PDM CASE STUDY:

BACKGROUND:

An operator designed the technology for a subsea sensing probe, and required that the probe operate in an environment that could range from 1000m subsea to a potentially explosive splash zone.

PROJECT CHALLENGES:

- In order for the sensing probe to work effectively, there were some areas of moulding that had to be kept to a thickness of 2mm.
- The moulding needed to be extremely complex to provide all of the features to both position the sensing probe parts and provide location points for mounting.
- A material had to be sourced with a Relative Thermal Index figure that would allow the probe to be used in a potentially explosive atmosphere.

PDM'S CONTRIBUTIONS:

- Sourcing and working with a new polyurethane material.
- Development of a vacuum moulding technique that would enable consistent production of complex mouldings.
- Sizing of the mould to accommodate differing shrink ratios at different points in the moulding due to differing wall thicknesses.

THE SOLUTION:

A completely encapsulated sensor probe which could be easily mounted by the customer in its final destination using the moulded features.

"We originally contacted PDM with regard to the supply of wet-mate connectors. On understanding their full scope of capabilities we embarked upon a product development programme where we could take full advantage of PDM's offshore pedigree and knowledge in a fully collaborative design and development programme.

The resultant fully moulded and potted sensor assembly met both the subsea environment requirements and that required to enable correct operation of the sensor".

- Offshore oil operator

Global Presence

Teledyne Marine is a global organization with manufacturing facilities and service and test centers around the world. Teledyne Marine delivers innovative engineered solutions, materials, science expertise, and integrated team support.

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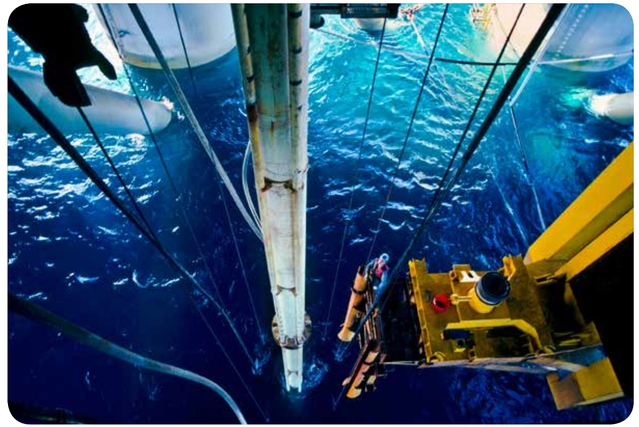
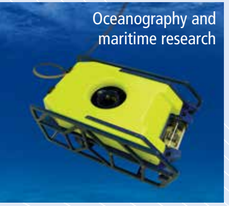


CONNECTORS, CABLE ASSEMBLIES AND ENCAPSULATION AND MOULDING SOLUTIONS FOR DEMANDING ENVIRONMENTS

TELEDYNE IMPULSE-PDM
Everywhereyoulook™

Markets Served



TELEDYNE IMPULSE-PDM

MARKET LEADERS IN SUBSEA PRODUCTS AND SERVICES

Teledyne Impulse-PDM (PDM) has served the underwater market since 1984, and evolved into an established supplier, designer, and manufacturer of products for the defence, commercial, and scientific industries. PDM's application engineering service helps clients to identify precise requirements in a broad range of subsea interconnect applications.

The engineering team has developed interconnect solutions using core skills in mechanical design, electrical and optical engineering, and the selection and use of materials for underwater applications, such as:

- Encapsulation and moulding using polyurethanes, polyethylenes and epoxies
- Design, development and manufacture of harnesses
- Custom cable design and supply
- Point-of-use polyurethane moulding services
- Bespoke wiring capacity including intricate wiring to PCBs

PDM PARTIAL CLIENT LIST

- Thales
- Western Geco
- GE
- Divex
- Qinetiq
- Wärtsilä
- VT Group plc
- Dstl
- National Oceanography Centre Southampton
- SMD Hydrovision

TELEDYNE MARINE
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Teledyne Impulse-PDM is a member of Teledyne Marine.

CONNECTORS AND CABLE ASSEMBLIES

PDM is the European support facility for Teledyne underwater connectors. This range of connectors is the most comprehensive in the industry. The connectors have served in the harshest environments. PDM's extensive experience in harness design ensures that all critical parameters are taken into account when a harness is manufactured.

Wiring Services:

- Soldering and assembly of all types of connector and cable applications
- Loom forming for a wide range of equipment and enclosures
- Intricate wiring to all PCBs including surface mount
- Specialist wiring of high density small connectors

BEND RESTRICTORS

Bend control is an essential consideration for any application where a cable is terminated to a rigid component. This interface is where the cable can be subjected to excessive mechanical loading that can result in cable damage, and ultimately lead to cable failure. PDM can offer considerable expertise in solving bend control issues, with over 15 years of experience covering a broad range of bend control products.

FIBRE OPTICS

Fibre optic technology is widely utilized in offshore and harsh environment application in order to satisfy the demands for increased bandwidth and communication speed. PDM has specifically addressed this market with its range of low loss fibre optic and hybrid connectors and penetrators. Custom units can also be produced for clients.

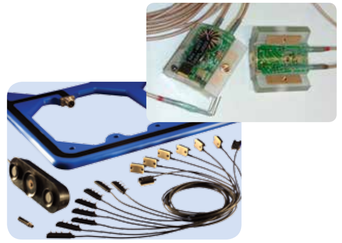
TELEDYNE IMPULSE-PDM OFFERS A WIDE RANGE OF TESTING SERVICES, INCLUDING:

- Electrical
- Tensile
- Pressure
- Mechanical
- Temperature cycling and annealing (in a specially designed 3.8 metre long oven)

All testing procedures carried out in-house are documented. There is also a clean electrostatic area in a stand-alone secure unit, which is ideal for electronic assembly and moulding.

ENCAPSULATION AND MOULDING

PDM has developed techniques and elastomers for all aspects of encapsulation and moulding. Products can be processed under vacuum, pressure, or open cast. PDM also supplies a range of polyurethane elastomers in pre-packed sachet format with support primers and release agents.



COMPACT QUICK CURE MOULDING SYSTEM (QMS)

The Compact QMS is portable and easy to use (minimal training for operators), and prevents expensive downtime for cable repairs or maintenance. Uniform heat distribution is achieved within the mould, which is an essential factor in producing repeatable quality mouldings. The Compact QMS reaches moulding temperature in 12-15 minutes, and has a typical de-mould time of 10 minutes. It is suitable for any cable installation up to 12mm in diameter which is costly or difficult to remove for maintenance and repair.

Product Features:

- A single slot, custom mould heating block
- A hotplate, digital thermometer and temperature probe
- Mould separation tool and removal drift

DESIGN AND DEVELOPMENT

PDM has a substantial and proven design and development capability. It can offer an independent design service or work in collaboration with clients or subcontractors. PDM is involved in a broad range of design areas including connectors and harness assemblies, penetrators, cable jointing, moulding, encapsulation, bend control, and fibre optics.

Current and past projects include:

- Navigation buoy electrical cubicles
- Special underwater electrical (including high voltage) connectors
- Water blocked penetrators
- Polyurethane encapsulated sensors and transducers
- Submarine communication cable assemblies
- Underwater cable bend control devices
- Cable strain termination