PARTIAL LIST OF PROJECTS UNDERTAKEN BY DR. ENG-BIN NG OVER PAST 4 DECADES

- **Technical Expert for Arbitration in SE Asia (2020 – 2021)**

I was engaged by an offshore construction company through their lawyers to function as the Technical Expert for the Claimant for Arbitration between two offshore contractors for a project in Thailand. Names of the Claimant and Respondent are confidential and cannot be disclosed as the arbitration is on-going. My duties included:

A. Liaising with the Respondent's experts in respect of the issues in the offshore technical discipline to produce a Joint List of Issues Agreed and Disagreed.

B. In formulating the Joint List of Issues Agreed and Disagreed with the Respondent's experts, I had to review and consider the following documents which were provided to me:

(1) The pleadings filed in the arbitration (collectively, the "Pleadings") as follows:

(a) Claimant's Statement of Claim;

(b) Respondent's Statement of Defence and Counterclaim;

(c) Claimant's Statement of Reply and Defence to Counterclaim;

(d) Respondent's Rejoinder and Reply to Defence to Counterclaim;

(2) The relevant documents in the Claimant's Bundle of Documents referred to in the Pleadings and/or further supporting documents which concern the relevant issues identified to be within your scope of expertise in the Claimant's List of Issues and Respondent's List of Issues (i.e. the Offshore Technical Issues).

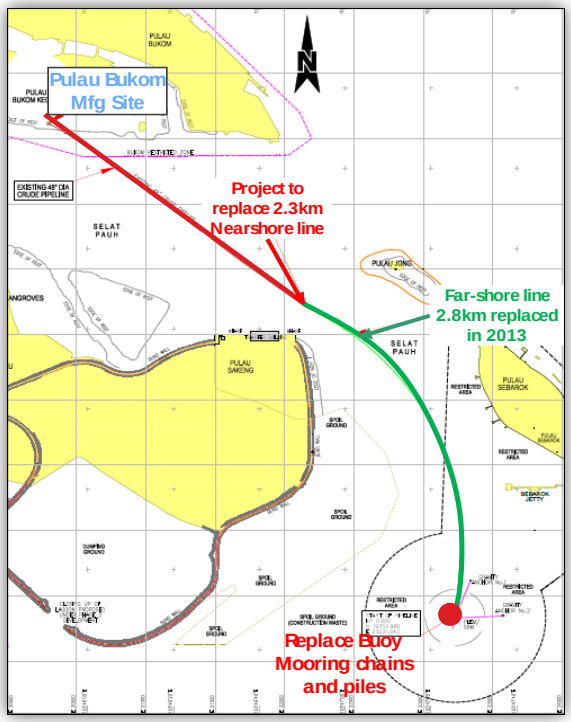
C. Once the List of Issues have been formulated, I prepared and provided a Written Report setting out my expert opinions on the Offshore Technical Issues by a stipulated date.

D. This report was then provided to the Arbitration body and the Respondent's Experts. The Respondent's expert would then provide a written report countering my claims, and thereafter, I am required to provide a Written Response to the Respondent's expert(s)'s written report(s) by another agreed date.

E. Where required, I would attend the arbitration panel to provide my expert testimonial on specific technical issues.

- **Shell Eastern Petroleum: SBM Pipeline Rejuvenation Project (2020 – 2022)**

The SBM Rejuvenation Project (phase 2) pertains to the replacement of the near-shore subsea SBM 48" pipeline section and rejuvenate the single buoy mooring (SBM) system, during the planned Pipeline System Shutdown period for the refinery at Bukom. Its primary objective is to maintain existing functionality and capability of the refinery as well as its crude oil import facility with a useful operating life till 2040. The project involves: offshore seabed trenching, landfall preparation, new 48" pipeline installation, old pipeline cutting, above-water tie-in of newly installed pipeline segment to the existing pipeline installed in 2013, backfilling and armour protection of newly installed pipeline segment removal of discarded old pipeline, and SBM rejuvenation works, including new pile and mooring chain installation, etc.

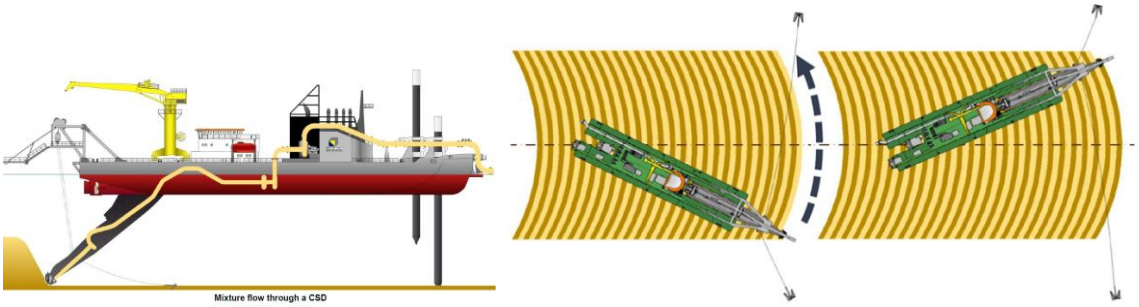


The EPMS Contract includea the following scopes: (1) Project Management Services; (2) Engineering Services; (3) Procurement Support Services; (3) Construction Management Services; (4) Interfacing with COMPANY Processes; and (5) Support for Mechanical Completion/Pre-commissioning/ Commissioning & Start up for Handover.

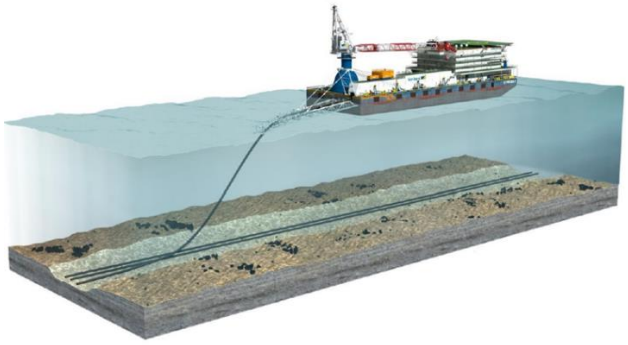
I functioned as INTECSEA's Project Manager for the Engineering and Project Management Services (EPMS) Contractor to Shell and formed part of the Integrated Project Management Team (IPMT), functioning as the IPMT's Construction Manager. The Scope for this Contract includes the management of COMPANY nominated EPCI CONTRACTOR and its SUBCONTRACTORS to deliver the EPCI WORK.

My roles and responsibilities are summarised below:

- Allocate resources from INTECSEA and manage Technical delivery through Engineering, Construction, HSSE and Quality Leads;
- Provide oversight and day to day coordination with the EPCI contractor to ensure delivery as per contract;
- Provide guidance to Package Engineers to develop construction section of the Project Execution Plan, and to review EPCI Execution Plan and Equipment and method statement which clearly outlines the construction methodology applied to the project;
- Provide necessary resources to ensure full implementation of the Construction execution plan defined in the Integrated Project Execution Plan; and
- Ensure that the EPCI contractor complies with the Execution Plan and Program of the EPCI contract.

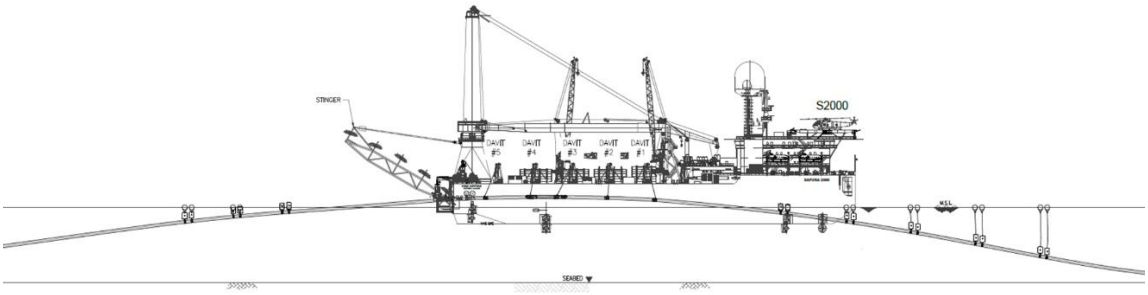


Cutter-suction dredger used for preparing trench along seabed

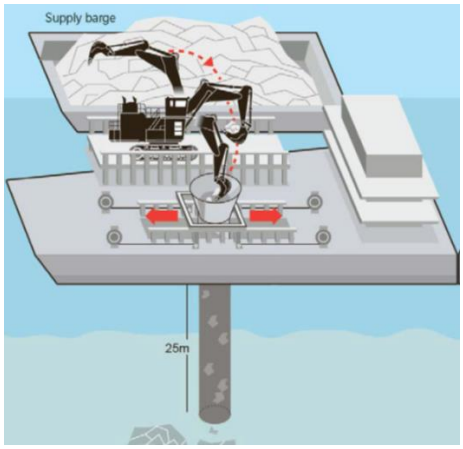


Laying of new 48″ pipeline segment

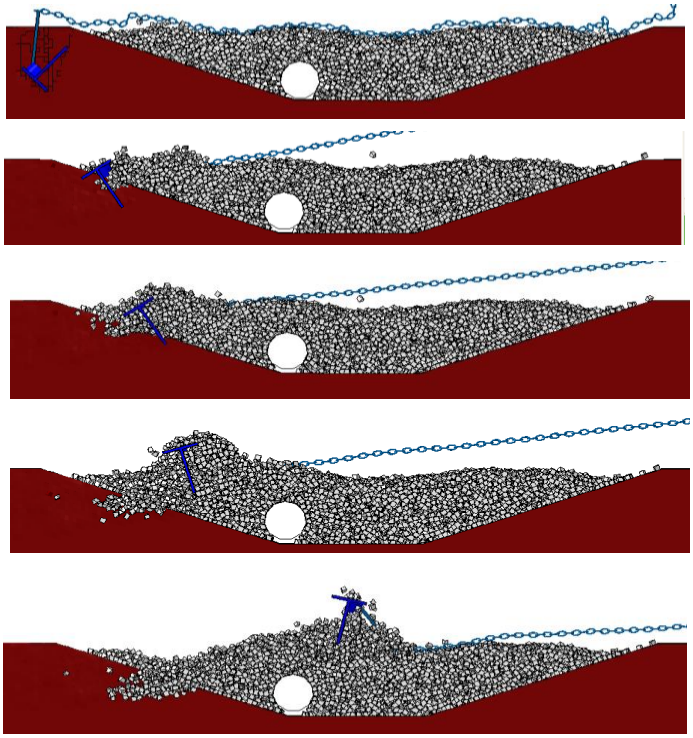
Jetting by Mass-flow Excavator of backfill cover on existing pipeline to facilitate cutting, lifting and above-water tie-in between new and existing pipeline segments



Above-water tie-in of newly installed pipeline segment to existing pipeline



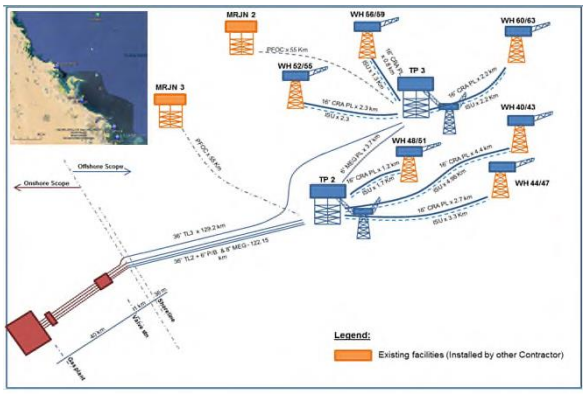
Backfilling of pipeline in trench



Verification of Armour Backfill design via FEA simulation and analysis

- **Hasbah II Saudi Aramco Project (2016 – 2019)**

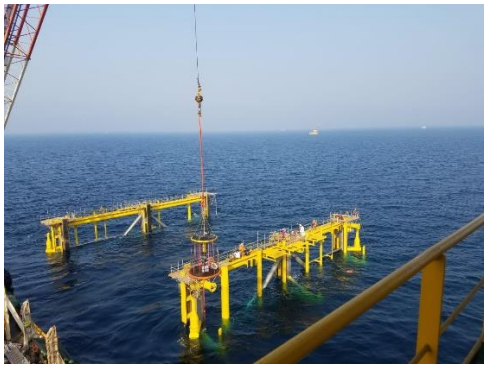
Functioned as EMAS AMC's Project Engineering Manager for Saudi Aramco's Hasbah II EPCI Project (valued at US$1.6 billion). Managed the entire team of project and analytical engineers in this EPCI project, which encompassed the detailed & installation engineering, procurement, fabrication, transportation, installation and pre-commissioning of several subsea pipelines, umbilicals, and platforms. This project was executed with LTHE, who were the consortium partner of EMAS AMC for Aramco Projects in Saudi Arabia.



Hasbah Field and Key Vessel Used for Campaign



Typical pipelay activities (initiation, normal lay and preparation for laydown)




Platform installation by float-over method

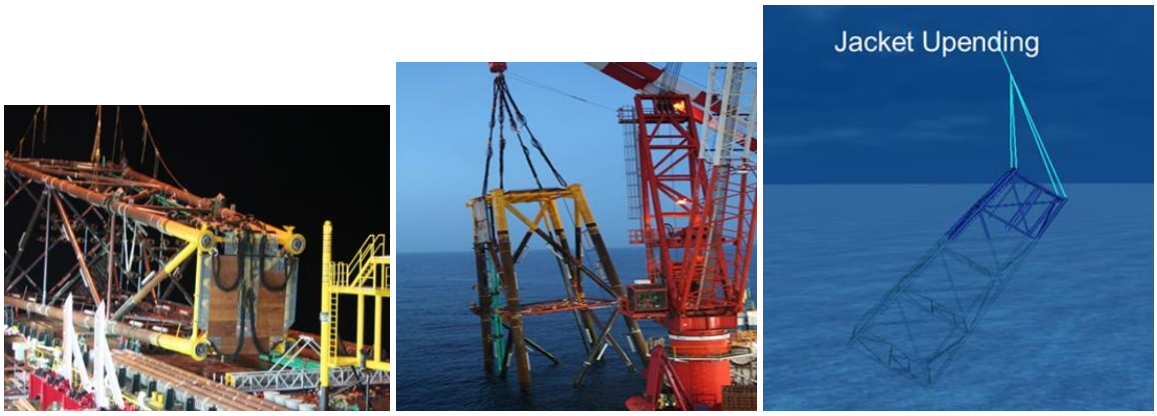


Installation of typical platform by lifting

Installation of umbilicals

- **Chevron Thailand (2011 – 2017)**

EMAS AMC was awarded the installation campaign for installation of jackets, decks and pipelines in the Gulf of Thailand from 2011 – 2014 and 2014 – 2017, where more than 80 platforms and many more inter-connecting pipelines were installed using their flagship vessel, Lewek Champion. I was the Vice-President of Engineering during this period and built the Design and Project Engineering team to a peak of 105. Although I was not directly involved hands-on in execution of the project, I recruited, trained, mentored and managed the team of analytical engineers to perform the detailed and installation engineering, and the project/field engineer for development of procedures and execution of the projects offshore.

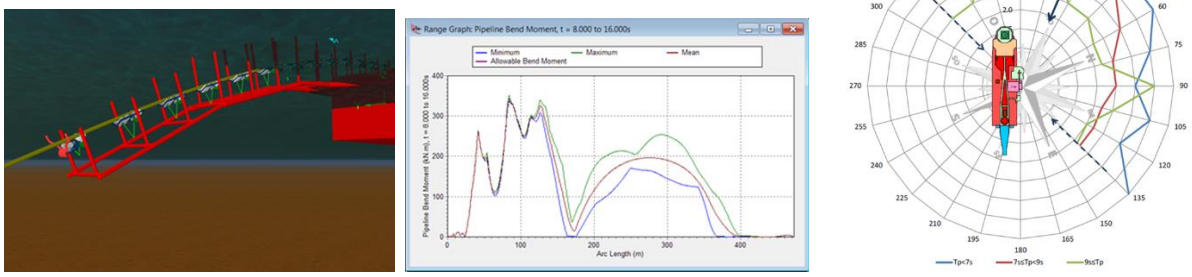


Jacket Installation (Left & Centre) and Analytical Simulation of Same Operation in Office

Engineered Lift Analysis using High-end Software and Actual Photos from Site

Pipeline installation (field joint coating, laydown head bolting & laydown of pipeline)

Installation of subsea spools



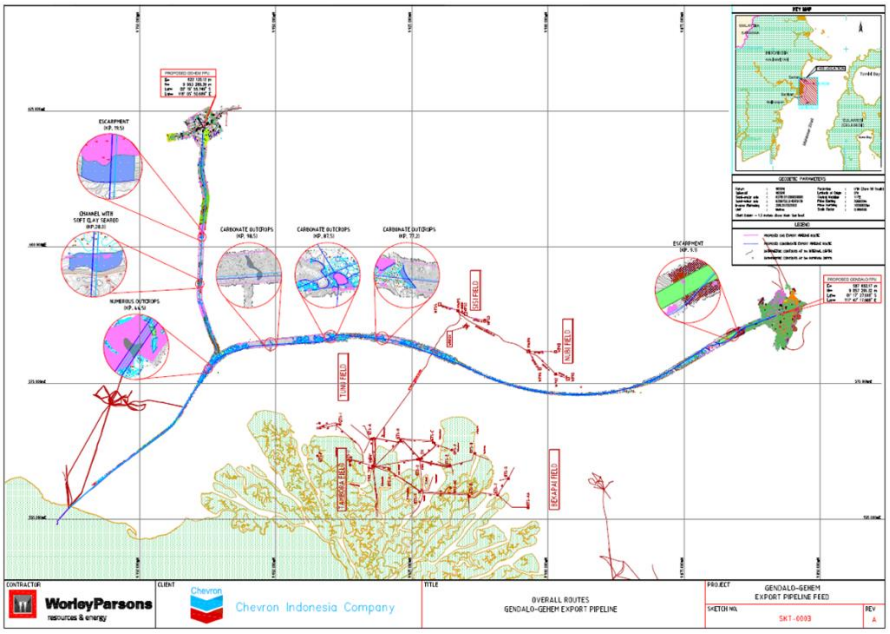
Pipelay analysis using high-end software and graphical example of sea state applicability for pipelaying for various wave directions

- **Chevron Gendalo-Gehem Deepwater Project (Indonesia) - 2011**

Chevron Indonesia Company intended to develop the Gendalo and Gehem hubs which are located in the Makassar Strait, offshore East Kalimantan, Indonesia. The Gehem hub comprises of several reserves in the Gehem field which flow to a FPU located in a water depth of 1765 m. The Gendalo hub lies approximately 100 km south of the Gehem hub. The Gendalo hub comprises of reserves in the Gendalo, Maha and Gandang fields which flow to a FPU located in a water depth of 1165 m.

I functioned as WorleyParsons/ Intecsea's Project Manager, based in Jakarta office, for the deep-water export pipeline FEED for the Gendalo-Gehem Project, valued at US$1billion. The Contract encompassed the design/engineering, procurement support, interface management, constructability assurance, project cost estimate, and project management services for the following Gendalo and Gehem Export Gas and Condensate Pipelines, which vary in length from 82km to 148km, and span from the onshore landfall point to the FPU locations (1765m and 1165m, respectively). I supervised the Jakarta team of specialist to perform FEED design, construction methodologies, project schedule and cost estimation, and discussing with various tier 1 contractors for feedback on our construction methodologies in order to fine tune our schedule and cost estimates.

The project was eventually tendered out and a successful Tier-1 Contractor chosen. However, due to economic situation in the Oil & Gas industry, the contract was withdrawn.



Schematic showing pipeline route and seabed challenges along the routes

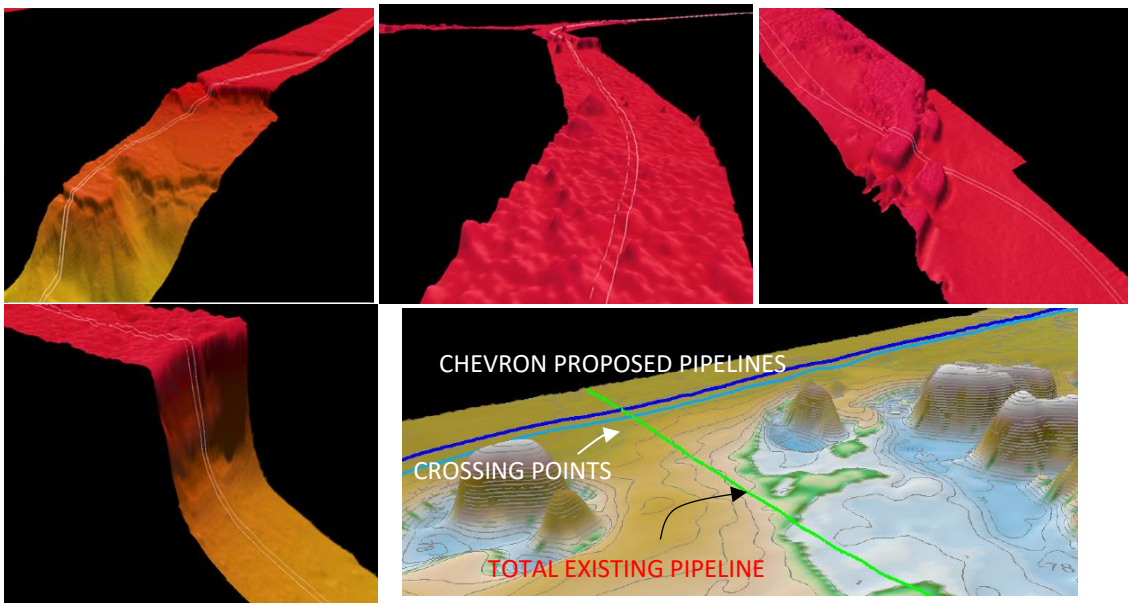


Illustration of seabed challenges along pipeline routes

- **VietsovPetro (2010)**

Eng Bin joined VSP as the Deputy Project Manager in the Construction Division and worked as the Subsea Specialist cum Deputy Project Manager for the TGT FPSO Project, Daihung II and Bien Dong jacket and topside projects. His duties included contracts negotiation and administration, supervision of subcontractors, review and implementation of installation methodology, assisting with installation, and assisting management and project managers with editing and writing proper English in all external communications. VSP is the largest Oil & Gas operator in Vietnam and account for 25% of Vietnam's GDP.



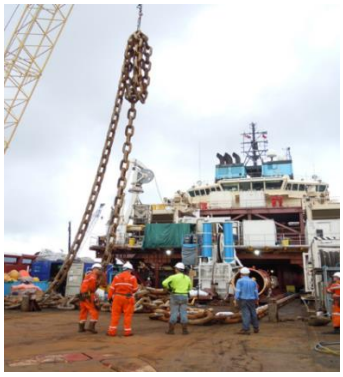
Confirmation of pile parameters before load-out onto material barge



(Left & Middle) Pile handling frames for use offshore and (Right) Rigging chains inside vessel hold to offload the chains



Lifting chains from transportation vessel for storage at site


Transporting chains to DSV for offshore installation and marking chain to facilitate offshore installation

Loading marked chains into chain locker inside DSV

- **DAEWOO SHWE Project (2009)**

I joined Daewoo as a Lead Pipeline and SURF/Subsea Engineer to oversee the execution of work for the Subsea Production System and Pipelines for the US$2 Billion SHWE Development Project Phase 1. Daewoo is a Gas Operator in Myanmar, and the project involves Pre-FEED, FEED, Detailed Engineering, Fabrication, Installation and Commissioning of the entire field.

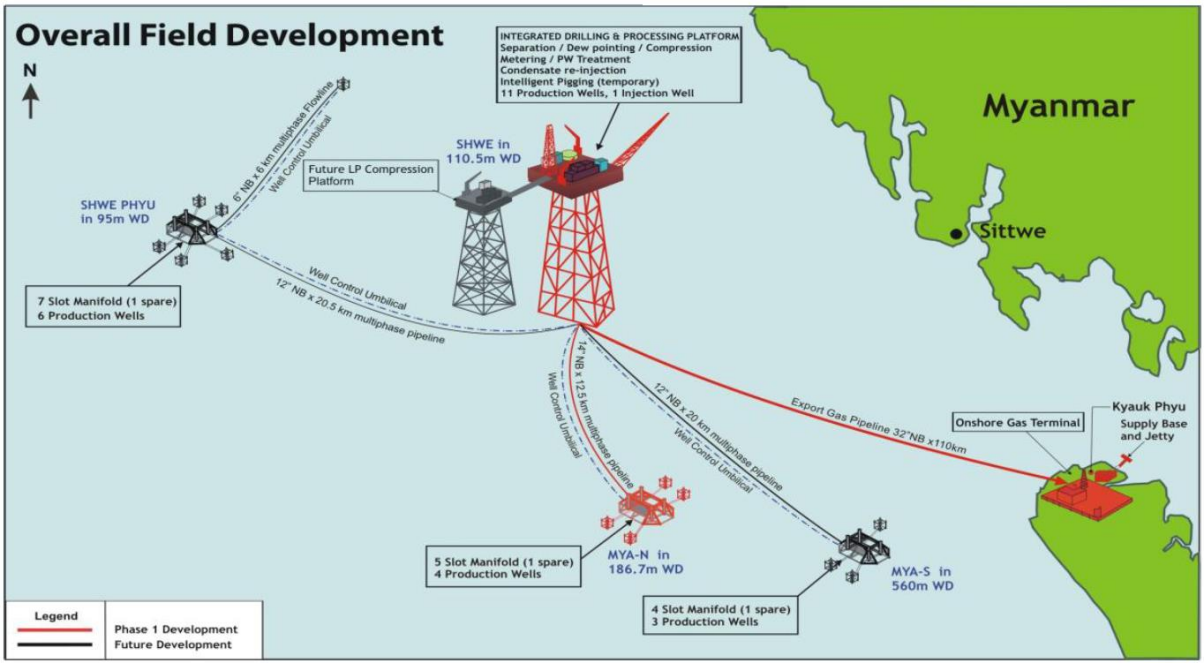


Illustration of SHWE Field for Phase 1 and Phase 2

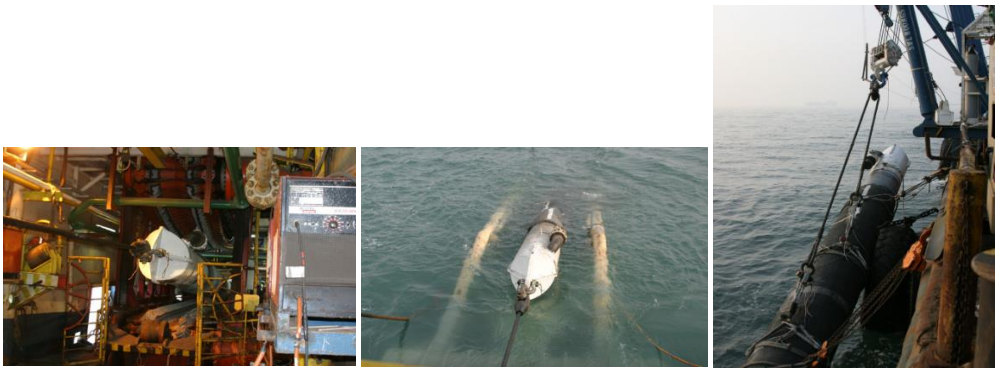
My scope involved the supervision, review and approval of Contractor's work pertaining to: (1) one 105-km 32" diameter gas export pipeline from SHWE platform to onshore, (2) one 4-5km 32" diameter onshore gas export pipeline from landfall to the Onshore Gas Terminal, (3) one 14-km 14" intrafield pipeline from the subsea manifold to the SHWE platform, (4) an entire subsea system, comprising one subsea manifold (and all associated equipment), 4 Christmas Trees, umbilical from SHWE platform to PLEM, jumpers, flying leads and associated topside and subsea control systems.

I completed the FEED phase of the project and left after assisting Daewoo to evaluate the bids and award the EPCI contract to HHI.

- **SK Corporation 36" SPM Relocation Project (Korea) - 2006**

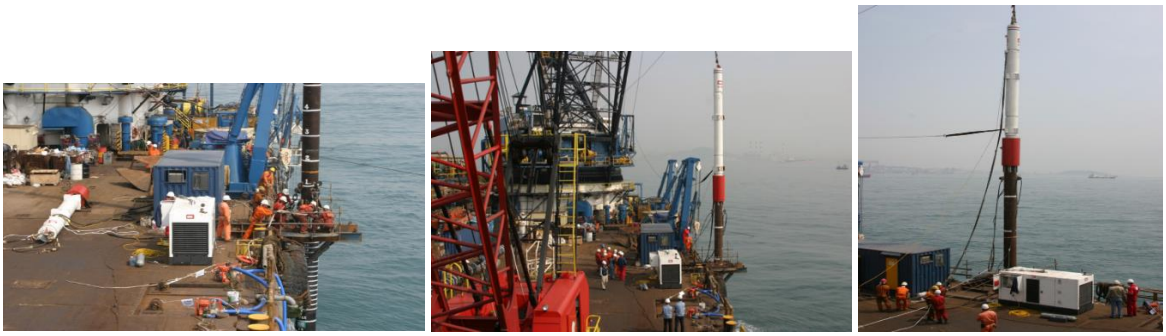
This project involved the recovery of existing 36" pipeline for further extension and included the installation of a new SPM system. As WorleyParson's representative, I functioned as the construction/design specialist responsible for reviewing SK Corporation's installation contractor's detailed installation engineering and procedures. Subsequently, I was stationed on Global Industries' laybarge as SK's specialist consultant during the pipeline construction to oversee the recovery of existing pipeline, installation of extension pipeline and installation of the PLEM.

Welding addition pipe to recovered pipeline and preparation for abandonment



Abandonment of Pipeline & Subsequent Davit Lift for Tie-in to PLEM

Installing Stabbing Guide to facilitate Alignment & Welding of PLEM spool to Pipeline



Installing PLEM piles

- **Sisi Nubi Field Development Phase 1 (HHI/Total Indonesie) - 2006**

I functioned as WorleyParsons' Project Manager for Hyundai Heavy Industries's Total Indonesie Sisi Nubi Field Development Project Phase 1. I was effectively HHI's Project Engineering Manager for this project, responsible for detailed engineering design and installation engineering support for the pipeline network for the project. The team was based in Jakarta to work closely with HHI and their Client Total Indonesie.

- **Brunei Shell Petroleum East/West Pipeline Replacement Project - 2005**

I was project manager for provision of engineering services for Conceptual and Detailed design of 39 replacement pipelines.

- **China Petroluem Company/DNV Taichung-Tungshiao-Tatan Gas Pipeline Project (2004 – 2005)**

I functioned as engineering project manager for Phase 1 of the contract, which included the conceptual design of a 126-km 36" pipeline, detailed design of onshore facilities, drafting of specifications and Tender Documents for the contract. In addition, I also provided construction engineering support for Phase 2 of the project.

- **Brunei Shell Petroleum Egret Offshore Pipeline Project (2004)**

I was the project manager for provision of engineering services for Conceptual and Detailed design of the Egret Pipelines.

- **SINOPEC Hangzhou Bay Pipeline (HHI/SINOPEC) (2003 – 2004)**

I functioned as Kvaerner's Project Manager for the detailed design of three 53-km pipelines across Hangzhou Bay in Changjiang Region, China. The pipelines comprise 1 no. 30" and 1 no. 28" oil pipelines and 1 no. 10" naphtha pipeline. The project involved all aspects of submarine pipeline design and included design of pipeline for self-burial using "spoilers", verification of the pipeline design for installation by HDD and conventional pipelay methods, cathodic protection design, etc.





Installation of the shore approach section of the pipelines by Horizontal Directional Drilling



Installation of pipeline with spoilers



Pulling of pipeline with spoilers to landfall – notice that pipeline has self-buried due to spoilers

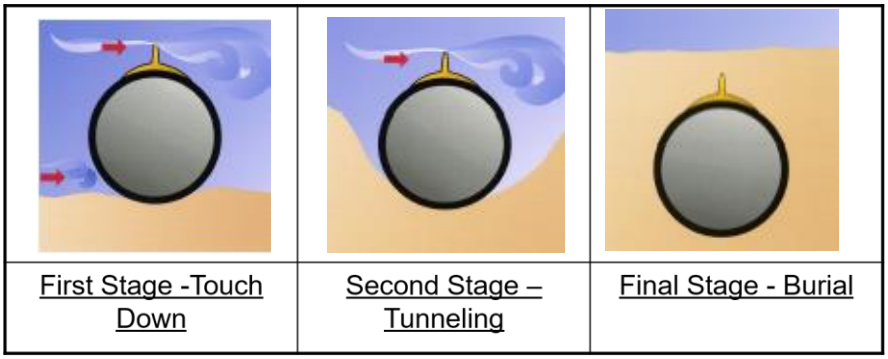


Illustration of mechanism in which spoilers help pipeline to self-bury

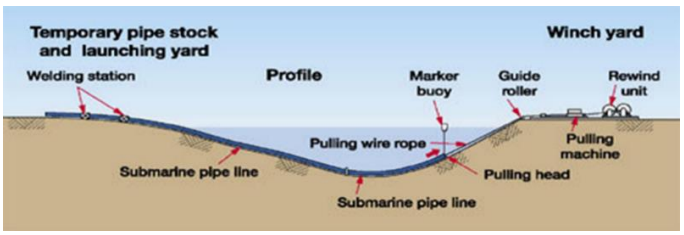
- **Hong Kong Electric Company Ltd (2001 – 2002)**

I was Project Manager for detailed design of a 92-km gas pipeline from Hong Kong to China, including the onshore receiving station. The pipeline is to be trenched to 3m along its entire route and protected from anchors with armour rocks along 20 – 25 km of its route. The scope of work involves the design of the gas receiving station, submarine pipeline, pipeline route, and its armour protection system, and drafting of all technical specifications, etc.

- **Shell Eastern Petroleum Ltd's Pipeline Bundle from Bukom to Seraya (Singapore) (1999 – 2000)**

I was EPCI Project manager for Shell Eastern Petroleum's submarine pipeline bundle of eight pipelines and two fibre optic cables. Project entailed permanent facility design and materials, subcontractor and operations management of the bundle installation from Seraya Island to the Singapore mainland, a combined pipeline / cable length of 36.5 km / 10 km across one of the world's busiest shipping lanes. Project was completed within 15 months of contract award and included seabed intervention (dredging, drilling & blasting, rock dumping etc), pipeline string fabrication & bundling, bottom pull, pre-commissioning and reinstatement of sites.

My scope included the overseeing of in-house detailed engineering team, T&I Contractor (Van Oord) and it's subcontractor, McConnell Dowell



Concept for Bottom Pull across Shipping Channel and Pull-head for Pipeline Bundle

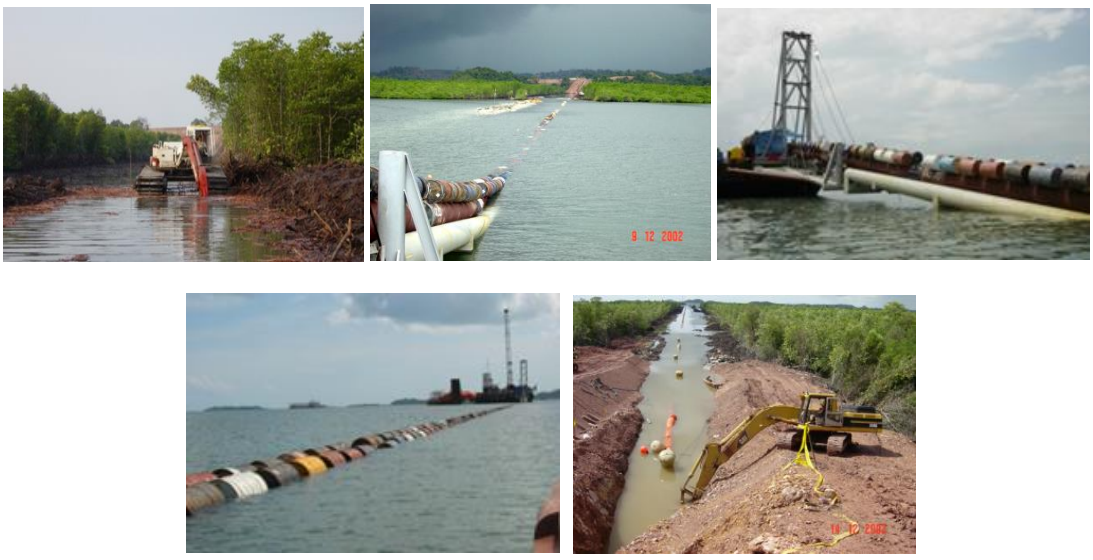
Pulling of pipeline bundle strings from Bukom Island to Penjuru (Mainland Singapore) using Linear Winch at Penjuru

Riser Installation and Site Reinstatement after Completion of Bottom Pull

(Left & Middle) Simultaneous dredging and drilling & blasting works for trench preparation & (Right) side-stone dumping vessel for backfill installation

- **PGN Gas Transmission and Distribution Project (HHI/PGN) (1999)**

I functioned as Kvaerner's Project Manager for the detailed design of PGN's 215-km gas pipeline from Kuala Tungkal (Sumatra) to Batam. The project involved the optimization of concrete coating design and trenching requirements, design of pipeline and cable protection for trawl board impact, and drafting of all technical specifications.



Excavation of mangrove swamp and installation of shore approach by "push-pull" method

Installation of onshore section of pipeline and anchor block

(Left) Reinstatement of site including mangrove planting; and (Right) two laybarges used for installing the long pipeline

Laying of 28" pipeline and subsequent trenching by jetsled

- **Dahej Project (1997 – 1998)**

I was Kvaerner's Project Manager for IPCL Dahej Effluent Outfall Project in India. This project involved the design and installation of a 3 km long 20" diameter pipeline and a diffuser at the Gulf of Khambat, where surface current of up to 8 knots and a tidal variation of 10m are present. I managed the design at the Kvaerner office and was also at site to supervise the pipeline construction.

Linear pull winch arrangement on a floating barge anchored 4.5km off landfall and 500m from inter-tidal zone

Pulling of pipe strings with buoyancy tanks from onshore stringing yard to pull barge location

Burial of subsea pipeline via jet sled (offshore) and excavator for inter-tidal zone and onshore

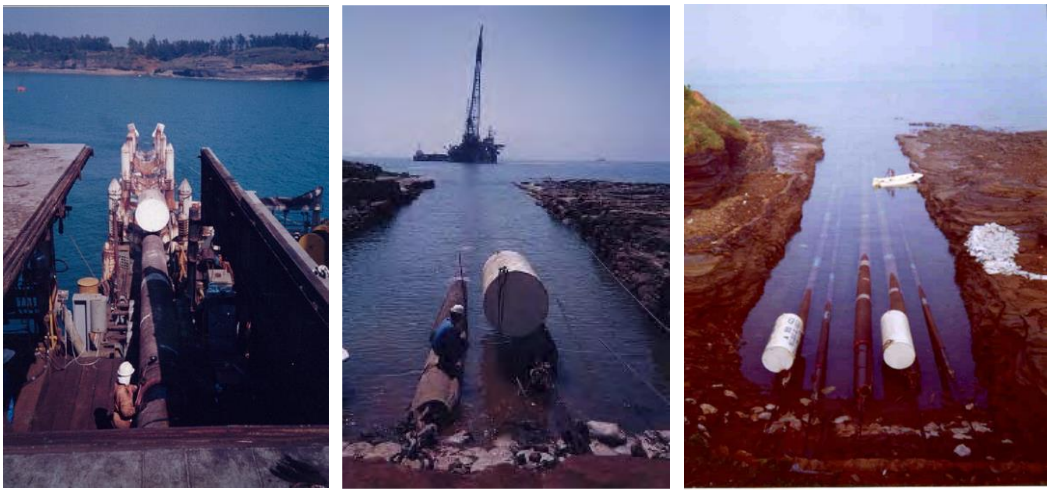
- **Shell Bonny Terminal Integrated Project (HHI/Shell) - 1998**

I functioned as Kvaerner's Project Manager for the detailed design of a 14-km effluent water pipeline and diffuser, and a 34-km oil export pipeline in Nigeria. Included in the project were the feasibility studies for refurbishment and upgrading of existing export pipeline facilities.

- **Weizhou Pipelines Development Project (HHI/CNOOC) - 1997**

I functioned as Kvaerner's Project Manager for CNOOC Weizhou Pipelines Development Project. This project encompassed the design of 8 pipelines and associated risers and expansion loops, a diffuser and 4 piggable wyes, of which two were divertible prototypes. Included in the scope of work were pipeline hydraulics and thermal analyses, detailed design of the pipelines, risers and riser clamps, design of cathodic protection, design of armour burial along the shore approach, routing of the pipelines and outline installation engineering.

Approach to landfall was dredged and complex anchor mechanism made for multiple landings



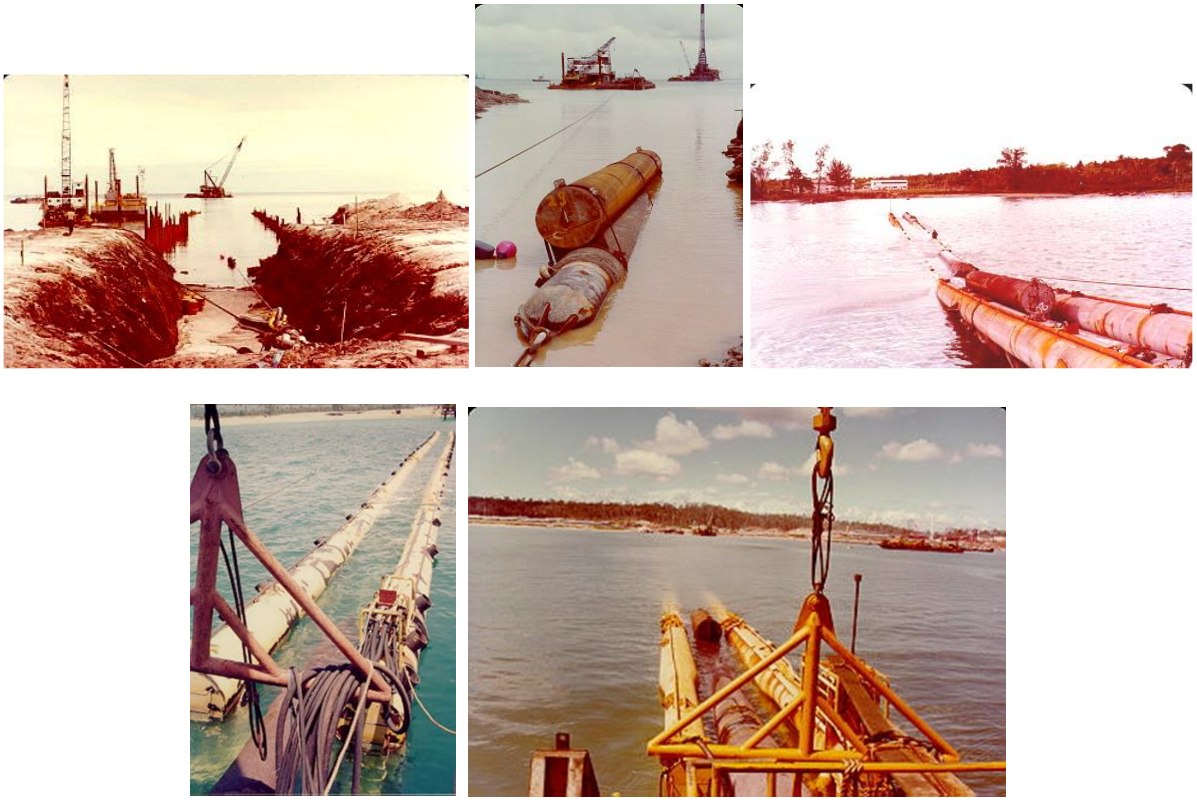
Multiple shore pull with pipelines spaced 2m apart

- **PUB Twin Pipeline Bundle Project (1994)**

Functioned as Kvaerner's Project Manager for Public Utilities Board's (PUB) twin 700 mm pipeline bundles from mainland Singapore to an offshore island 2 km away installed using the bottom pull method. Was involved with detailed design for the pipelines and tender package preparation for PUB.

- **Sarawak Shell Berhad Category 1 Programme (1979 – 1984 & 1986 – 1991)**

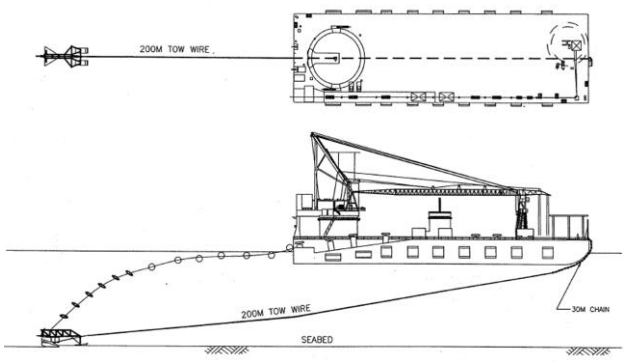
I was the Lead Pipeline Engineer for performing all installation analysis for the program and providing installation guidelines in the form of "Field Data Books" to the Operation Dept for the SSB Category 1 program. Such Field Data Books form the basis of McDermott's pipeline installation procedures. I was also the Lead Pipeline Engineer for all EPC and T&I projects executed by McDermott in Singapore.



Examples of shore-pull for various pipelines installed during the campaign

- **McDermott's Super-plough Project (1982-1984)**

I was the assigned project engineer to work with RJ Brown to fabricate and test the prototype plough, make trial runs to obtain data for use to design the actual plough. Subsequently, I was in charge of coordinating the building the plough at McDermott's Batam yard and doing trial runs in Batam before sending the plough to Sarawak for use on SSB pipeline trenching project. Subsequently, I was responsible for reinstating the plough and providing procedures for use on another project in W. Malaysia.



Concept for post-trenching using the plough & onshore testing and adjustment of procedure prior to offshore deployment

Successful offshore deployment off East Malaysia for SSB Project

- **Sarawak Shell Berhad twin 8" Rentis Pipeline (1985)**

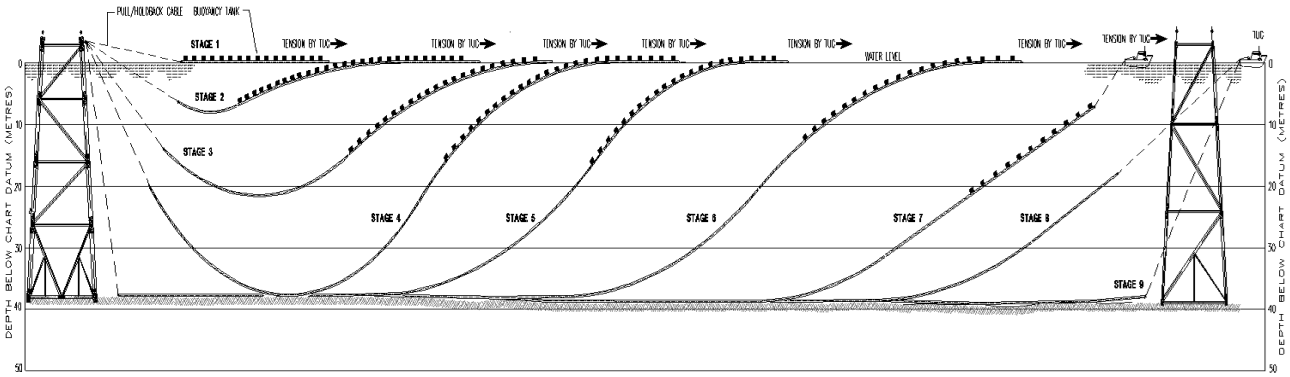
I was Deputy Division Manager for the Offshore Construction and Engineering Division of Selco and also functioned as their Chief Engineer. During the period, I helped Selco set up their Project Office for the Joint Venture with Shapadu to form Shapadu Offshore Services for the SSB Category 3 Program. I successfully managed and installed Selco/Shapadu's first 'Rentis' pipeline project for Shell Sarawak Berhad, positioning Selco/Shapadu as a full-fledged pipeline contractor. My work entailed performed installation analysis to provide guidelines for the laydown of the string, site management of the retrofit work to uncover the badly maintained Rentis launch track, organizing resourcing from local suppliers, organizing marine spread for the launch, tow and installation, supervising the launch (in conjunction with the construction superintendent), towing the pipeline string to site and managing the stripping of the buoyancy drums to lay down the pipeline. Subsequently, I performed installation analysis for the davit lift of the pipeline using a different marine spread and provided the guidelines for the riser installation.

Launching of pipeline bundle from stringing yard 2 km from sea to the landfall

Towing of pipeline bundle to offshore platform, tying to initiation cable and retrieving stripping wire from bundle

Stripping of buoyancy drums from pipeline while applying tension to lay it down to seabed

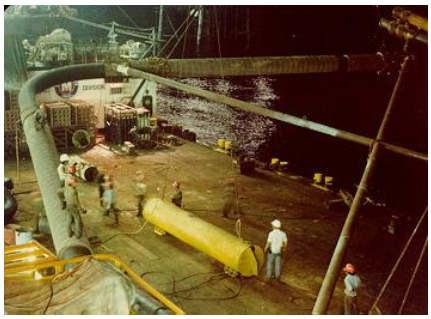
Collection of stripped buoyancy drums for delivery to collection site onshore



Schematic illustrating the various stages of buoyancy removal and pipelaying

- **Sarawak Shell 30" U-Bend by Surface Tie-in (1983)**

I was tasked to eliminate the hyperbaric welding of 85'x75' U-bend expansion spool for SSB platforms in 290' water depth. I came up with a davit lift procedure using several buoyancy tanks, modification to McDermott's laybarge to locate a 400T crawler crane on top of the welding stations to assist with supporting the U-bend during davit lift and lowering. After much scrutiny by Shell and their consultant, RJ Brown, the method was accepted and McDermott went to install the expansion spools successfully at 2 platform locations, saving the company millions of US$.


Davit lifting of 36" pipeline and stalking-on of U-bend



After installing the U-bend, the riser was added and the assembly lowered to seabed with riser installed inside riser clamps