Marginal Project Development

A case study of the
MC-66 / OCHRE Project

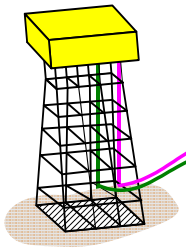
Richard Weser

MC66 OCHRE
Joint Venture Project

MARINER ENERGY, INC.

STONE ENERGY

OCHRE PROSPECT DEVELOPMENT
Mississippi Canyon 66
1 Gas Subsea 7.9-Mile Tieback to Taylor Platform in MC 20



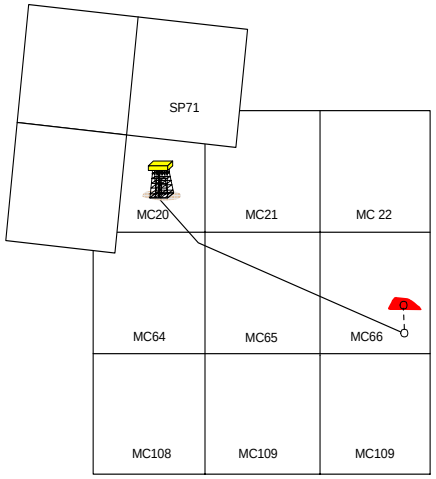
TAYLOR PLATFORM
MC 20
475' WD

TABLE 1 WELL INFORMATION	
Initial Production (approx)	15 MMCFD
Initial Yield	Nil
BHT (^{o}F)	125
Initial BHP (psia):	3,234
Reservoir Depth (TVD SS)	5,918
Water Depth:	1144 feet

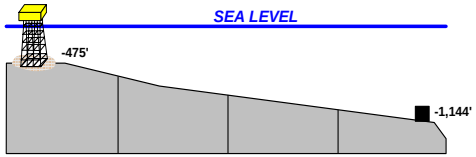
TABLE 2 SUBSEA TREES	
No. of Trees:	1 Subsea Tree
Manufacturer:	Cameron
Type:	Horizontal
Size:	4" x 2"
Pressure Rating:	10,000 psi
Control:	Multiplex

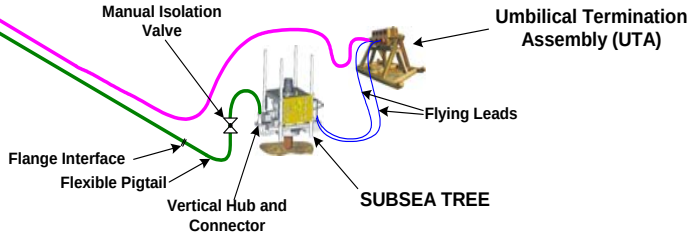
Umbilical

7.9 Mile 3-1/2" Flowline



Plan View - Development Plan Mississippi Canyon





REV	DATE	BY	DESCRIPTON	CHK	ENGR	APPR	CLIENT
001	5/07/2003	KAW	Text Correction (Umbilical)	KAW	KAW	KAW	KAW
N/C	4/25/2003	KAW	First Release	KAW	KAW	KAW	KAW

Ochre_Rev01.vsd

MARINER ENERGY, INC.
Houston, Texas

PROJECT NO:		
DESIGNED BY:	Karl Winter	April 25, 2003
DRAWN BY:	Karl Winter	April 25, 2003
CHECKED BY:	Karl Winter	April 25, 2003
APPROVED BY:	Karl Winter	April 25, 2003
SCALE:	NONE	DATE

OCHRE PROSPECT
Mississippi Canyon 66

DEVELOPMENT CONCEPT

DWG. NO. OCHRE - 001 REV 001

Profitable Development of Marginal Deepwater Prospects Demand…

1. Innovative Solutions to Reduce Cost

2. Cost Containment Strategies:
   - exceed budget → little or no profit, 'capital recovery' at best
   - commercial engineering – lump-sum, shared incentives
   - make careful technology choices with good recovery options

3. Careful Risk Management:
   - leverage 'proven' technology extensively
   - borrow, 'steal shamelessly'
   - gradual implementation of 'new' technology
   - be aware that the vendor's risk profile is different than the operator's

Four Operations Conducted From Mono-hulled MSV's:

1. **Plug & Abandonment** of subsea wells
2. Installation of a subsea tree
3. Recovery of a preinstalled umbilical
4. Recovery of Jumpers,Flying Leads,PLETS, and UTA's

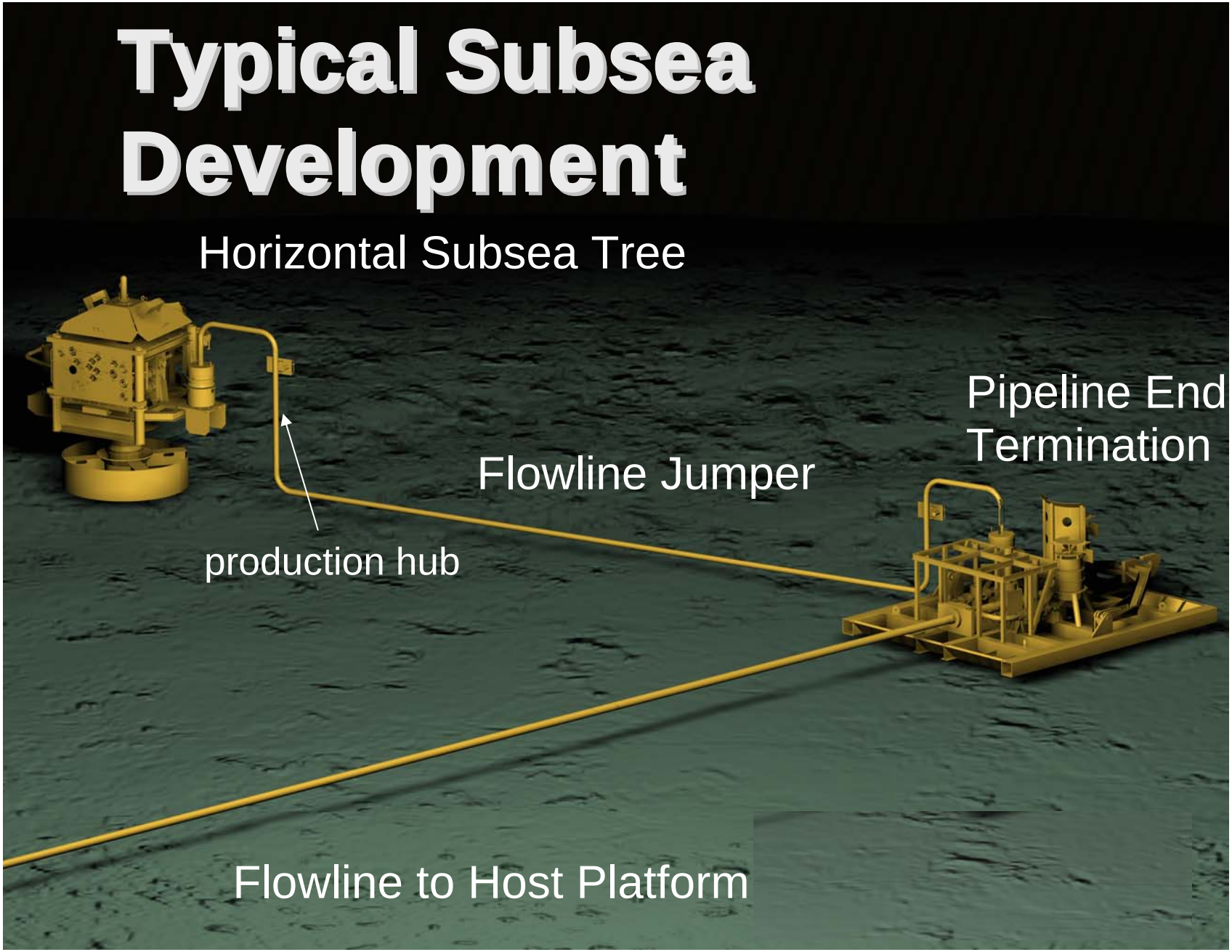
Case Study 1:

Plug & Abandonment of Subsea Wells with Horizontal Subsea Trees from a Mono-hull Multi-Service Vessel.

- A precedent for the Gulf of Mexico.
- Accomplished via wireline intervention from MSV.
- Total cost: $1.8 million per well (3-well lump-sum)
- Savings: $1.5 million per well (vs. semi-sub rig).

Subsea Well P&A:

- Traditionally conducted from a drilling rig on a moored semi-submersible vessel.
- Water Depth: 750 feet to 1,100 feet
- Performed by 254 ft DP-2 MSV with 60 ton A-Frame over moonpool.


Typical Subsea Development
Horizontal Subsea Tree
Pipeline End Termination
Flowline Jumper
production hub
Flowline to Host Platform

General P&A Procedure (1)

1. Bleed down flowline & disconnect flowline jumper.
2. Install IWOCS to control the tree. Check tree functions.
3. Connect coiled tubing to the production hub on the subsea tree.
4. Kill well and establish injectivity via production hub.
5. Pump cement plug into producing zone and allow plug to set.
6. Leave cement in the tubing.
7. Hydro-test the plug.

General P&A Procedure (2)

7. Re-enter the well. Pull debris cap. Pull internal tree cap.

8. Install **Subsea Intervention Lubricator System** (SILS) on subsea tree. Pull tubing hanger plug.

9. Perforate tubing and casing and set intermediate plugs as required.

10. Cut tubing w/ wireline below SCSSV. Release tubing hanger and recover tubing.

Subsea Intervention Lubricator System

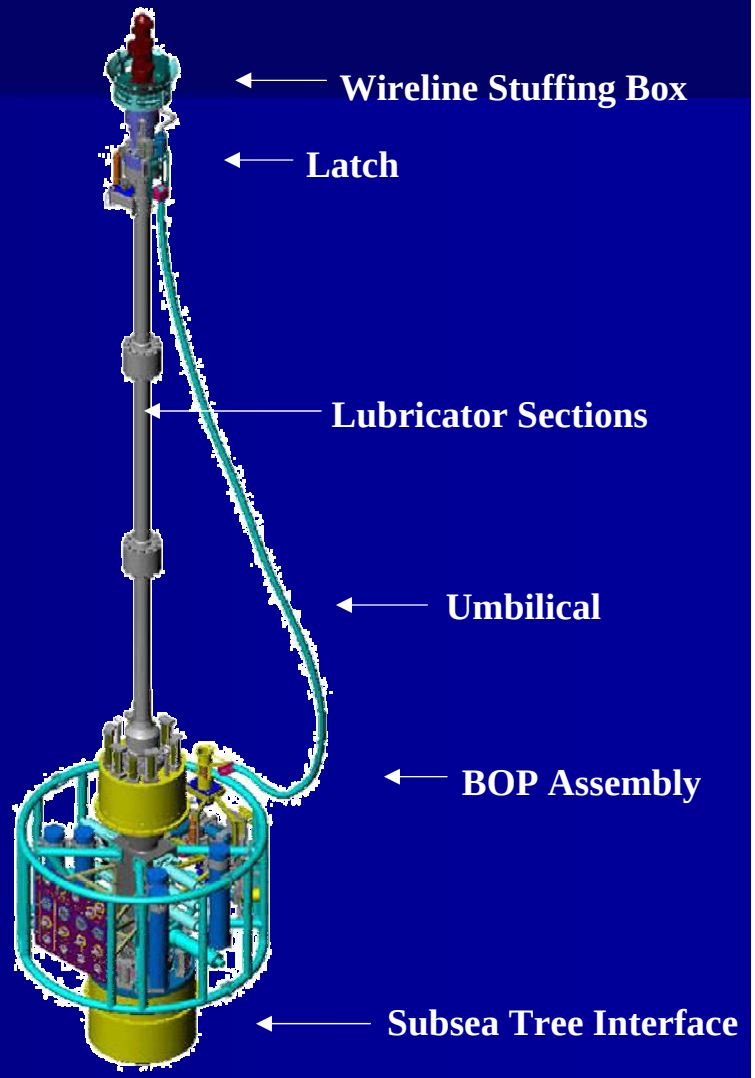
Lands & locks on subsea tree.

Provides well control.

Mates with tubing hanger to allow circulation via tubing and annulus.

Facilitates slickline and wireline access.

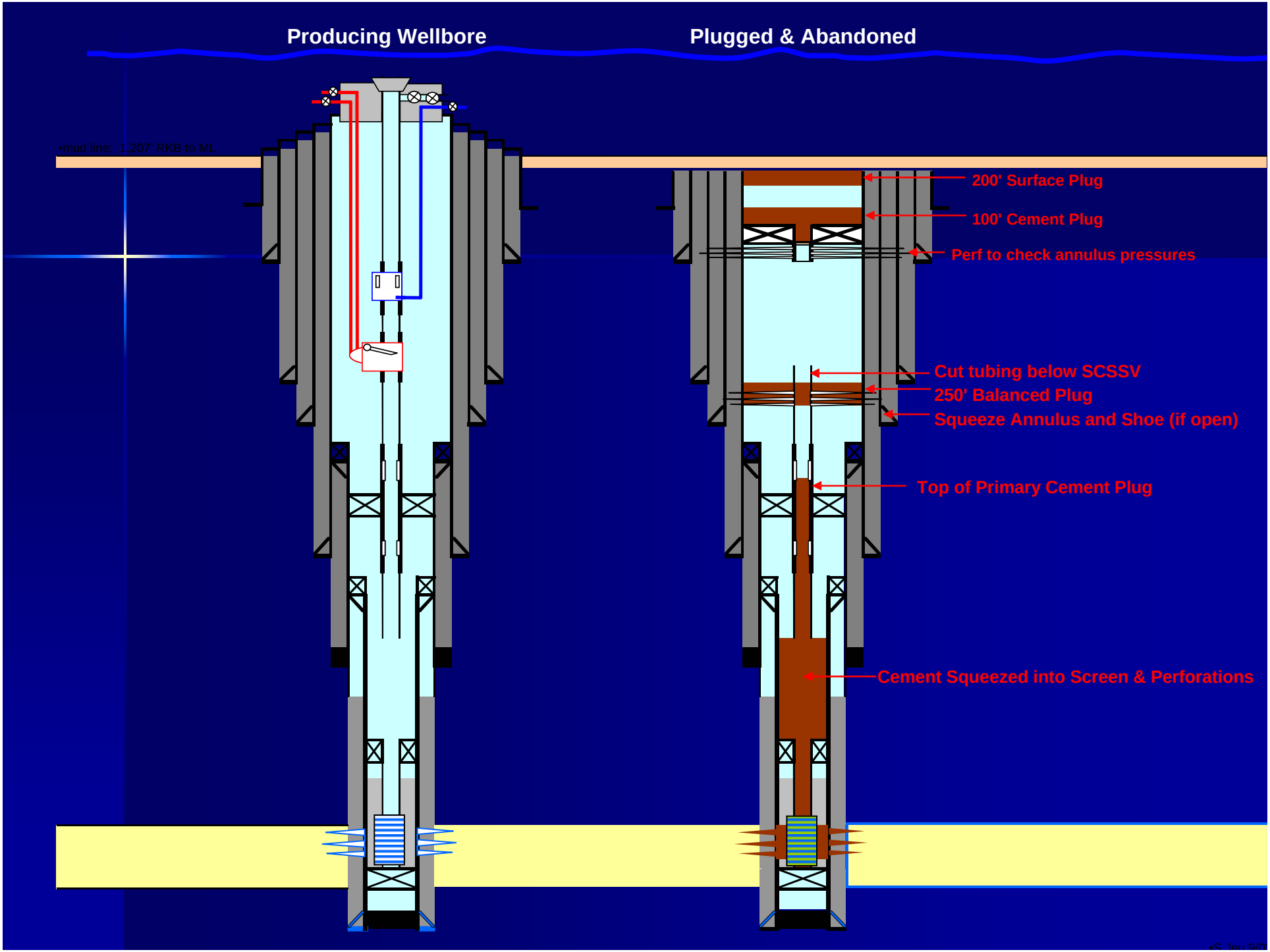
Must accommodate 5.25” TH plug.



General P&A Procedure (3)

11. Perforate upper casings & check for pressure. Set any required plugs.
12. Set surface plug 150' below mud line.
13. Unlatch and retrieve subsea tree.
14. Cut casings 15 feet below the mud line.
15. Retrieve wellhead and casing stump

Tree Retrieval Tool with ROV Panel (left of tree #3) allows unlatching and pulling of the tree on cable.


Producing Wellbore
Plugged & Abandoned
•mud line: 1,207' RKB to ML
200' Surface Plug
100' Cement Plug
Perf to check annulus pressures
Cut tubing below SCSSV
250' Balanced Plug
Squeeze Annulus and Shoe (if open)
Top of Primary Cement Plug
Cement Squeezed into Screen & Perforations

Advantages of MSV

- DP mono-hull MSV's offer cost advantages:
  - Lower mobilization costs; no mooring
  - No marine riser
  - No production (test) riser – no SSTT

Case Study 2:

Installation of a horizontal subsea tree from a mono-hull multi-service vessel without buoyancy compensation.

- A precedent for the Gulf of Mexico.
- Total cost: $80,000.
- Less than six hours spent on location.
- Resulted in savings of $300,000.

Installation of a Horizontal Subsea Tree from a Mono-hull MSV Without Buoyancy Compensation

- Water Depth: 1,200 feet
- Well drilled, cased, then temporarily abandoned.
- Bridging sleeve already installed in wellhead – ready to receive the subsea tree.

Requirements:

- Bridging sleeve must be installed in wellhead before the well is temporarily abandoned.
  - The wellhead must be ready to receive the subsea tree.
  - Do not leave the wear bushing in place.
- ROV interface panel to operate tree running tool and to test the gasket seal.
- Without buoyancy-compensation – sea conditions must be less than 5 feet.
- Need contingency mud mat to set tree on sea floor if conditions are too rough to land on wellhead.
  - Final installation on the wellhead is done with the rig.

MSV with Dual 125 Aft / 80 Mid-deck Ton Cranes

Ochre Tree Installation

September 2003

Installation of a Horizontal Subsea Tree

10K 4” x 2” Horizontal SpoolTree™

MUX control pod

Recovered during P&A. Refurbished in 60 days

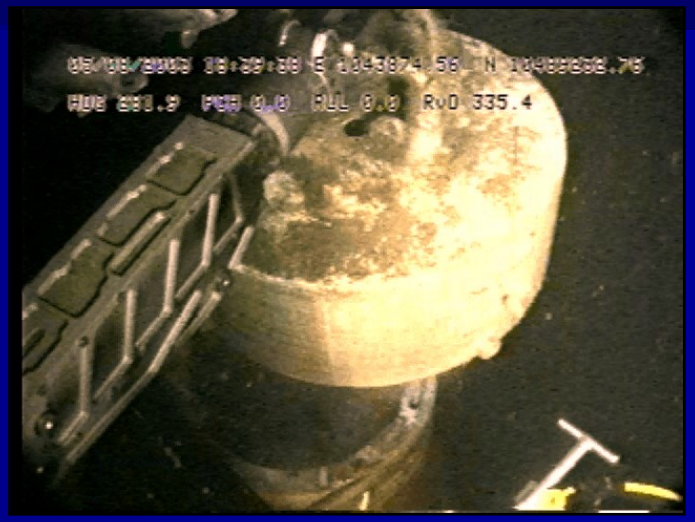
Weight: 72,000 lbs

Footprint: 16.6’ x 16.3’

On deck of MSV with tree running tool installed

Installation Procedure (1)

1. Perform SIT - tree & running tools.
2. Mobilize tree to dock. Transfer tree to deck and install tree running tool.
3. Transit MSV to location, perform DP checks.
4. Remove debris cap with ROV – clean gasket prep.



Installation Procedure (2)

5. Position vessel ~100 ft off location.

6. Splash tree with crane. Monitor with ROV.

7. Move vessel over well.

8. Using ROV, guide tree funnel over wellhead.

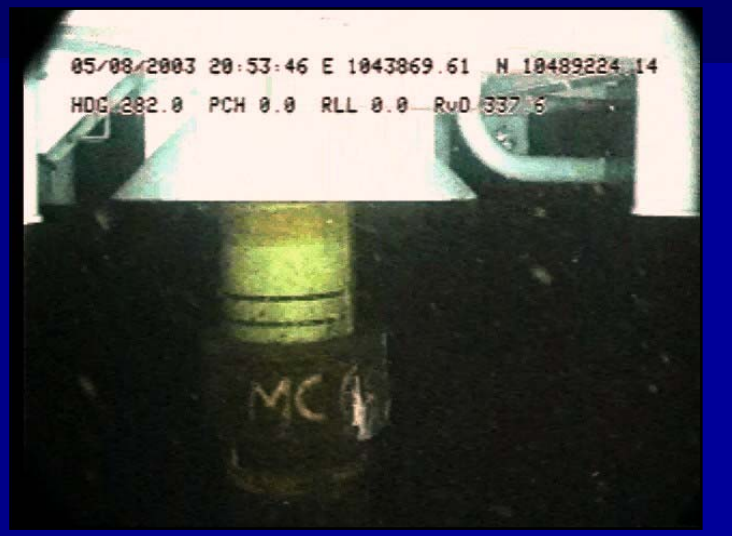
Installation Procedure (3)

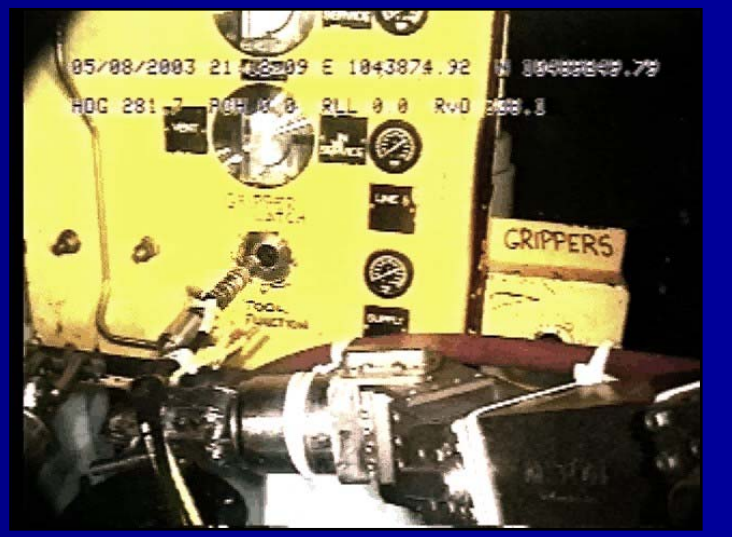
8. Orient tree to desired heading using ROV.

9. Land tree on wellhead.

10. Latch & lock tree via ROV hot stab.

11. Test gasket seal via ROV hot stab.

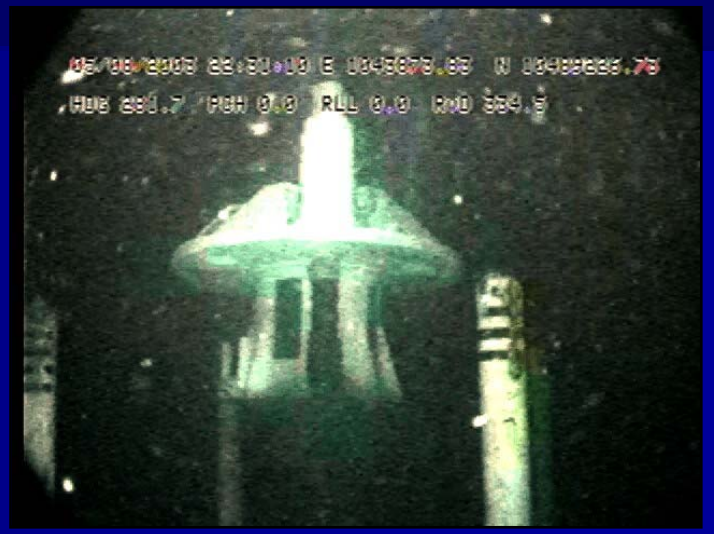




Installation Procedure (4)

12. Release tree running tool via ROV interface.
13. Set debris cap on subsea tree with ROV.
14. Depart location.

Total time spent on location was less than six hours.



Advantages of MSV

- Tree installation is taken off the critical path.
  - Reduces completion operations sensitivity to weather.
- No handling of tree on drilling rig.
  - Allows use of less-expensive rigs with smaller moonpools and/or limited crane capacity.
  - On Ochre, limited crane capacity required keel-hauling the tree.
- Flexibility in installation timing allows MSV to install tree during good weather as work schedule allows.
  - Reduces MSV's weather sensitivity and MSV cost.
  - Reduces MSV's cost sharing mobilization with other projects.
- Estimated savings to Ochre Project: US$300,000

Case Study 3:

- Recovery of a decommissioned umbilical for use at a new location.
- Cost to recover, terminate and test $600k.
- Savings over new $1.2 m and greatly reduced delivery schedule.

Midnight Wrangler

Umbilical Recovery

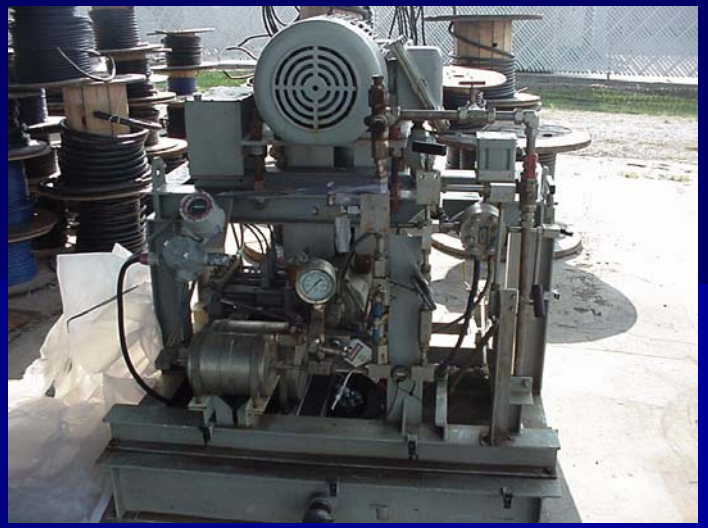
Cost Saving Strategy

- Give contractor a wide window to perform operation.
- MSV was in area with retrieval gear already on board. Key to the Savings we realized.

Case Study 4:

- Retrieval of bottom founded equipment utilizing a MSV.
- This equipment is mandated by regulation to be removed from bottom as part of flowline and umbilical abandonment.
- Saving over new estimated at least 50%.

Diamond Saw



Summary & Conclusions:

- **Innovation** must be combined with **Cost Containment** and **Risk Management** to be successful.
- **Best Practices** should be re-evaluated for each prospect - "a horse for every course."
- **Simplicity** often means **cost savings** – avoid unnecessary complexity.
- **Teamwork** is critical. Early vendor involvement & alliances with key suppliers is needed to attract quality talent and innovation.
- **Commercial Engineering** (lump-sums, incentives) is crucial to aligning operator and vendor motivation and risk profiles.
- Place **Responsibility and Accountability** at the execution team level. Reward innovation & results. Challenge, but avoid micro-management.

Impact of Lower-cost Solutions

- Crucial for profitable development of marginal prospects in mature deepwater basins.
- Lower costs for anticipated interventions (workovers, recompletions, etc.) qualify more prospects for sanction.
- Lower costs for long-term obligations (P&A) frees capital available for development and improves corporate balance sheets.