Decommissioning Services and Cutting Capabilities

TOTAL MARINE TECHNOLOGY

www.tmtrov.com

Contents

Decommissioning and Abandonment

Our subsea well abandonment and field decommissioning capabilities include removal of subsea infrastructure, down-hole plugging of the well and environmentally safe operations including:

- Well suspension
- Flowline flushing
- Well kill
- Plugging and abandonment
- Wellhead removal
- Conductor cutting
- Platform decommissioning
- Pile cutting
- Project Management and Engineering

Our suite of tools has a proven track record for performing subsea well abandonment and decommissioning. The equipment can be deployed on drill pipe from a conventional drill rig or on wire from a mono-hull vessel of opportunity. This can offer significant cost savings when compared to rig-based solutions. The higher availability and faster mobilisation/transit times of mono-hull vessels adds to operator convenience and cost benefit.

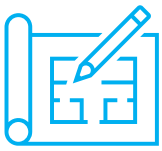
Product and Services

Standard Tooling

Rotary Cutters, Diamond Wire Saws (DWS) for external cutting of pipelines, umbilicals, risers, flowlines, etc.

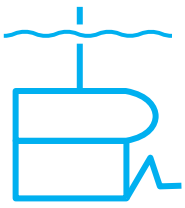
Specialty Tooling

Tools are designed in-house, and we are continually expanding their capability to meet clients' requirements: Axe waterjet cutter, Cement Injection Tool (CIT), Subsea Top Drive, Hydraulic Flange Connector, Hot tap tool.



Bespoke Tooling & Engineering

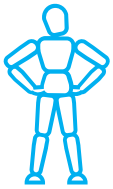
TMT engineers can provide bespoke tooling and tooling modifications to suit a specific project scope. Design, prototype develop, manufacture, assembly and testing are all done by our in-house team.



Integration with ROV Services

Total Marine Technology are experienced ROV operators and can provide full ROV equipment, crew and tooling to support a project. Ranging from hot stabs to torque tools, gauges to ROVs, TMT has developed an extensive range of over 600 tools for oil & gas, with a comprehensive suite of tools readily available.

TMT Advantage



Dedicated Personnel

Our engineers, technicians and supervisors are full-time employees who operate the equipment offshore, maintain the equipment onshore and are involved in the design, assembly and testing of new tooling in our dedicated facilities.

Track Record

TMT has an enviable track record for providing state-of-the-art decommissioning tooling and services dating back over 20 years.
Real people, our own real equipment, and real experience; here and now.

Regional Support Bases

Total Marine Technologies has well equipped workshops and offices in the following locations:

- Perth, Australia
- Kuala Lumpur, Malaysia
- Labuan, Malaysia

Local Content

In Malaysia and Australia, the crew and equipment contribute to project local content requirements. Having local crew with appropriate visas and reduces project risk.

Health, Safety, Environment, Quality

- Platinum safety award winners
- ISO certification
- Ongoing equipment improvements to enhance performance and safety.

Tooling Specification Sheets

Tooling specification sheets can be downloaded from our website: www.tmtrov.com.

Talk to our engineering and assets team for availability & latest updates. From the website you can download or request a copy of the tooling handbook which details the full range of TMT tooling.

Some key spec sheets for decom and abandonment are listed below

Standard Tooling	Specification Sheet
16” Diamond Wire Saw	TMT-NSS-317
24” Diamond Wire Saw	TMT-NSS-544
30” Diamond wire saw	Call for details
900mm Chop Saw	TMT-NSS-084
9” Multipurpose rotary tool	TMT-NSS-001
4” Dredger	TMT-NSS-325
6” Dredger	TMT-NSS-326
18-3/4” Connector Override Tools	TMT-NSS-028
Specialty Tooling	**Specification Sheet**
AXE Abrasive Cutting System	SWS-SP-0060
Cement Injection Tool	SWS-SP-0059
Subsea Top Drive	SWS-SP-0058
4” Collet Connector Mechanical Override Tool	TMT-NSS-022
AM1 Valve Hole Cutting Tool	TMT-NSS-023
AM1 Valve Insert Gripper Tool	TMT-NSS-024
Tree Cap Drill	TMT-NSS-030
Hydraulic Re-entry Flange Connector	TMT-NSS-058
½” Hot Tap Tool	TMT-NSS-506
7” Hot Tap Tool	TMT-NSS-516
IWOCS Reelers, umbilicals and controls	Call for details
2” 5000 psi Black Eagle hoses – on offshore reelers. 600m length	Call for details
Umbilicals – 14 x 15k hoses; 8 x 2.5mm^2 copper. 800m length	Call for details

Standard Tooling

DIAMOND WIRE SAWS

For external cutting of pipelines, umbilicals, risers, flowlines, etc.

Cut Diameter: 16” – 40” (400 – 1200 mm)

Diamond Wire Saws (DWS) are used to cut medium diameter structures. The tool clamps to the structure using the front mandibles. Then a moving abrasive wire is fed into the structure, removing material proportional to the applied speed and feed rate.

DWS are moderately easy to transport, setup, and deploy. They require trained personel for operation and maintenance and can be powered from a surface power unit or from an ROV.

DWS are most suitable for cuts above seabed, with good access all around

ROTARY CUTTERS

Compact circular saws, grinders, and drills

Blade Diameters: 9” – 36” (220 – 900 mm)

Rotary cutters are used to cut small diameter structures. They typically consist of a diamond toothed blade mounted on a rotary hydraulic drive spindle. Some of the tools can clamp to the structure, with blade fed into the cut. Smaller tools can be manually pressed against structure to cut.

These tools may be operated by existing diver or ROV crew.

Rotary cutters are rugged, versatile tools that can be used for range of applications

DREDGERS

For clearing seabed to allow access to structures

Diameter: Up to 4”
Suction flow: Up to 4000 Lpm
Solids removal: 40 t/hour

Dredgers are used to breakup and move seabed mud, sand and gravel, clearing access for external cutters. They range from small manipulator mounted units to large ROV mounted skids.

TMT have a range of dredgers available and can advise dredger configuration most suitable for project seabed conditions.

FST/SSB OVERRIDE TOOL

For assisting release of seized well head connections

Jacking force: 125 t per unit

Collet override tools assist in releasing seized or disabled connection collars. Capable of externing 250 t of force when used in a pair, these tools can be placed around existing SST or FSB override rods.

Each tool consists of twin 3-stage hydraulic cylinders which apply the pressure and can be easily installed or operated by ROV or dive crews as required.

Specialty Tooling

CEMENT INJECTION TOOL

For recementation of casings and inserting abandonment plugs

Operating pressure: 15000 psi

Casings: 9”

Cement plug: ±100 m

Cement Injection Tool (CIT) is a combination, disposable, isolation, squeeze packer and casing perforating system. It enables the perforation of production casing, monitoring and control of annular pressure and, if required, recementation of the production casing annulus and placement of an abandonment plug in the casing itself.

The tool has two main components including an upper and lower subassembly, each comprising dual packers and perforating units. The subassemblies are interconnected by a lifting wire and hydraulic umbilical. A hydraulic umbilical connects the tool to surface controls, the length of which is determined by the plug requirement depth.

AXE ABRASIVE CUTTING TOOL

For cutting multiple-casing strings

Casings: 7” to 36”

Operating pressure: 14,000 psi

The AXE system is used to sever multiple casing strings below the mud-line.

AXE uses ultra high pressure grit-entrained water to cut steel, cement and anything else in its path.

The tool cuts up to four casing strings (plus centralisers and control lines) from inside the well bore in a single pass.

The tool can be run on wire or drill pipe

Multiple connector options available.

Typical cut times from 1 to 4 hours

IWOCS SKIDS, REELERS AND UMBILICALS

For pressurised power used in intervention works

30 x lines @ 3500 psi
2 x lines @ 10000 psi
4 x accumulators

The Intervention & Work Over Control System (IWOCS) skid is a self-contained High Pressure Unit (HPU) providing 30 independently controlled lines to 3000 psi and 2 lines to 10000 psi.

The IWOCS unit has five independent air driven pumps. There are two 3500 psi pumps, two 10000 psi pumps and one 500 psi filtration pump. Four 11-gallon accumulators assist the 3500 psi pumps. Each circuit has complete double block and bleed functionality. The IWOCS unit has a proven track record on many intervention and work over campaigns.

HYDRAULIC RE-ENTRY CONNECTOR

For re-establishing access through the flowline connection flange to the subsea trees

Flanges up to 12” API
Flange Connection MWP: 5000 psi
Actuation MWP: 3000 psi

The TMT hydraulic re-entry flange connector can be used to re-establish access through the flowline connection flange to the subsea trees, or other subsea infrastructure.

Using ROV tooling, the flange bolts can be cut, the flowline disconnected, and the Hydraulic Re-entry connector installed. The connector is fitted with isolating valves and a hot stab to allow controlled access to the flowline

The tool connects hydraulically and is mechanically locked on.

SUBSEA TOP DRIVE (SSTD)

For retrieving Internal Tree Caps and Tubing Hangers

Torque: 10 kN
Lift: 300 tonne

The TMT Subsea Top drive can retrieve both Internal Tree Caps and Tubing Hangers, which require a torque to be applied, normally via drill pipe from a rig. This tool was specially developed to assist in rigless abandonment of subsea wells.

Providing 10 kN torque and 300 tonne lift, this tool can be used to unlock the Well Tubing hangers and recover the upper section of tubing to the rig, and may be run on wire, allowing parallel activities to continue.

HOT TAP TOOLS

For tapping into pressurised lines

Clamp and punching pressure: 10,000 psi
Control pressure: 3000 psi
Hydraulic control flow: 14 Lpm

Tools that allow hot tapping into pressurised lines from ½" to 7" for flushing, dewatering, bleed-off, control, cementing. The tapping is done without introducing any swarf into the pipeline.

Bespoke Tooling

Specialised tooling can be developed to meet the specific challenges of a campaign. Below tools are examples of tools supplied to a client who was on a critical timeline, decommissioning 30+ year old wells. Using information from hand decades-old hand-drawn diagrams, these tools were designed and built to overcome seized tree connectors and corroded valves.

AM1 VALVE HOLE CUTTING TOOL

For opening seized subsea tree needle-valves

Cutting Head Diameter: Ø50 mm
Feed Depth: 56 mm total
System Pressure: 207 bar

The TMT AM1 Valve Hole Cutting Tool is used to open subsea tree needle-valves that have deteriorated to the point where they can no longer be operated. This sometimes occurs during abandonment operations.

The Valve Hole Cutting Tool cuts through the valve actuator, allowing the valve stem to move freely, enabling the valve to be opened by applying hydraulic pressure underneath the stem of the valve.

AM1 VALVE INSERT GRIPPER TOOL

For removing valve inserts from needle-valves on subsea trees

ROV Interface: Ø19 mm (¾") T-Bar Handle

Depth Rating: Unlimited

The TMT AM1 Valve Insert Gripper Tool is designed to remove the valve insert from the needle-valves on subsea trees.

The Gripper Tool has a threaded actuator attached to the ROV handle. The actuator is driven underneath a wedge that expands to grip the valve insert. As the actuator and the wedge are linked together, when the handle is wound out, the gripper releases the insert, allowing the valve insert to be reinstalled.

Grippers are easy to transport, setup, and deploy. They can be operated at any depth using an ROV.

TREE CAP DRILL

For drilling holes to aid in release of tree caps

Drill Dia.: 50 mm
Drill stroke: 94 mm
Hydraulic Pressure: 3000 psi
Hydraulic Flow: 20 L/min Total

This tool was designed for trees where the collet ring was not accessible for jacks, and the hydraulics release had failed.

The Tree Cap Drill is used to drill three 50 mm diameter holes underneath the actuating ring of the tree cap.

Lifting hooks can be inserted into the holes to release the tree cap.

4" COLLET CONNECTOR MECHANICAL OVERRIDE TOOL

For raising the locking ring inside the flowline connector to release the connector

Max. Pressure: 700 bar (10,000 psi)
Cylinder Stroke: 152 mm (6")
Connector Stroke: 89 mm (3.5")

The 4" Collet Connector Mechanical Override tool is used to actuate the collet when the hydraulic release mechanism has failed.

The override tool interfaces with the two 1" mechanical override rods that protrude from the top of the flowline connector. It uses two hydraulic cylinders to raise the locking ring inside the flowline connector and release the connector.

The tool is designed to replace diver-operated tools, allowing a greater force to be applied to the mechanical override rods than was previously possible. The tool can be modified to suit customer requirements.

Track Record

The table below lists projects involving subsea abrasive jet cutting operations since 2002:

For the most recent campaign, TMT completed a major upgrade of the Axe cutting tool, adding a remote-control station to improve operator safety, and a new centraliser and nozzle extension to accurately cut large 2.6 m diameter piles. In this campaign, 28 high-quality cuts were completed, saving months of dangerous diver operations.

Year	Location	Operator	Water Depth	Casing Configuration (inches)	No. of Cuts	Cut Type	AXE	CIT
2019	Sikka Port, Jamnagar, India	Reliance	17 m	2650 x 25; 2150 x 25; 1650 x 25 Pile removal for jetty construction	28	Pile	✓	
2017	Browse Basin	Shell	168 m	30 x 20 x 13-5/8 x 9-5/8 Wellhead severance	3	Cameron Spool / GE H4 / FMC H4 / Drilquip H4	✓	
2017	Browse Basin	Shell	260 m	30 x 20 x 13-3/8 Wellhead severance	1	Cameron Spool	✓	
2017	Browse Basin	Shell	260 m	30 x 20 Wellhead severance	2	DrilQuip H4	✓	
2017	Browse Basin	Shell	266 m	30 Wellhead severance	1	DrilQuip LP Housing	✓	
2011	Timor Sea	PTTEP	120 m	30 x 20 x 13-3/8 x 9-5/8 Wellhead severance	16	Cameron Spool	✓	
2009	Timor Sea	ConocoPhillips	100 m	30 x 20 x 13-3/8 x 9-5/8 Wellhead severance	5	Cameron Spool	✓	✓
2008	NW Shelf	Woodside	80 m	30 x 20 x 13-3/8 x 10-3/4 Wellhead severance	3	FMC 5K	✓	
2008	NW Shelf	Woodside	160 m	30 x 20 x 13-5/8 x 9-5/8 Wellhead severance	3	Cameron Lo-Torq	✓	
2006	Vietnam	Total	50 m	30 x 20 x 13-3/8 x 9-5/8	2	SS-10	✓	✓
2006	Vietnam	Total	50 m	30 x 20 x 13-3/8 x 7 Wellhead severance	3	SS-10	✓	✓
2005	Timor Sea	Nexen	38 m	13-3/8 x 20 Platform Decommissioning	5	Platform Wellhead	✓	
2005	Timor Sea	Nexen	38 m	20 x 30 Platform Decommissioning	3	Pile	✓	
2004	Mumbai High	ONGC	30 m	48 x 52 Platform Decommissioning	3	Pile	✓	
2004	Mumbai High	ONGC	60 m	48 x 52 Platform Decommissioning	3	Pile	✓	
2004	Mumbai High	ONGC	90 m	48 Platform Decommissioning	3	Pile	✓	
2003	NW Shelf	Woodside	70 m	30 Wellhead severance	1	SG1	✓	
2003	NW Shelf	Woodside	70 m	30 x 20 x 13-3/8 Wellhead severance	2	SG1	✓	

TMT Facilities & Capabilities

Australia

TMT's 'Engineering Centre of Excellence" in Perth Western Australia has more than 30 engineers and comprehensive manufacturing, testing, maintenance, and storage facilities.

- Office space 750 m^2
- West workshop 1500 m^2
- East workshop 1410 m^2
- Client storage 500 m^2
- Assets/logistics 725 m^2
- Forklift trucks 1.5T, 3T, 7T
- Machine shop
- Hydrostatic pressure testing
- Hydraulic and electrical clean rooms
- Electronics lab
- Aluminum & steel fabrication bays
- 60,000 L test tank

Malaysia

Our Malaysian branch supports several TMT ROV operations in the region. The office provides improved communication with local clients and better support for ROV crews and has comprehensive fabrication, testing, maintenance, and storage facilities.

- Office space 400 m²
- Workshop 1700 m²
- Yard 12,000 m²
- 15 t forklift
- Onsite tooling and spares
- ROV crews
- Aluminum and steel fabrication
- Electrical and electronics lab
- Hydraulics service and testing
- Engineeirng and operations office

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