

30 YEARS INNOVATION IN ACOUSTIC NAVIGATION AND SONAR SOLUTIONS

Sonatech Underwater Acoustic Products

Sonatech was founded in 1973 as a member of the Channel Industries family of companies, now Channel Technologies. In the thirty years since, it has evolved into a leader in the design and development of underwater navigation and sonar equipment for the US Navy and other US and foreign government, research and military customers.

Channel Industries, a developer and manufacturer of piezo-electric ceramic materials, had by 1973 already established a sister company, International Transducer Corporation (ITC), to develop underwater acoustic transducers utilising these materials.

In establishing Sonatech, Channel took the next step in a logical technological progression by adding underwater electro-acoustic and mechanical systems expertise. The Channel family now had the capability of manufacturing end-user equipment and systems from the ground up, meeting customer requirements in the areas of electro-acoustic performance, effective mechanical design, long-term corrosion resistance and pressure proofing, and long-life self-contained power sources.

In the present company structure, Channel Industries, along with ITC, Sonatech and three additional sister companies form the Channel Technologies Family. The other companies are Harris Acoustic Products, Electro Optical Industries, Inc., and Channel Products.

Company Background

Messrs. Reg Cyr and Sam Stein, selected by Channel to start and run the company, had been involved from the earliest days in developing underwater communications and technologies to produce free standing self-powered underwater acoustic transmitter/receivers.

In the 1960s they had participated in communications equipment design for the SeaLab 2 Man in the Sea programme and Jacques-Yves Cousteau's underwater vehicle, Soucoupe. They were also part of the team that developed the first underwater electro-acoustic transponders used in ballistic missile scoring.

In the course of electronics design for these projects, Mr Cyr co-developed an acoustic receiver capable of maintaining high sensitivity and low false alarm rate in changing noise conditions. This so-called Constant-False-Alarm-Rate (CFAR) receiver is protected by a patent shared by Mr Cyr and the other developers; it has provided the performance of Sonatech receivers for more than twenty years.

By 2001, Reg and Sam had retired after nearly thirty years at the helm and a new team taken responsibility. Mr John Fumo, earlier an engineer with the company, became Chief Executive Officer, and Mr Mike Ornøe became President. As staff engineer for Honeywell, Mr Fumo had previously led the system and software design teams in developing an AMLCD flat-panel display system for the MEDS Space Shuttle cockpit upgrade programme, Space Shuttle-Atlantis. He later went on to found Trisys, Inc., working in various technologies including aerospace and underwater electronics and data processing.

Mr Ornøe, as Division Manager for the MariPro Operation of SAIC (now Nautronix MariPro), led design efforts for the underwater tracking ranges at SCARF, PMRF, AUTECH, AFWTF and Onslow Bay Range.

Evolution of Technology

Long-Baseline Acoustic Navigation

During its first ten years, Sonatech focused its efforts on long-baseline navigation equipment and systems and became the exclusive supplier of deep-ocean tracking range transponders to the US Navy Strategic Systems Program (Polaris, Poseidon and Trident) and the US Strategic Air Command (MX Peace-keeper). Hundreds of Sonatech transponders have been deployed in missile impact range arrays in the Atlantic and Pacific Oceans.

Later developments from this technology included Doppler units, which transmit a sustained signal at a precisely controlled frequency for velocity tracking. Sonatech also developed air-launched transponders and submarine and DSRV-launched transponders. A number of new designs evolved from these products and their applications, including a line of CTFM transponders and the AN/BQN-13A Submarine Distress Pinger.

By 1985, Sonatech had integrated its long-baseline technology in a computer-controlled system that combined long-baseline solutions with other technologies, including inertial, Loran and satellite; to provide position fixes for primary and secondary platforms. Users have included ocean engineering, research, government and military entities in the US and abroad. Among these are the US Naval Oceanographic Office, US Navy Strategic Systems programme, US Navy Deep Submergence Program, Naval Ocean Systems Center - San Diego, US Navy Oceanographic and Atmospheric Laboratory, US Geological Survey, Metal Mining Agency of Japan, German Deep Ocean Research Group, and Hokkaido University.

SSBL Systems

In 1983, Sonatech developed a SuperShort-BaseLine (SSBL) system for submarine tracking in areas without transponder arrays. The

system exceeded range and bearing accuracy requirements and the technology has continued to be refined in a number of new designs.

Sonar Systems

Sonatech began developing sonar system technology in the 1980s, in 1994 being selected to develop Obstacle Avoidance Sonar (OAS) for US Navy SEAL Delivery Vehicles to ensure safe transit and navigation in challenging underwater environments. Sonatech has continued to furnish all production systems to date and is presently retrofitting units with a processor upgrade offering features such as a colour-mapped display.

In 1998, Sonatech delivered side-looking sonar designed specifically for an application requiring extremely high-resolution where only a very small aperture could be used. The array is 15 inches long and all sonar electronics fit in an 8 inch OD by 10 inch long housing, allowing use in a 9 inch UUV. The high operating frequency (1 MHz) initially limited range to approximately 40 metres; within this limit, the unit produced extremely high-quality, high-resolution images over its coverage range. Recent implementation of pulse-compression technology has extended range to 60 metres.

In addition to other sonar systems, Sonatech has designed and delivered all sonar used in the Engineering Development Units (EDUs) for the AN/BLQ-11 Long-Term Mine Reconnaissance System (LMRS). These consist of a forward-looking sonar, side-looking sonar, homing and docking sonar, and acoustic communication link.

Plant and Location

Sonatech is presently located in a 47,000sq-ft. engineering and manufacturing facility on the main Channel Technologies campus in Santa Barbara, California. Channel Industries, International Transducer Corporation and Electro Optical Industries, Inc., are also located on the campus, allowing close co-ordination of efforts when necessary. The facility is classed as "cleared"™ through the Department of Defence, capable of performing on classified efforts for the government or as a subcontractor to other cleared facilities.

Staff

The Sonatech staff of 93 consists of professional, technical, manufacturing and support personnel with a broad range of experience in underwater acoustics and oceanography as well as in engineering, software development and manufacturing. Essential to the operations is a highly experienced group dedicated to the design, development and manufacture of unique transducers used in the equipment. As required by specific programmes, transducer design may utilise prototyping and computer analysis with the ATILA finite element analysis or CHIEF boundary element method programs. With immediate access to acoustic tanks for testing prototypes, we are able to develop designs very rapidly for specialised, highly demanding requirements.

Manufacture and Testing

The facility includes mechanical, electronic and acoustic development, manufacturing and test capabilities for a wide range of technical disciplines. A machine shop offers complete production facilities, including CNC and conventional milling and turning, sheet metal fabrication, welding and bonding. Testing facilities include two acoustic test tanks, with cranes capable of handling systems weighing up to 2,000 pounds, and a hydrostatic vessel for pressure testing to 10,000 psi. The location also offers convenient access to excellent field test areas off the Santa Barbara and Goleta piers and in the Santa Barbara Channel.

Markets

Sonatech has historically served an international market including customers in Japan, Germany, Israel and Brazil. Currently, however, efforts are directed primarily towards US Navy projects.

Current and Future Developments

At present, Sonatech is engaged in research into, and testing of, transducer materials, development of extreme-accuracy SSBL technologies and systems and technological innovations extending the range and otherwise enhancing the performance of forward and side-looking sonar. In addition, homing and docking systems are being developed utilising various methodologies.