# Remote-Operated Submersible Gold Dredge

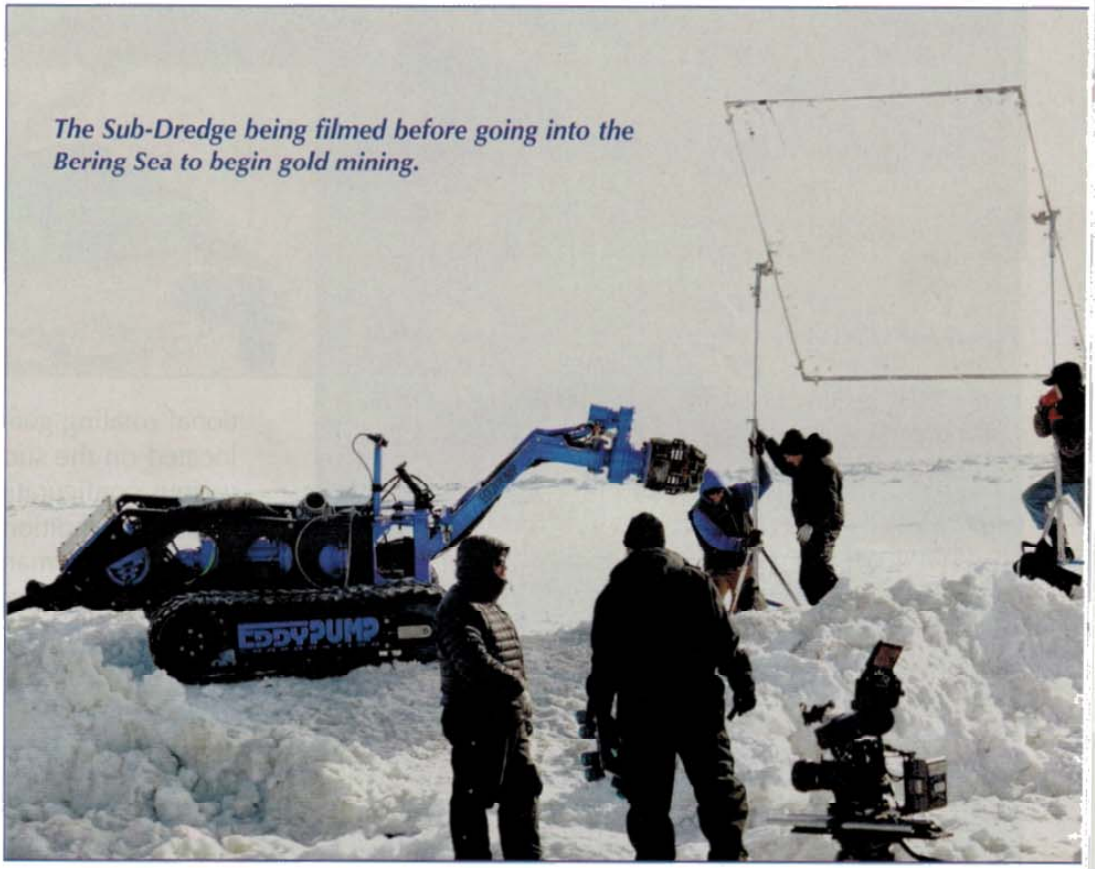
## *Sub-Dredge Becomes First of its Kind as it Mines for Gold in Bering Sea*

**By Ben Weinrib**

For a long time, underwater gold mining has been a very labor-intensive and often low-yielding process. Divers are put into freezing-cold, dangerous waters in order to pump gold-rich sands to make their fortunes.

Currently, the biggest issues stem from the inability to operate at depths greater than 25 ft., the dependency on divers, inefficiency of pumps, and environmental impacts and conditions.

Recently, Eddy Pump Corp., based in San Diego, California, was asked to come out to Nome, Alaska, in order to showcase its gold-mining solution to these challenges on one of the most-watched television shows on the Discovery Channel, "Bering Sea Gold."




*The Sub-Dredge being filmed before going into the Bering Sea to begin gold mining.*

### The Sub-Dredge

For the past 25 years, Eddy Pump has been engineering the development of state-of-the-art pump and dredging technology. The technology has been utilized in a vast number of industries, ranging from the U.S. Navy to oil, mining, dredging, wastewater, chemical and many others.

With such a diverse industry background, Eddy Pump stepped up to the challenge of gold mining via dredging in Nome by sending out the Sub-Dredge. This remote-operated submersible dredge is the answer to pre-existing issues and restrictions that currently plague the underwater gold-mining industry. It was developed in order to go where conventional dredging equipment would often fall short, due to depth restrictions, high operation and mobilization costs, inability to run remotely, environmental impact and lack of sufficient pumping capability.

The Sub-Dredge operates at depths exceeding 125 ft. while safely being controlled by an operator on the surface. Weighing less than 5,000 lb. and being 172-in. long by 62-in. wide and 60-in. tall, the submersible is easily deployable in most applications at a low cost. The weight of the Sub-Dredge is dispersed over large rubber tracks that make it very rugged and able to deal with diverse conditions, while only creating 3.3 psi of ground pressure. This design enables operation in applications with potentially delicate liners, such as concrete-lined canals and clay and poly-lined holding ponds. With such a low ground pressure, the Sub-Dredge is perfect for operation on the ocean floor, without sinking too far into the sand and getting stuck.

Utilizing a remote control, the operator can precisely maneuver and operate the dredge with the utmost accuracy from a safe area on the surface. This is possible with the assistance of GPS and acoustical positioning located on the Sub-Dredge along with high-resolution cameras and high-powered lights. All of this is integrated into an RTK positioning software package. Through this software, the operator


*(Top) The Sub-Dredge being mobilized to the project site on a trailer and pickup truck. (Middle) An aerial view of the mining camp. (Bottom) A helicopter filming the mining operation.*

can easily see the exact position of the Sub-Dredge, while also monitoring the pump's flow rate and rpm and seeing a live video stream of the underwater operations.

Furthermore, the ability of the Sub-Dredge to operate remotely and underwater greatly increases the amount of mining time that normally would be impossible because of bad tidal conditions or an environment of poor visibility.

## Eddy Pump Design

The core of this technology is the patented Eddy Pump. This is the only pump on the market that utilizes the principles of a tornado to create a synchronized eddy current. This pump is not a centrifugal, positive displacement or vortex pump, but instead a highly efficient, high-solids and high-specific-gravity pump. This translates to the ability to pump higher percent solids of material and capture the heavy, specific-gravity gold. At the same time, the higher suction capability creates less turbidity, hence, less material being resuspended in the water column and creating a possible environmental impact.

Based on its design, the pump is virtually clog proof when it comes to rocks or debris jamming inside of the volute. The high tolerance of the pump allows any object up to 3.5 in. to pass directly through without obstruction or harm to the pump. This pass-through ability leads to significantly more mining without shutdown due to clogging.

In order to keep up with the high suction capability of the Eddy Pump and constantly keep it fed with material, a bidirectional rotating guard is incorporated. This rotating guard is located on the suction of the Sub-Dredge and comes with various configurations. In order to deal with different materials and conditions, the basket can easily be modified for optimal performance. For hard-packed material, such as compact sand, digging teeth are easily added to the rotating basket, which then breaks up the material for better pumping production. In conditions where there is a lot of debris or clay-like material that can foul the suction, a comb is

*"The Sub-Dredge became the first remote-operated submersible dredge to gold mine under the ice."*

added that cleans the basket on every rotation, minimizing any suction issues.

## Sub-Dredge in Alaska

At the end of March, the Sub-Dredge was sent to Nome, Alaska, to mine for gold under the 5-ft.-thick ice of the gold-rich waters of the Bering Sea.

Previous to the Sub-Dredge, miners would cut a hole in the ice and send down divers with hoses to operate for short periods of time, while utilizing low-suction, conventional centrifugal pumps. This method would yield on average approximately 5 cu. yd. of material an hour, with divers only being able to operate for at most a few hours until they would have to be changed out because of exhaustion and harsh conditions.

Within a few days of arriving in Nome, The Sub-Dredge was dropped into the Bering Sea to become the first remote-operated submersible dredge to gold mine under the ice. The Sub-Dredge easily began traversing the rocky seafloor and began to pump material immediately.

The Sub-Dredge comes equipped with Eddy Pumps of various sizes. The one utilized in Nome was a 4-in. pump that had a flow rate of 700 to 1,000 gpm.

Due to the high suction capability of the Eddy Pump, along with the strong digging capability of the Sub-Dredge, production rates of up to 150 cu. yd. of material an hour were achieved. Compared to the average of 5 cu. yd. achieved by divers, this was a monumental improvement. With material in the Bering Sea containing up to an ounce or more of gold per cubic yard, huge fortunes are possible with the proper equipment and mining knowledge.

The ability of the Sub-Dredge to travel up to 200 ft. away from the power unit gave it a lot of maneuverability under the ice and limited the amount of dredging stoppage that otherwise would have to have occurred to reposition all of the equipment. This was possible because of the 200 ft. of hydraulic umbilical, which can be extended up to 400 ft. With electric-powered Sub-Dredges, ranges of more than 1,000 ft. are reached.

## Conclusion

After four weeks of operation in Nome, Alaska, the Sub-Dredge can truly be seen as the future in not only dredging, but also underwater gold mining. The Sub-Dredge has the ability to outperform any diver by a production rate of more than 10.

The Discovery Channel has spent countless hours taping the success of the Eddy Pump Sub-Dredge in the field will be seen by millions this September. **ST**

*Ben Weinrib is the executive vice president of Eddy Pump and has been working with the company for more than 10 years. He has a vast array of knowledge in the pump and dredging industry and has been involved with numerous high-profile pump and dredging projects over the years.*