

approximately ¥1.5 billion and was manufactured jointly by KDD and Mitsubishi Heavy Industries.

Japan's domestic telephone and communications company, NTT (Nippon Telegraph and Telephone Corp.) uses a similar ROV to KDD's. It was produced by POI of the U.S. and costs ¥500 million.

In addition, KDD and NTT use smaller ROVs for other cable-related activities.

ROV technology has not yet advanced sufficiently to take the place of human beings in all intended operations. Manned submersibles are still preferred for many tasks and will continue to be into the future. Thus, advanced ROV technology that will complement new diving and manned submersibles is in demand.

Because of the move to shallow water activities, a one-pressure diving suit, much like International Hard Suits' "Newsuit," is considered necessary in the industry. Made for depths of 50 to 70 m and offering a great deal of mobility, this type of suit could be used by construction foremen and oil drilling company workers who are not divers, as well as by the fishing and shipping industries for inspection purposes and in many other applications.

An advanced intellectual unmanned mining system and an advanced sub-sea high-resolution profiler are currently needed to facilitate research and extraction of newly discovered deep-sea hard minerals in Japan.

Manufacture and Supply

A number of Japanese companies possess submersible technology and manufacturing capabilities, even though they may not presently manufacture such equipment. Such companies include Kawasaki Heavy Industries Ltd., Kowa Co. Ltd., Sumitomo Heavy Industries Ltd., Mitsui Engineering & Shipbuilding Co. Ltd., Hitachi Zosen Corp. and Mitsubishi Heavy Industries.

As demand for submersibles grows in Japan, Japanese corporations which were previously uninterested will become more involved. Recent examples include the large shipbuilding companies, Kawasaki Heavy Industries and Mitsubishi Heavy Industries. These companies have always had advanced submarine technology because of their production of defence-related ships and submarines, but recently, they have become more involved in submersibles: Kawasaki in the ROV

field, with potential in manned submersibles, and Mitsubishi with ROV and the Moglyn tourist submarine.

Instrumentation

Total annual ocean industries instrumentation is estimated at ¥4 billion, of which marine geological surveying equipment and environmental/water analysis instruments earn approximately ¥1.5 billion each in annual sales. Other instruments are considered to account for the remaining ¥1 billion.

Imports account for approximately 70 per cent of the total domestic market, according to industry estimates. Two importers, Toyo Corporation (Toyo Technica) and Hakuto Co. Ltd., collectively hold over 55 per cent of the overall market share. They are particularly strong in the marine geological surveying and ocean/water analysis equipment fields respectively. Other major importers are Shin Nippon Kaiji Co. Ltd. (Fukada Salvage) and Ogawa Seiki Co. Ltd.

There is presently very little research and development being carried out in the instrumentation field. Most end users give manufacturers specifications of instruments that are needed and have them manufactured. Thus, a very small specialty market is created in Japan. The major manufacturers are NEC (NEC Corp., formerly Nippon Electric Corp.), Oki Electronics, Toyo Communication Equipment Co. Ltd., Furuno Electric Co. Ltd., Ushio Inc., Yokogawa Navitec Corporation and Japan Radio Co. Ltd.

The distribution between major categories of end users of research and other instrumentation is approximately fisheries (20 per cent), private surveying and research companies (30 per cent), Marine Surveying Agency (20 per cent), construction related (10 per cent) and Japan Defense Agency, shipyards and others (20 per cent).

Selected Technology Requirements. Future demand will arise in the environmental surveying equipment fields. Most ocean industries-related research equipment being used on ships must possess anti-corrosive, anti-rust and anti-shock qualities. Such equipment is in great demand by research related end users.

Night diving instrumentation for tourist submarines is also being sought because of plans by tourist submarine operating companies to add underwater night excursions to their attractions.