduced at this stage of the excavation. We worked from a very stable platform. We had to make some strange cuts up against sheet piling in various places along the bayou, where we had to be very creative in excavating the material at depths up to 42 ft (13 m). The machine basically was well suited for just about everything that we encountered on the project.

Conventional barge transport also was considered. People did not want the barges on the waterway. It is a somewhat messy operation, which requires manual handling, and there was some risk of accidents and spills from the barges. It involved greater exposure to the surrounding environment. On the other hand, conventional hydraulic transportation would not be very efficient in handling that volume of water for our client, the International Technology Corporation and OHM Corporation (IT-OHM). This project was very successful for IT-OHM. This is another jewel in their history.

The process that we decided to use was a combination of the barge and pumping system. We used and patented a slurry processing unit (SPU). We removed and transported densities as high as 75 percent solids by volume, compared to the 15 to 20 percent solids that we probably would have achieved with a hydraulic system. The material was dropped into a hopper, where the larger materials were separated out and transported by barge to shore. Everything else went into the SPU, which monitored the density through specific-gravity loops.

The SPU added in only the amount of water needed to reach the density specified by the client. Then the slurry went into the filter presses in the incinerator, which eliminated as much as 60 to 80 percent of the water that normally would be added through a hydraulic transportation operation. The SPU was monitored by a computer and was fully automated, in that it would monitor the flow rate and density through the pipeline and then transport this material to the shoreline very effectively.

The trash and debris were transported by barge. We reduced the number of barges needed on the waterway and dealt with some traffic issues. The people all were outfitted in protective clothing. The pipeline itself was double cased; there was a pipeline within the pipeline. Thus, if the integrity of the inner pipeline was lost, we still contained the material in the outer pipeline. The area was surrounded by silt curtains and booms, and the project was limited to an eight-hour day, five days a week, because of the neighborhood in which we were working.

We completed the project in March 1995, having removed 162,000 yd^3 (124 000 m^3). The average amount of overdredging (calculated by dividing the overdredged quantity by the total area dredged) equaled just 0.17 ft^3 (.005 m^3). I think EPA and our client were extremely excited about the performance.

Here are some recommendations, from our perspective, for things to consider. Develop performance specifications and allow innovation to meet the requirements of those specs. Require a scientific demonstration of the technology. Ask the contractor to demonstrate mathematically exactly what is going to happen. Perform a thorough site characterization. Avoid the misapplication of equipment due to an inadequate site assessment. There have been a number of times when, because of inadequate site characterization, a contractor has brought in the wrong equipment.

I strongly recommend retaining an engineering firm that has experience with this type of work. This type of firm has resource awareness, knows the industry standards, and knows the contractors that can work effectively in that business. Although the knowledge base may be insufficient as far as this forum is concerned, and we want to add to it, the knowledge base already is vast and the work is complicated; I strongly recommend retaining someone already working in the field. Select contractors based on their science and their solutions for meeting performance specs. Be sensitive to the proprietary nature of the solutions. To maximize exposure to the solution and the science, be sure that the contractor can feel comfortable that this expertise will not be passed on to someone else.