EMAS AMC (Singapore)

Engineering 'Lunch & Learn' Series

Installation of Pipeline Bundle Across Shipping Channel by Bottom Pull – Project Example (Singapore)

3 Dec 2012

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Together We Deliver

AMC Energy Marine Production

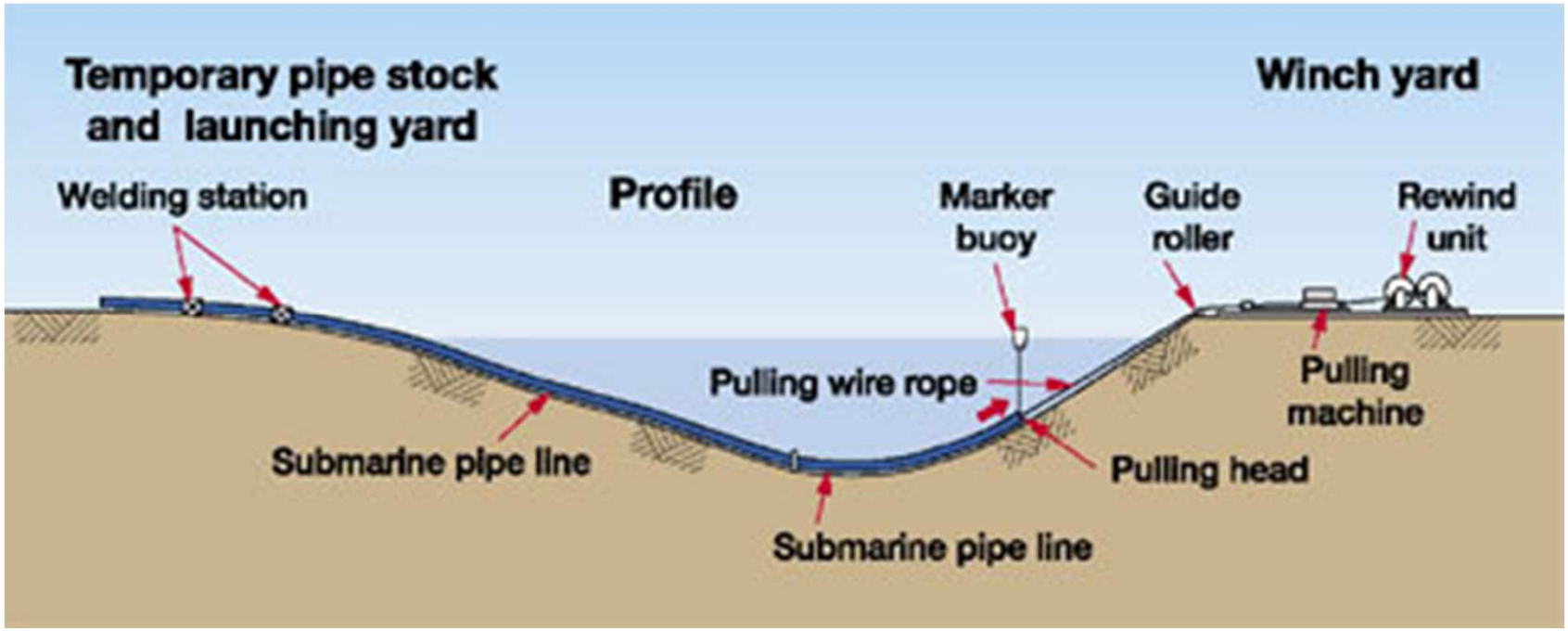
Planned Talks for FY2012/13

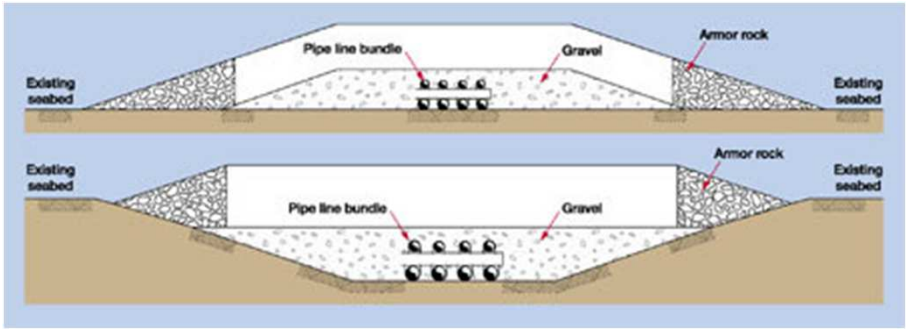
PLANNED TALKS FOR FY2012/13

No.	Proposed Topic	Speaker	Date	Status
1	Soil classification, Trenching and Lowering of a Live Gas Pipeline	Dr Thusy (CAPE)	18-Oct	Done
2	Surface Tow Method of Pipeline Installation (aka Rentis method)	Eng Bin	02-Nov-12	Done
3	Talk by GE Wellstream on Flexible Pipeline Design & Manufacturing	CK Tan (Wellstream)	28-Nov-12	Done
4	Pipeline bundle (8 pipelines) installation by Bottom Pull Method - Project example	Eng Bin	3-Dec-12	Confirmed
5	Flexible and umbilical installation methods and challenges - Project Examples	Ye Ziqing	7-Jan-13	Pending
6	Introduction to engineering software used by or available to 'Engineering'	Vu Khac Kien	4-Feb-13	Pending
7	Definition of Lift Loads and Lifting Sling Selection & Heavy Lifting Analysis using MOSES software	Santosh	04-Mar-13	Pending
8	Use of Spoiler to Initiate self-burial - project example	Eng Bin	18-Mar-13	Pending
9	Hydrodynamic loading through the splash zone and water column	Kingsley or designate	1-Apr-13	Pending
10	Well-head platform installation - Project Example (Chevron Project using Lewek Champion)	Anthong Wong	22-Apr-13	Pending
11	Management of change & control of engineering documents	Kingsley	6-May-13	Pending
12	Conventional pipeline installation - Project Example (Chevron Project using Lewek Champion)	Pichet	03-Jun-13	Pending
13	Span correction methodology - project example	Eng Bin	18-Jun-13	Pending
14	Lift rigging design	Kingsley or designate	01-Jul-13	Pending
15	Pipeline installation analysis - Shallow water versus deep water	Donikon	5-Aug-13	Pending
16	Deep water riser configurations	TBA	2-Sep-13	Pending
17	Mooring System Installation - Chevron FPSO	Landon	7-Oct-13	Pending
18	Diverless connection systems	TBA	4-Nov-13	Pending
19	Decommissioning of SPM and Mooring System - Project Example	Moorthi	2-Dec-13	Pending

Project Requirement: Build 8 pipelines and 2 Fiber optic Cables from Shell Bukom Refinery @ Bukom Island to Tanjong Penjuru @ mainland Singapore

Installation Concept: Build Pipeline & Cable Bundle at Bukom, Then Bottom-pull across Shipping Channel to Penjuru, and Protect Bundle with Rock Berm





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Preparatory Works prior to Bundle Pull

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Stringing of Line Pipe to form Pipe Strings

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Completed Pipe Strings Ready for Bundling prior to Bottom Pull

Pulling Head for Pipeline Bundle

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Preparation of Sheet Pile Cofferdam for Bundle Pull (Bukom End)

Preparation of Sheet Pile Cofferdam for Bundle Pull (Penjuru End)

Final preparation of cofferdam (Penjuru End)

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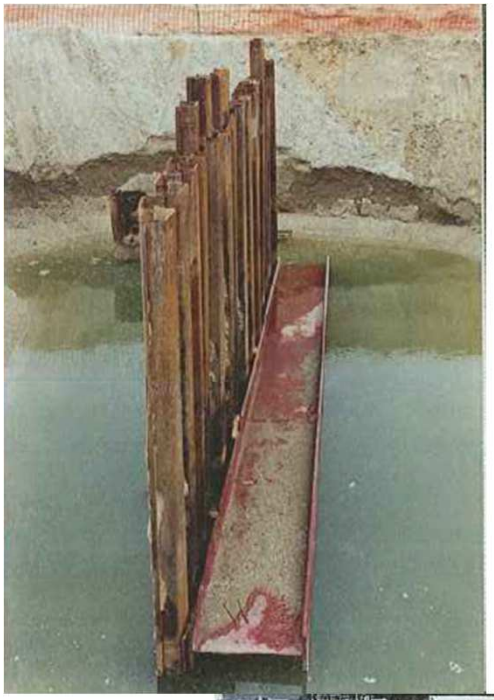
Final Preparation of Cofferdam (Bukom End)

Construction of ‘hold-back’anchor for linear winch



Linear winch base construction and arrangement for pipe pulling

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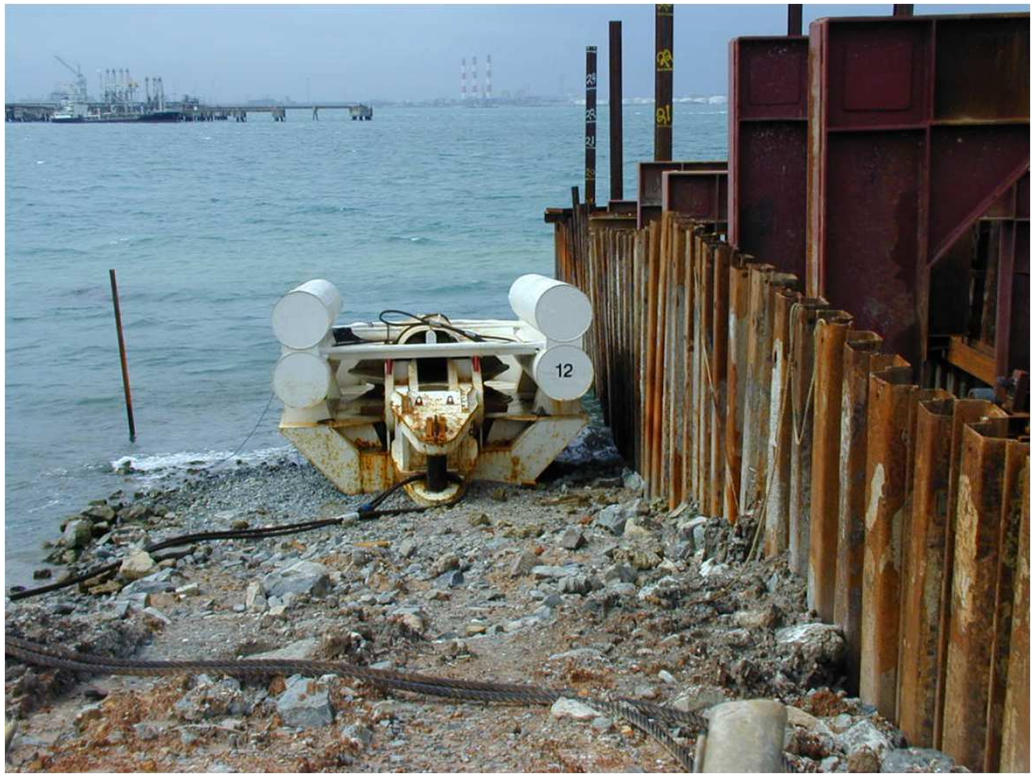
Dredging of Channel along Pipeline Route to obtain Required Seabed Design Profile

Drilling & Blasting Works along Pipeline Route to Shatter the Rocks to Enable Dredging

Due to Excessive Lengths of Rocks Requiring Blasting, a 2nd Blasting Spread was Used

Dredger and ‘Drilling & Blasting’ Vessel Working Side by Side

Sheave Block which will be connected to Pipe Bundle Pulling Head



Sheave block enables effective pull force on pipe bundle to be double of the linear winch capacity

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Manouvring Sheave Block for Connection to Pipe Bundle Pulling Head

Laying of twin wire (from sheave block) along pipeline route, then terminating on lay vessel before connecting to ‘triplate’

Laying single length pull wire from ‘monkey plate’ to pull winch site

Bundle Installation Across Sea Channel by Bottom Pull Method

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1st Pipeline Bundle fully rigged up and ready for pull – waiting for dredging to be completed (see foreground)

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Buoyancy tanks strapping arrangement on Pipeline Bundle

Pipe Bundle on Lauchway complete with buoyancy drums ready for Pull

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Initial launch of the pipeline bundle

Pipeline bundle ready for 1st launch

(note: 2 team members now working with EMAS AMC)

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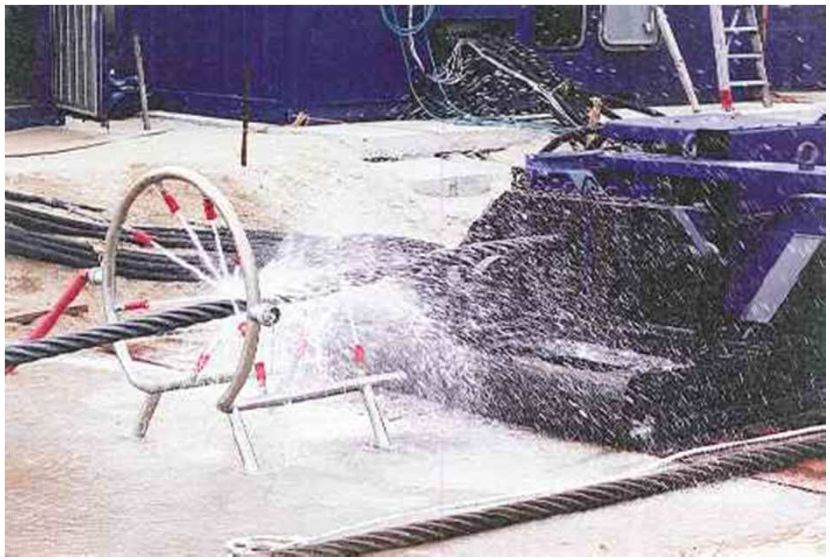
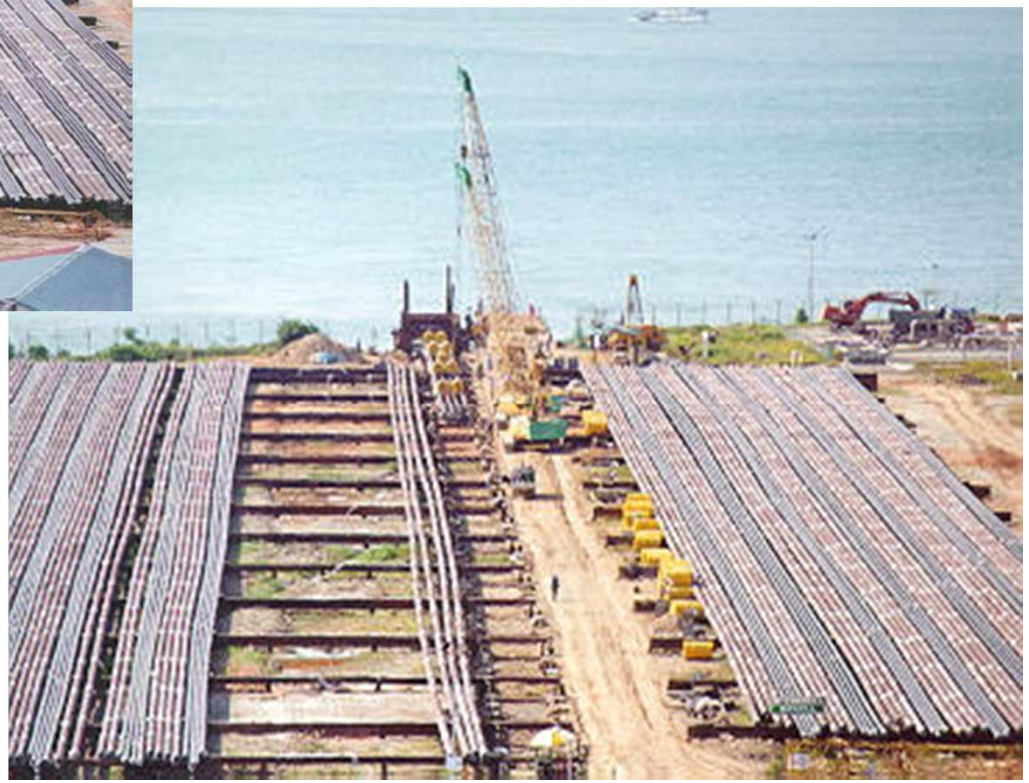
Pulling Winch in operation



View of Stringing Yard, Showing Bundle Pull in Progress

Commencement of pull



Near the end of Pull for this bundled string

Alignment & tie-in of preceding bundle to the new bundle

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Attachment of Buoyancy Tanks on Pipeline Bundle

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Resumption of pipeline bundle pull after tie-in to preceding section

3 more Bundled Strings left before Completion of Installation by Bottom Pull

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End of the bundle pull

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Arrival of Pulling Head/Sheave Block at Destination Point

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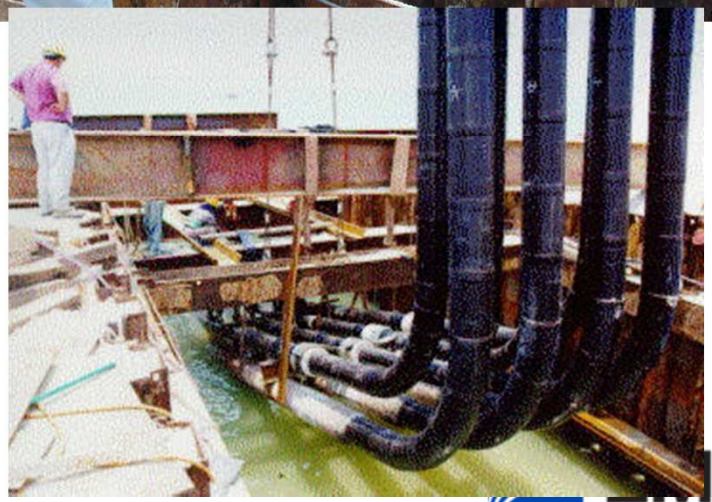
Installation of Risers on Pipeline Bundle



Production of Rocks for Pipeline Protection

(note: a separate Lunch & Learn session will be presented in future just for this)

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Extraction of rocks at Quarry by drilling & blasting

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Extracted rocks are crushed to get rocks & stones of varying sizes

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Crushed rocks are graded into various categories & transferred by conveyor belts to different storage sites

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Armour rocks are graded using special chain separators (How it works is Quarry's trade secret)

Manual verification of ‘cushion’ rock grading

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Manual verification of ‘armour’ rock grading

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Load-out and transportation of engineered rocks to construction site

Rock dumping, pre-commissioning and site re-instatement

Transfer of quarry materials to site storage barge, and then to rock dumping vessel

Rock dumping by side stone dumping vessel

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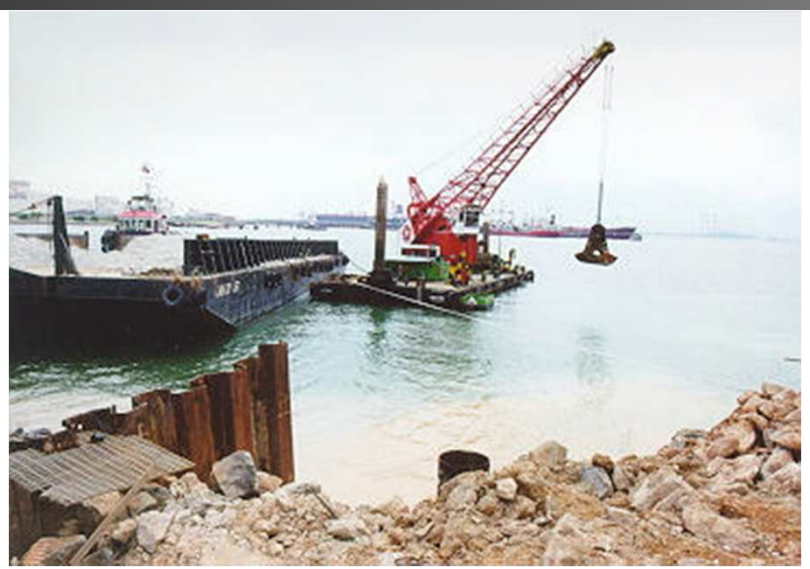
Backfilling trench at shore approach - by rock dumping vessel & by clam dredger where water depth is too shallow for rockdumping vessel



Hydrostatic testing of pipeline bundle

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Site re-instatement

Site re-instatement (Cont'd)

QUESTIONS ????

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