

## *Case 24*

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# *Sinkemfast*

*by*

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I. L. Sinkemfast, Inc., is a drilling company that works on Alaska's North Slope. The oilfields have been constructed on ice-rich permafrost ground which is thaw unstable. Since oil is extracted from the formation at 160°F, the various pipelines needed to develop the field cannot be cost-effectively buried. Instead the pipelines are elevated on pilings. Over the next five construction seasons, about 120 miles of new pipelines will be built. About 56,000 pilings with a total value of about \$51M will be let in 5 seasonal piling contracts.

Standard piling installation is to auger a hole 6" larger in diameter than the piling, plumb the piling in the hole, stabilize it with cribbing, backfill the annulus with a sand-water slurry, and then after the slurry has frozen, remove the cribbing. Conventional pile driving with impact hammers does not work in the ice-rich frozen soil, but an engineer known to Sinkemfast has tested a sonic pile driver. The sonic pile driver oscillates the piling at its resonant frequency to liquefy the ice-rich soils at the soil/pile interface. The piling then penetrates the frozen ground. Preliminary testing on 85 piles indicates a man-hour reduction of 80% per piling. The engineer will lease the rig as-is to Sinkemfast for \$3M for a 5 year period. However, the oscillator unit has failed on the average once every 17 pilings. The engineer has told Sinkemfast that investing \$1M in R&D has a 70% chance of curing the problem.

Sinkemfast owns a fleet of 6 auger-type drills. Each one has a market value of \$62,500 and is expected to last three more years, when they will be worn out and worthless. Using this equipment there is a 35% probability that Sinkemfast will win all of the drilling work each season at an 8% profit margin after deducting bidding costs.

Sinkemfast can purchase 4 new air auger drills for \$500,000 each. This drill is faster than conventional augers and will give Sinkemfast a competitive advantage. If the new drills are bought, the old drills will be sold. These air augers will have a market value of \$75,000 each after five years. Using the new air auger equipment, there is a 45% probability that Sinkemfast will win all of the available drilling work each season at a 12% profit margin after deducting bidding costs.

If the sonic pile driver is operational, Sinkemfast estimates a 90% probability for winning all of the available drilling work each season at a 20% profit margin after deducting bidding costs. The existing fleet will be sold when the sonic driver is operational. The useful life of the new sonic pile drivers is unknown, but it is believed to be longer than the 5-year license period.

The state regulatory agency is issuing new regulations that tighten the requirements to remove all facilities when production is finished. How does this affect this decision?

The cost of bid preparation is \$231,000 annually. Sinkemfast uses  $i = 10\%$ . What should Sinkemfast do and why?

### **Suggestions to the Student**

While a decision tree that analyzed each year (win or lose bid) could be developed, it is much easier to use expected values for annual receipts. This also better matches the accuracy of the data and assumptions. The more detailed tree would be useful in analyzing changes in bidding strategies (winning several years in row implies that Sinkemfast can increase its bid price or losing several years in a row implies Sinkemfast should make a lower bid). A decision tree may still be useful for evaluating R&D on the sonic driver to fix its failure rate.