Reduced of a Cable Resistance by Helical-Ridge Type Faring

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Abstract: In order to understand the deep structure of the earth's crust Japan Marine Science and Technology Center (JAMSTEC) has been conducting site surveys in the adjacent seas of Japan using a multi-channel seismic survey system (MCS).

Nippon Marine Enterprises Ltd. (NME), which was established in 1980, operates four research vessels, a deep submersible Shinkai 2000 and three deep ROVs owned by the JAMSTEC. JAMSTEC commissioned NME in 1997 to operate the MCS system and in 1999 one hundred ocean bottom seismometers (OBSs) were added.

The R/V Kairei has installed on board an air-gun system the largest in the world with a 200-liter capacity, and 4000-meter long streamer cables to carry out the MCS reflection surveys. Each gun has a capacity of 4.6 liters and pressure of 140 kgf/cm2 with a total of 8 guns.

In order to do a quasi-3D MCS survey by single streamer cable we needed to expand the distance of the air gun arrays, which is towed on both sides, to 100 m. The air guns on both sides will be shot by flip-flop mode to run two gun arrays at a time. In 1999, we measured the towing width of the gun arrays, which was only 65 m, so at that time we started a program to increase the width of the air gun arrays to 100m.

We cloud expand the air gun arrays to 100m by several ways. I talk about the faring that is one of ways to success our study.

The umbilical cable (diameter: 66mm) is attached the rope (diameter: 10mm) at spiral. It’s called by a helical ridge type faring. The faring is also popularly practiced as decreased the oscillation and the resistance of a cable. We measured the tension of the umbilical cable, which was 600 kg by 4 knot. We needed use some tools to hold up the cable for towing the system. If faring decreases tension, we can reel out the cable for expanded the air-gun arrays, and we can operate the system for safety. The faring is a good implement to decrease the cable's resistance.

A water tank test was carried out, using a 1/2-scale model of the cable and faring to understand the basic characteristics. Our experiment had 7 samples. We tried out an experiment several angles for a water flow. At result, we understood that a spiral rope changed a cable resistance for 3 dimensions.

For the next step, we did a sea trial in September 2002.We attached a rope (diameter: 4mm) on the cable. We measured the tension of the umbilical cable, which was 300 kg by 4 knot. We cloud easily extended a length of umbilical cable by 110m and safety operates.

It is very interesting that the cable resistance is decreased by helical ridge. In the future we will be looking at many ways to decrease the cable resistance.