Ensure the dredge and other equipment are designed for the depth.

Conduct site analysis and geological testing.

Develop a well-thought out mine plan.

Pay attention to details when configuring a deepwater dredge.

Continually sample the material when starting production.

J. (Joe) Clement works out of Edmonton, AB, Canada as director of technical services for Calgary-based CEDA Dredging & Fluid Management. The company has operations throughout Canada and the United States and was involved in the world’s first reclamation of an oil sands tailings pond near Fort McMurray, AB. Clement has more than 37 years of experience in various types of dredging from reclamation work, lake restoration, and environmental cleanup to dredging for minerals, tailings, and marina maintenance.

Bob Wetta is president and chief executive officer of family-owned DSC Dredge, LLC (DSC), based in Reserve, La. He is past president and chairman of the Western Dredging Association’s Board of Directors and a member of the Young Presidents Organization and the Louisiana District Export Council (and a past chairman). Wetta received the Western Dredging Association’s “2014 Dredger of the Year Award.”

Bob Woodington is owner and manager Phoenix Pinelands Corp., a family-owned and operated sand and gravel producer based in Warren Grove, N.J. Phoenix Pinelands is a recipient of the Green Apple Award for Fine Aggregate Sand, awarded by the New Jersey Chapter of the American Concrete Institute and the New Jersey Concrete and Aggregate Association.
Mining in deep water may increase deposit life, but requires significant planning and testing.

As it becomes more difficult to permit additional land to open up greenfield projects, sand and gravel and aggregates operations are increasingly making the decision to dredge deeper. In the last 10 years, companies have discovered they have deeper reserves in areas they have already mined, explains Bob Wetta, president and CEO of Reserve, La.-based DSC Dredge.

CalPortland now has a dredge designed for a depth of 135 feet and Vulcan Materials has a dredge in Florida that was designed to and has achieved 200 feet, although this is atypical. So how does a producer determine whether to abandon an existing site and move to a new location or dig deeper? There are obvious costs to starting up a new operation such as stripping overburden, bringing in utilities, and moving or purchasing new equipment, Wetta says.

“If you can stay at the same site, there are several costs that have already happened that you won’t have to take on again,” he says.

“One cost, though, is critical when deciding whether to dredge deeper or find a new location – geological testing, such as boring analysis and compaction testing. “Think long term, educate yourself, and develop a mine plan,” Wetta advises. “Don’t be afraid of testing. It could be the cheapest information you ever pay for so you don’t spend money on something that won’t work.”

“You could have a great-looking dredge that can produce material, but you’ll have a really expensive water pump, if you can’t dig it,” Wetta says. “If you can double the life of the deposit, you don’t have to look for new land, but you want to make sure you don’t put the dredge in a spot where it has to be moved several times and end up mining around the material instead of mining the material.”

J. (Jos) Clement, director of technical services for CEDA Dredging & Fluid Management in the Edmonton, AB, Canada office, notes that producers/dredging contractors need to carefully examine all physical conditions and process requirements to ensure they have the correct equipment configurations for a deep excavation application. “You can potentially undermine and/or overstress sections that may effectively destroy the viability of the dredge,” Clement says.

“The deeper you go, the more complicated it becomes. You can’t afford to overlook the details.”

Seals on an underwater pump are one example. If the bearing housing seals are not correct and proper lube pressure is not applied, the seals will be destroyed in short order, Clement says. “Then lubricant is lost, putting the bearings at risk,” he says. “All of a sudden, you are contaminating the water because you are losing oil. Little things like this must be taken into account.”

Bob Woodington, owner and manager of Phoenix Pinelands Corp., says, if a producer is going to buy a new dredge, it must be designed for the job. “You can vary the deeper a dredge mines. Initially is extremely important because material can vary the deeper a dredge mines.”

Producers should continually sample material as it is being produced when dredging material in a new area of an existing location or a new site. It will help obtain adequate information to characterize the quality of the material in the project area. If the product remains consistent in the first few days of continuous sampling, the material no longer needs to be sampled every few hours. Initially, consistent sampling initially is extremely important because material can vary the deeper a dredge mines.

In deepwater dredging applications, the equipment is not one size fits all. A dredge needs to be designed to accommodate specific depths. Components such as underwater pumps and ladders must be configured to accommodate outside pressure to which they will be subjected. Improper pump selection could cause its bearing houses to fail, which could potentially allow oil to leak into the water and pollute it. Process conditions, such as how far the dredged material will settle, must also be taken into account when determining the right equipment for the job.

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When it comes to successful deepwater dredging, the devil is in the details. The cost and size of vessels have grown exponentially, making it imperative to work out the process conditions and requirements – such as how far material will be pumped – before proceeding, says Jos Clement, director of technical services for CEDA Dredging & Fluid Management.

Just about 15 years ago, dredging 25 to 30 feet deep was sufficient, Clement explains. Gradually, the dredging depth requirement grew to 50 to 60 feet. Now, dredging at the 70- to 100-foot deep mark isn’t extraordinary.

“With the increase in water caps in tailings ponds, we are having to build equipment to get down below 100 feet,” Clement says, adding that his operation began dredging at deeper depths about a year and a half ago. “Some of the tailings are getting very deep. With tailings and reclamation work, you can’t expand the geographic footprint in a horizontal frame anymore, because getting permits to expand is difficult. Deposits are deep so you have to go deep.”

Before digging deeper, Clement says producers need to understand what they are working with and how deep they need to go. A dredge designed for extracting material at 40 feet isn’t adequate for dredging at 60 or 70 feet.

“The deeper you go, the more conditions change,” Clement says. “Once you go beyond 40 feet deep, Mother Nature doesn’t give much assistance into a dredge pump. Below the 50-foot mark, you need to have some form of ‘jet assist’ or a submerged ladder-mounted pump.”

Clement cautions that a jet assist may provide additional material pick up capability, but it will dilute the slurry and actually reduce the overall dredge efficiency. A ladder-mounted submerged pump is more efficient.

“When you have a ladder pump and you are excavating below 40 feet, the primary item of concern will be the actual ability of the cutter and suction arrangement on the dredge to acquire the desired material. ‘At deeper depths, the ability to get the material into the pump becomes the critical factor for dredge production,’” Clement says.

Designing a dredge to mine material in deepwater is both “challenging and fun” – especially when intended to get to depths of 150 to 200 feet, says Bob Wetta, president and CEO of DSC Dredge.

From a design aspect, safety is very important. “This can be challenging, because the dredge needs to accommodate several things without compromising the stability of the dredge.” Achieving this can be difficult, because dredges are designed where the dredge ladder – a.k.a. the boom – experiences a big shift in the center of gravity because the weight is moving the entire time it is going up or down.

“The long boom, you have deflection in the ladder, so it will sag and bend,” Wetta says. “You have to design around these structural members bending and make sure not to fatigue the beam and jeopardize its useful life. If you start noticing a difference in stability, your flotation tank may have taken on water,” Wetta points out. “You shouldn’t have to watch for that on a properly built dredge.”

Finite element analysis software can be used with the dredge structures to run through worst-case scenarios to tweak as needed during the design process. However, it doesn’t mean the barge can be put in the water and forgotten about.

“There is vibration when mining underwater,” Wetta says. “If you think you’ll run it for years without inspecting bolts, etc., you’ll start seeing things fall off.” Understanding what to inspect on a dredge is all part of the process – a big part – of successful dredging, especially in deep water applications.

“Whether dredge operators are new or pros, mining deeper is different, and dredges are custom pieces of equipment,” Wetta says. “Automation can take a lot out of the hands of operators, but you still need to know how to check and operate the equipment and make sure bad habits aren’t developed.”

The quality of material being dredged can change as the depth increases, making it essential to conduct test boring and look at the history of an area, explains Bob Woodington, owner and manager of Phoenix Pinelands Corp.

“You want to keep going if you are getting valuable material,” he says. “However, you can go from dredging at 90 feet to 125 feet, but it may not be the material you want, so you have wasted money doing it. Digging deeper takes more horsepower to produce material.”

Although initial testing may have been done, Woodington suggests that producers continually sample the material as it is being produced when beginning to dredge at a new site. “You should be sampling the product all day long as it’s produced,” he says. “If the product is staying consistent in the first couple days, you don’t have to sample the material every three to four hours.”

Plotting at a deeper depth helps determine whether dredging deeper makes sense. Depending on what the producer is looking for, such as gravel or coarse sand, the material has to justify digging that deep.

Woodington also notes that having a computer-generated screen that identifies where and how deep dredging has occurred is very useful to monitoring dredge operations, especially in a deepwater environment. Sometimes, Woodington says he will see something on the monitoring system while in his office that he didn’t notice in the field because he was busy focusing on something else.

“If you’re unsure if you dredged an area, you can look back on the computer,” Woodington says. “You want to go to one area to dredge, be efficient, and be done with it. In this business, sand in the water is revenue. If you leave sand behind, you’re leaving money behind.”