Roncador Field Subsea Manifold: a Risk Analysis Approach to Verify the New Installation Procedure

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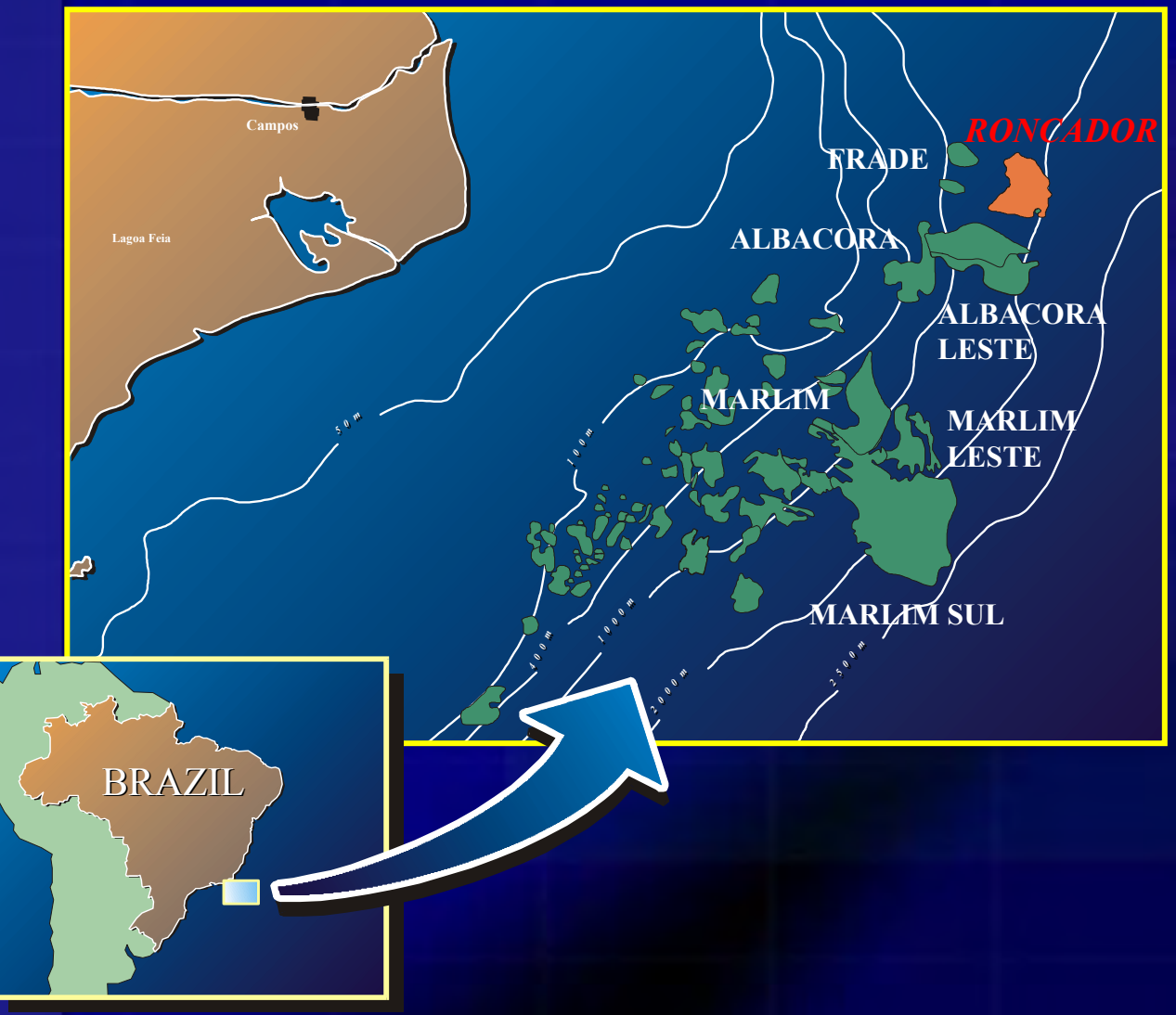
Topics

- Roncador Field – P-52 Subsea System
- The use of Pendulous Installation Method (PIM) in Roncador Field
- Qualification Process
- Risk Analysis – Methodology, Global Results, Revision
- Final Remarks

Roncador Field Location



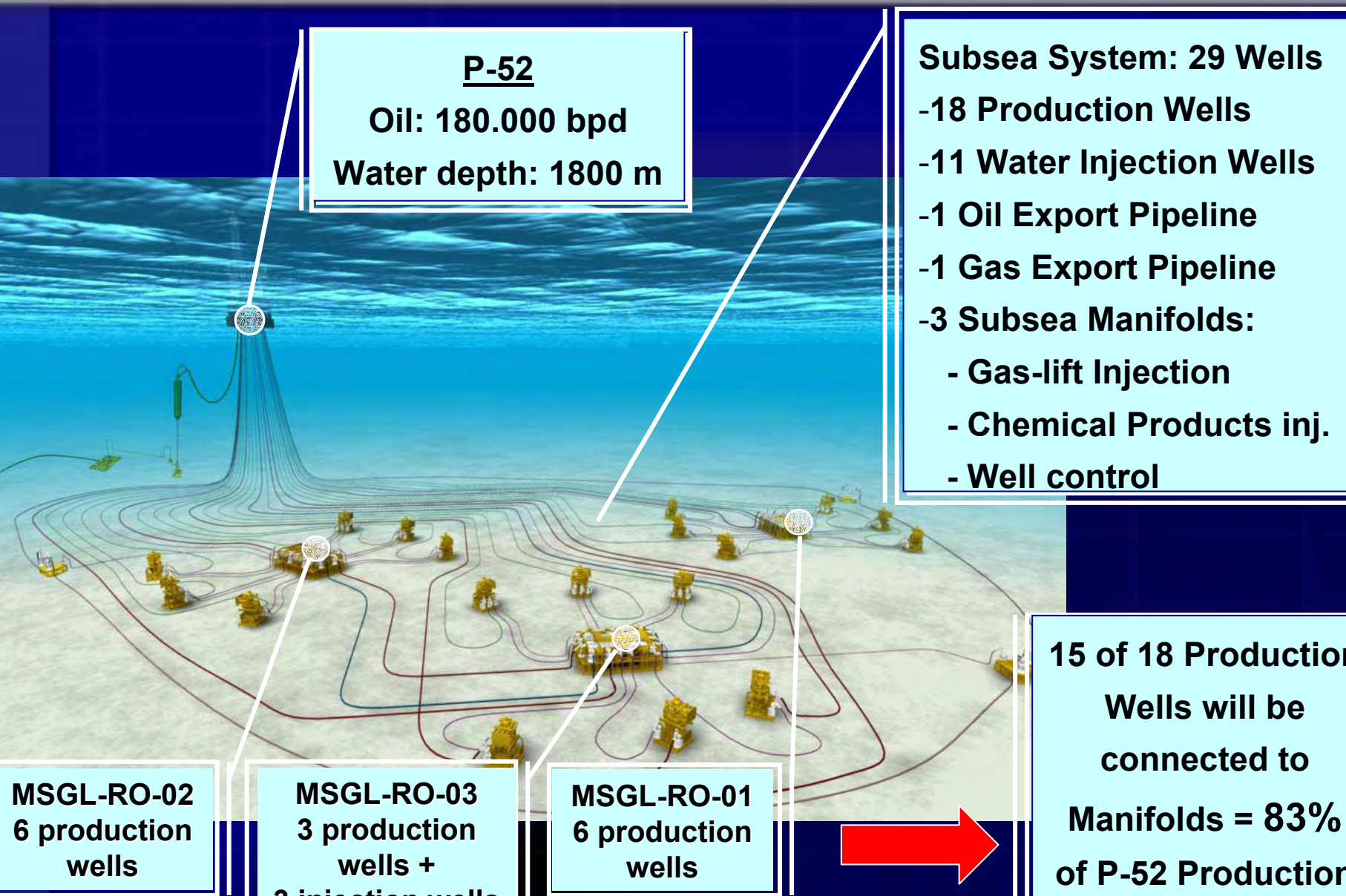
- Reservoir:

3 billion barrels

- Water Depth:

1500 – 2000 m

P-52 – Subsea Layout



P-52

Oil: 180.000 bpd

Water depth: 1800 m

Subsea System: 29 Wells

-18 Production Wells

-11 Water Injection Wells

-1 Oil Export Pipeline

-1 Gas Export Pipeline

-3 Subsea Manifolds:

- Gas-lift Injection

- Chemical Products inj.

- Well control

MSGL-RO-02
6 production wells

MSGL-RO-03
3 production wells +

MSGL-RO-01
6 production wells

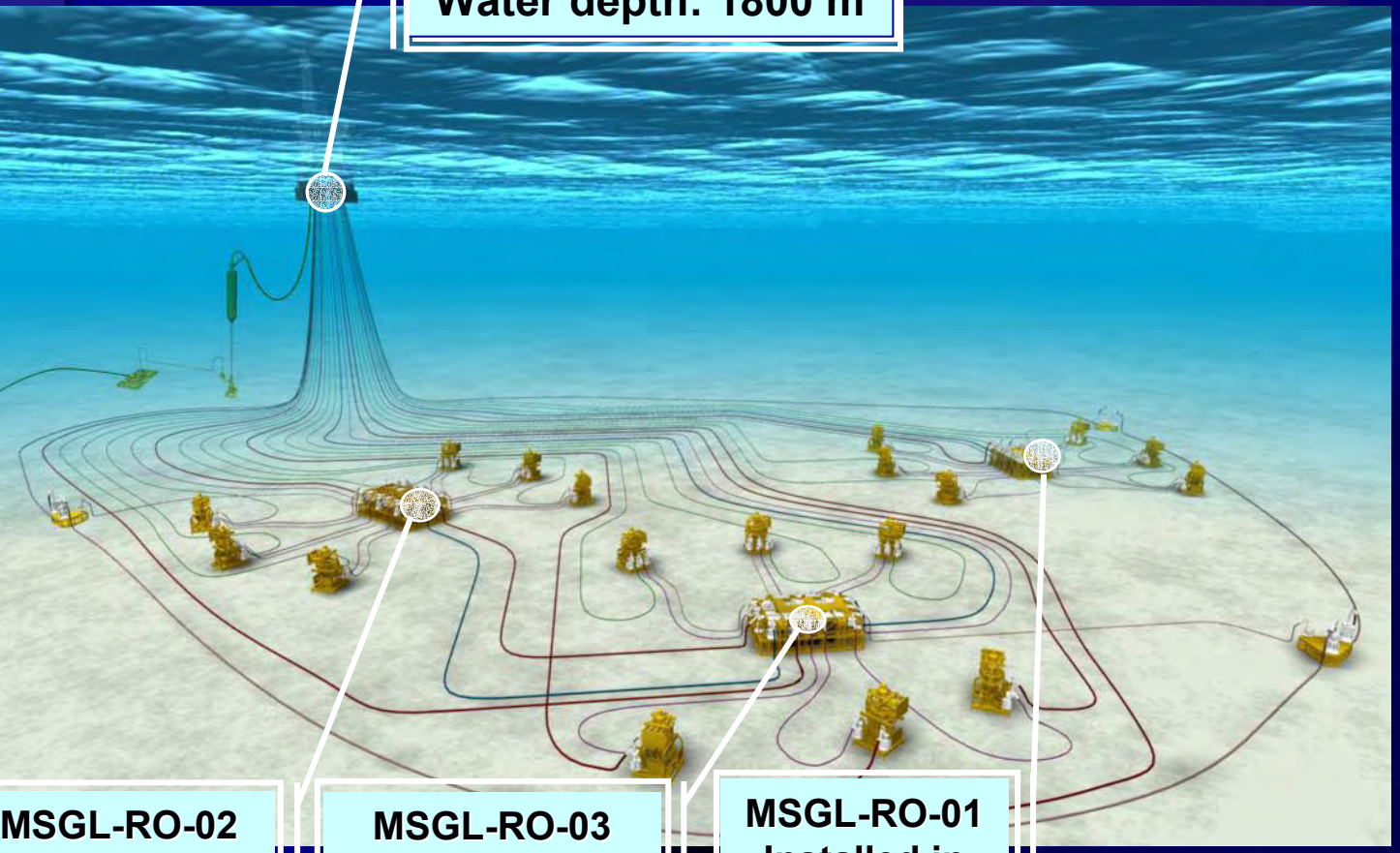
15 of 18 Production Wells will be connected to Manifolds = 83% of P-52 Production

P-52 – Subsea Layout

P-52

Oil: 180.000 bpd

Water depth: 1800 m



MSGL-RO-02
To be installed in 2006

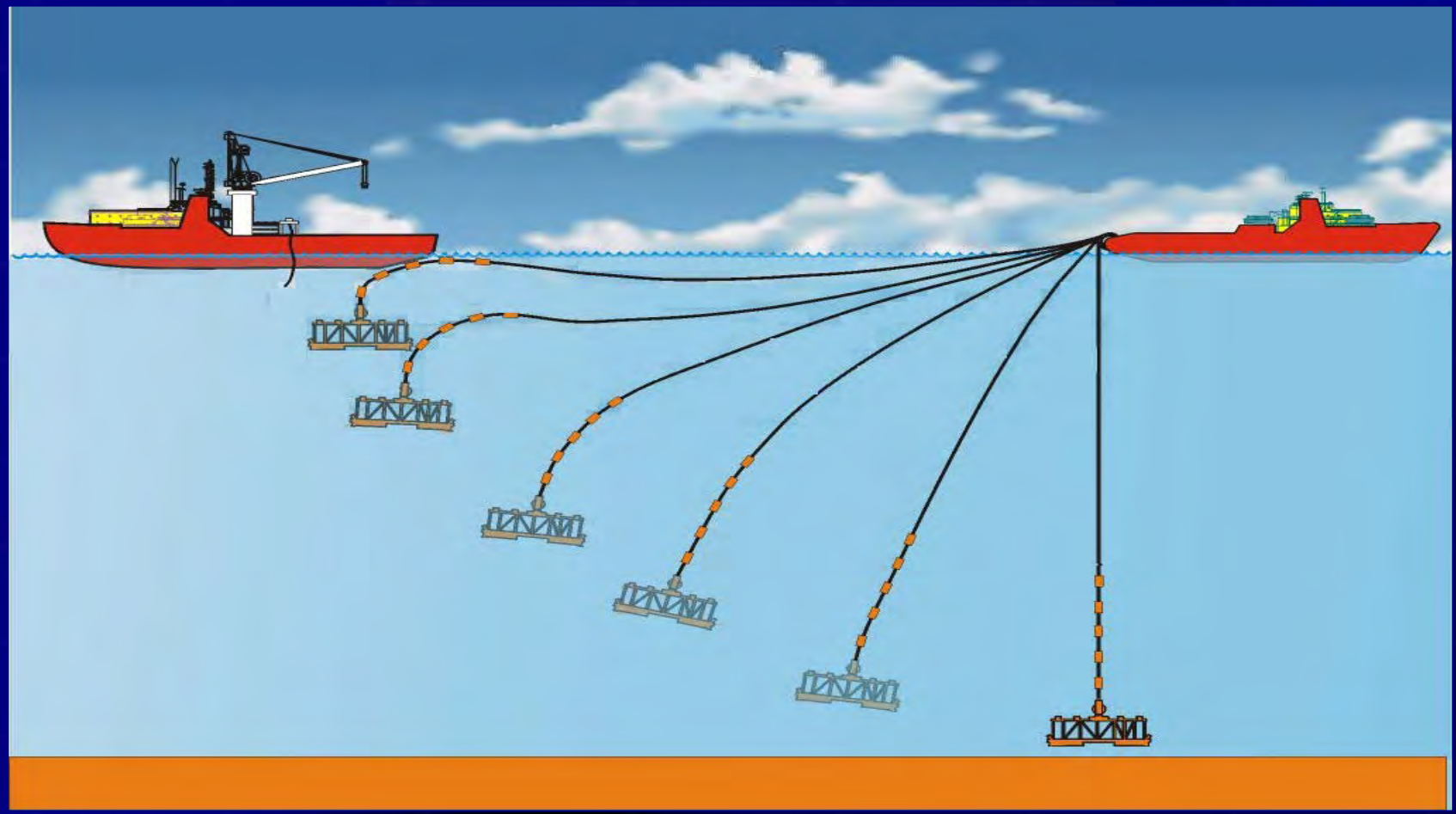
MSGL-RO-03
To be installed in 2006

MSGL-RO-01
Installed in 2002

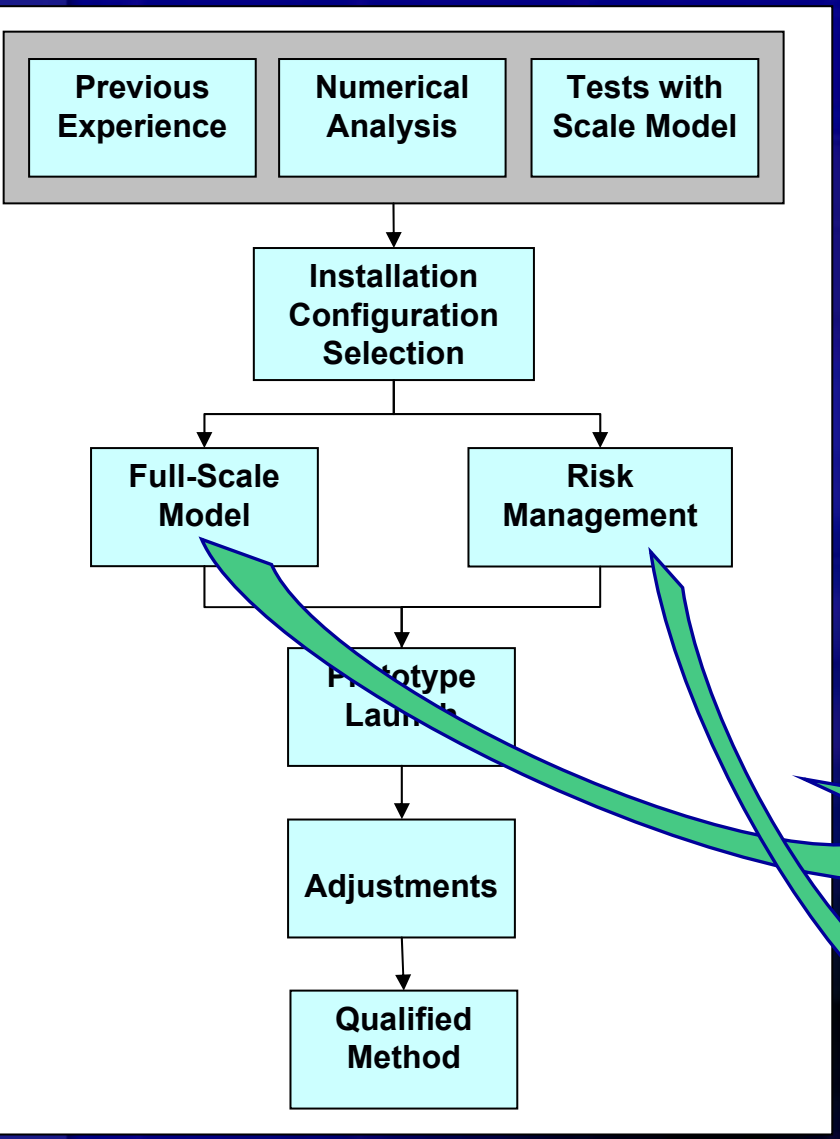
SHEAVE METHOD

A New Installation Technology

Pendulous Installation Method (PIM)



Qualification Process - Steps

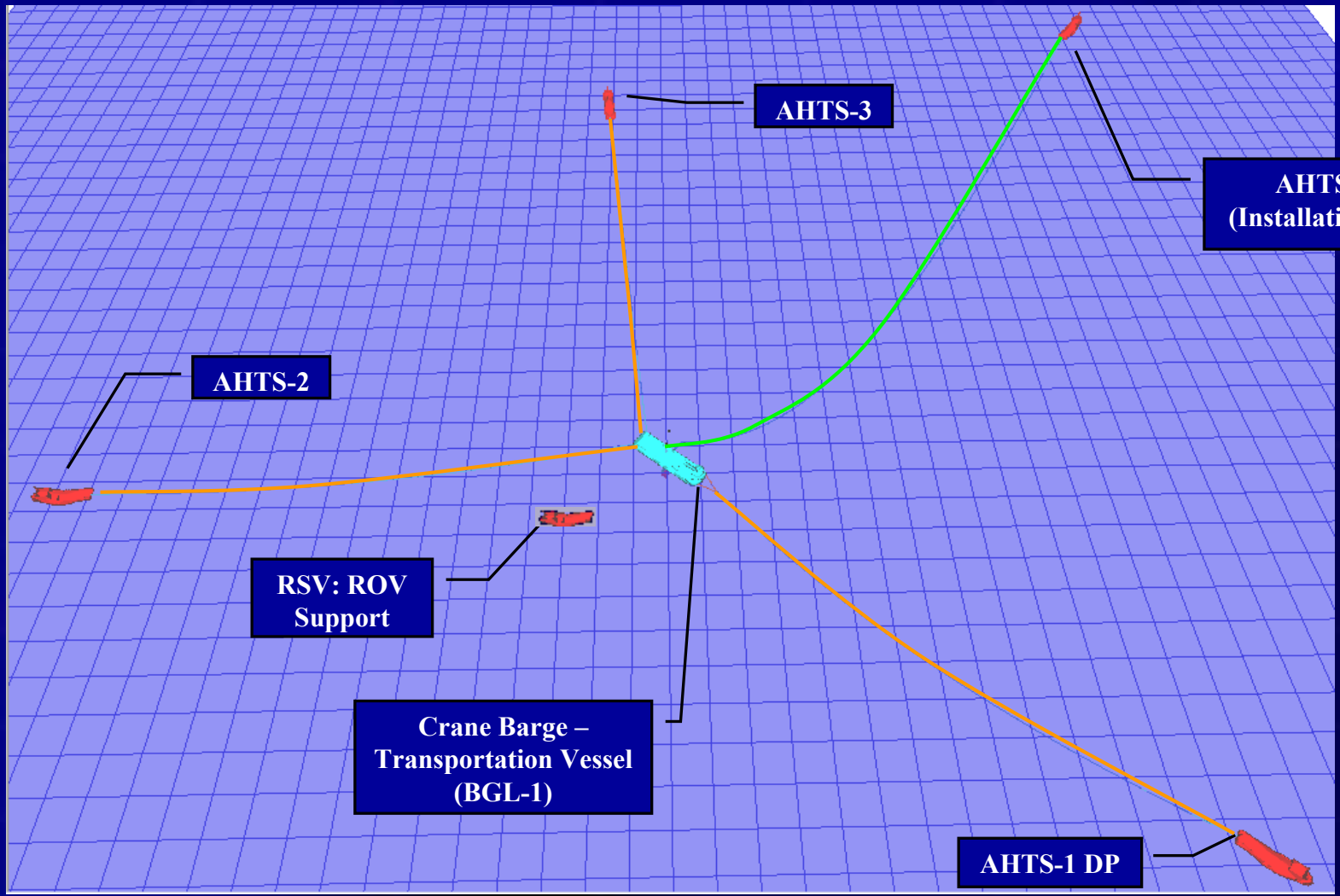


FULL SCALE MODEL
DUMMY MANIFOLD

Dimensions (L x B x H) = 16 x 8 x 5 m
Weight = 280 Te / Water Depth = 1900 m

RISK ANALYSIS FOR THE INSTALLATION PROCEDURE

Risk Analysis – Vessels Configuration



Risk Analysis - Methodology

Task Preliminary Hazard Analysis (Task PHA)

QUALITATIVE TECHNIQUE

RISK SCENARIO

Hazard + Causes + Consequences

Classification in terms of occurence frequency, severity and risk level

Risk Analysis - Methodology

RISK ANALYSIS TEAM	
Area	**Representatives**
Risk Analysis	2
Manifold Design	4
Manifold Construction	2
BGL-1 Operation (Transportation Vessel)	3
FAR SANTANA Operation (Installation Vessel)	2
Health Security and Environment	1
WORKING IN 7 DAYS	

VESSEL

ACTIVITIES

TASKS

SINCE THE DUMMY MANIFOLD LIFTING IN THE SHIPYARD

UNTIL THE VESSELS DEMOBILIZATION AT THE END OF INSTALLATION

Risk Analysis - Methodology

	TASK PRELIMINARY HAZARDS ANALYSIS	UN-RIO/ATP-RO/ISUP
Unit: P-52	System: Pendulous Installtion Method to Dummy Mannifold BGL-1 Activities	Date:
Activitie 8: BGL-1 navigation to installation area	Tasks: 1- BGL-1 towing, from Sermetal shipyard, in Rio de Janeiro, to the Dummy Manifold installation area.	Documents: MD-3915.00-1512-960-PPR-001 Rev. 0 - Procedimento de Instalação (Escopo BGL-1)

HAZARDS	CAUSES	DETECTION MODES / PRECAUTIONS	POSSIBLE CONSEQUENCES	CATEGORIES						OBSERVATIONS / RECOMENDATIONS	SCENARIO
				FREQUENCY	SEVERITY			RISK MATRIX			
					P	I	E	P	I	E	
Dummy sea fastening rupture	- Adverse sea conditions	- Navigating to shelter harbour (P)	- Equipment damages - Operation delayed or cancelled - Risk of injury to crew	C	IV	IV	I	C	M	NC	R7) Continuous assessment of weather conditions for navigation	9

Risk Analysis – Global Results

INPUT: 23 ACTIVITIES AND 109 TASKS ON INSTALLATION PROCEDURE

STEP QUANTITIES ON PROCEDURES OF EACH VESSEL		
VESSEL	**ACTIVITIES**	**TASKS**
Transportation Vessel	17	79
Installation Vessel	5	26
AHTS-1	1	4

SUMMARY OF RISKS ANALYSIS RESULTS = 39 RISK SCENARIOS			
RISK RELATED TO	**CATEGORY OF RISK**		
	NOT CRITICAL	**MODERATE**	**CRITICAL**
PERSONNEL SAFETY	15	21	3
EQUIPMENT INTEGRITY	17	17	5
ENVIRONMENT	39	0	0

SUMMARY OF RECOMMENDATIONS = 29	
RECOMMENDATIONS RELATED TO	**TOTAL**
PERSONNEL (QUALIFICATION, SKILLS, EXPERIENCE, SAFETY)	21
EQUIPMENT INTEGRITY (OPERATIONAL CONDITIONS, CERTIFICATION)	7
WEATHER CONDITIONS	1

Critical Risks Related to Personnel Safety

SUMMARY OF RISKS ANALYSIS RESULTS			
RISK RELATED TO	CATEGORY OF RISK		
	NOT CRITICAL	MODERATE	CRITICAL
PERSONNEL SAFETY	15	21	3
EQUIPMENT INTEGRITY	17	17	5
ENVIRONMENT	39	0	0

CATEGORY OF SEVERITY	CATEGORY OF FREQUENCY						
	A (EXTREMELY REMOTE)	B (REMOTE)	C (UNLIKELY)	D (PROBABLE)	E (FREQUEN		
IV (CATASTROPHIC)		2	2			4	10,3%
III (CRITICAL)			13	1		14	35,9%
II (MARGINAL)		4	6			10	25,6%
I (NEGLIGIBLE)	1	7	3			11	28,2%
	1	13	24	1	0	39	100%
	2,6%	33,3%	61,5%	2,6%	0,00%		

NOT CRITICAL | MODERATE | CRITICAL

Scenario #27

Accidental operation of the release device used to initiate pendulous movement

Critical Risks Related to Equipment Integrity

SUMMARY OF RISKS ANALYSIS RESULTS			
RISK RELATED TO	CATEGORY OF RISK		
	NOT CRITICAL	MODERATE	CRITICAL
PERSONNEL SAFETY	15	21	3
EQUIPMENT INTEGRITY	17	17	5
ENVIRONMENT	39	0	0

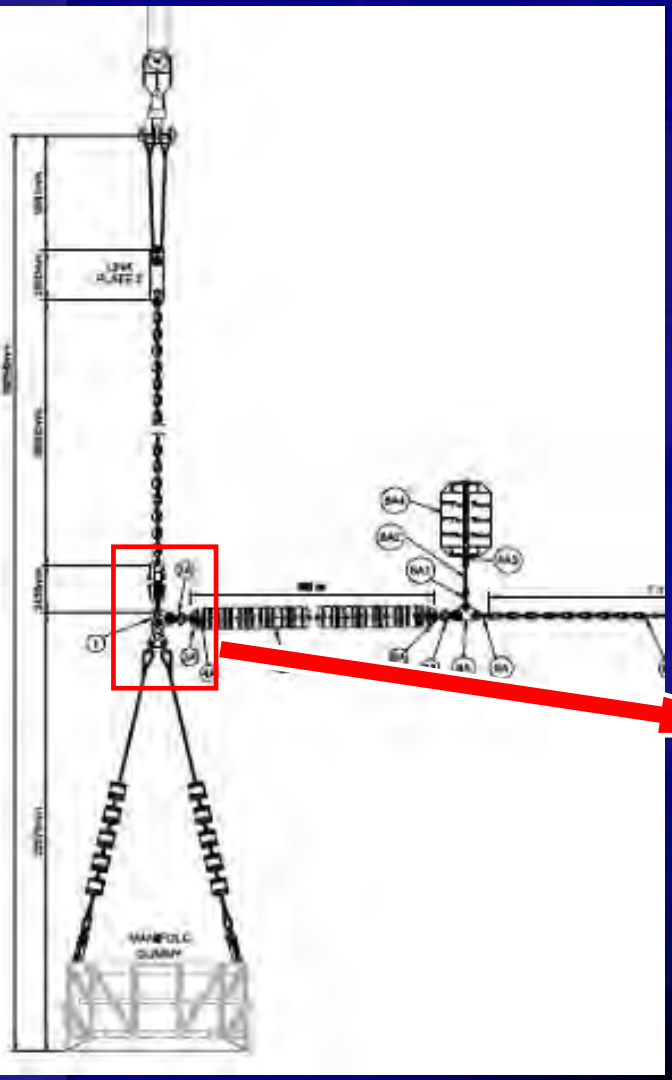
Scenario #27

Accidental operation of the release device used to initiate pendulous movement

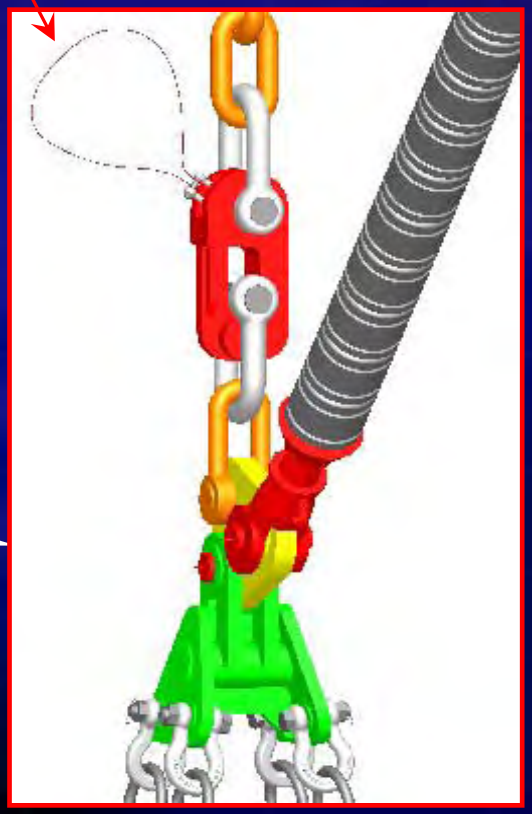
	CATEGORY OF FREQUENCY						
CATEGORY OF SEVERITY	A (EXTREMELY REMOTE)	B (REMOTE)	C (UNLIKELY)	D (PROBABLE)	E (FREQUENT)		
IV (CATASTROPHIC)		5	4	1		10	25,6%
III (CRITICAL)		3	6			9	23,1%
II (MARGINAL)			3			3	7,7%
I (NEGLIGIBLE)	1	5	11			17	43,6%
	1	13	24	1	0	**39**	100%
	2,6%	33,3%	61,5%	2,6%	0,00%		

NOT CRITICAL	MODERATE	CRITICAL

Risk Analysis Results – Scenario #27

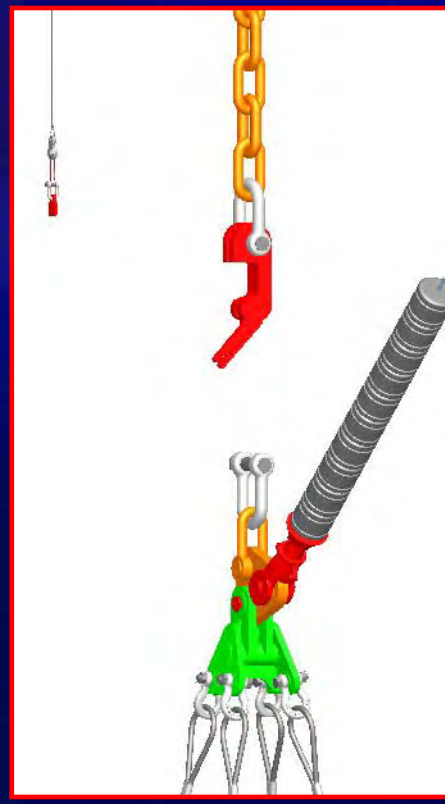


TRIGGER SLING

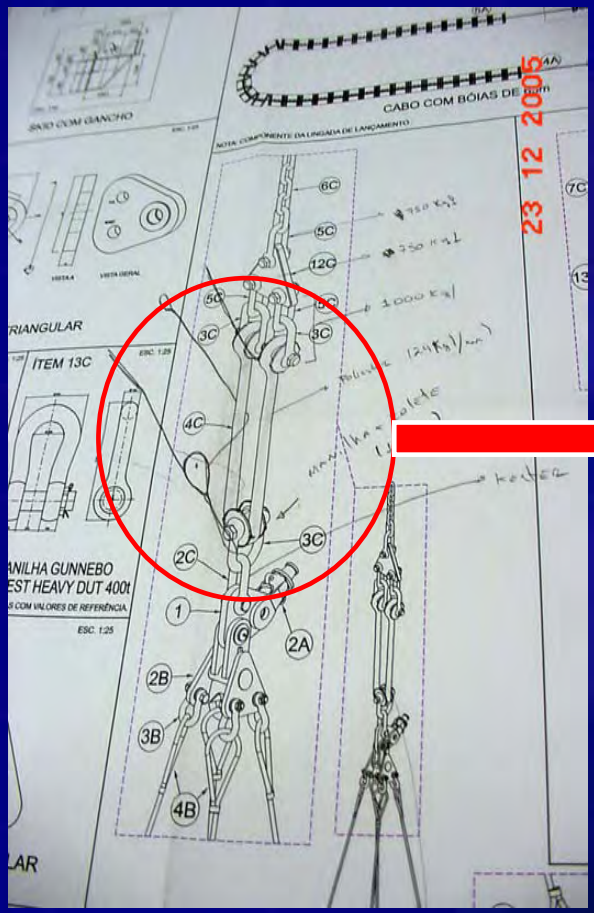


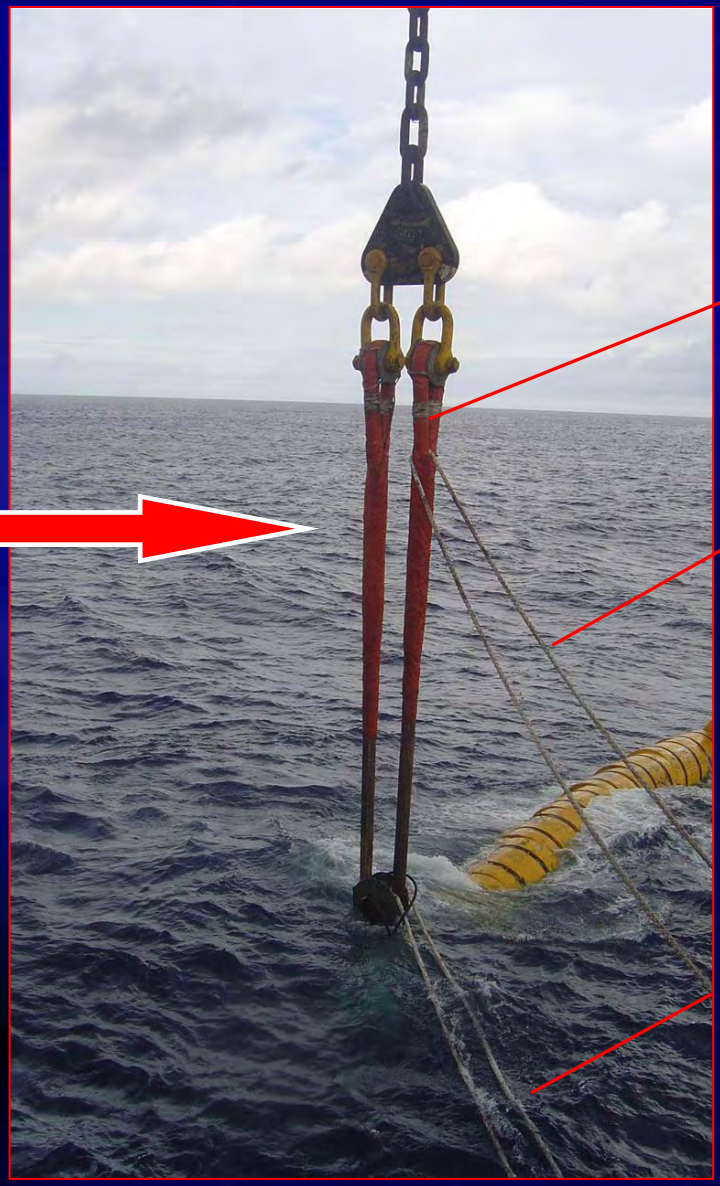
TRIGGER SLING CONNECTED

MOMENT OF RELEASE



Risk Analysis Revision – New Release Device





Polyester Cable

Messenger Line (backup)

Messenger Line + Wire Rope

Final Remarks

1) Task Preliminary Hazard Analysis (THA): simple, effective and depended on the experience of the technicians involved.

2) Risk Analysis benefits:

- Installation Procedure Revised and Integrated;
- Risks Identified and Mitigated;
- Verifications of Premises and Responsibilities;
- Teamwork Integration;
- Confidence to do this pioneering installation;

Final Remarks

- The Dummy Manifold was installed as planned on December 27, 2005;
- No damage to vessels, equipment or personnel;
- Adjustments in the method to avoid initial instability;
- Pendulous Installation Method Qualified;
- MSGL-RO-02 and MSGL-RO-03 will be installed by PIM this year.

THANK YOU