

Wale Marine

24 years of engineering experience in the creation of
Specialised and Customised Marine Solutions and Equipment

Designed & Supplied by

Wale Marine cc

Incorporating HDPE work-boats fabricated under licence by

Rhino Marine Products (Pty) Ltd



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Introduction

In 1952 Steinbeck wrote “the free, exploring mind of the individual human is the most valuable thing in the world. (It is) the one thing that separates us from the uncreative beasts.” This was written in East of Eden in the same year that the founder of Wale Marine was born. In 1986, after resigning as a director of Underwater Construction (a leading Cape Town based Civil Engineering Contracting Company specialising in the design and construction of marine, harbour and piling works), Anton Wale established an engineering management practice. Nearly twenty five years later Wale Marine continues to create innovative engineering solutions primarily for marine clients in the offshore Oil and Gas sector.

In line with Steinbeck’s thinking, Wale Marine remains a small group of individuals who focus on creative thinking, but over the decades we have formed close associations with larger specialised companies so that we can maintain the potential of speed and flexibility associated with a dynamic and non bureaucratic core, whilst also being able to offer the larger potential of complex turnkey systems which we co-create together with our established partners and sub-contractors.

We are a registered Professional Engineering corporation carrying a blanket 17.5 million Rand professional indemnity insurance covering the design of these services and equipment.

Wale Marine specialises both in the engineering of marine solutions and methodology as well as the design and supply of customised equipment. Our leading fabrication partners and sub-contractors are:

- Hyflo on the engineering and supply of hydraulic systems and components used in our design and equipment;
- Lenwalt on the fabrication of structural steel, mechanical, and high density polyethylene (HDPE) equipment;
- Concrete Units on the construction of reinforced and pre-cast concrete works, as well as for fabrications incorporating large diameter spirally wound steel pipework; and
- Customised Plastic Products on the fabrication of HDPE work boat hulls and barges.

In 2008 Wale Marine appointed Danie van der Merwe to act as our contracts manager. Danie not only has a wealth of experience and creative skills in Civil, Structural and Mechanical engineering, but also has exceptional computer skills enabling us to represent, design and communicate the creations that we develop in three dimensional model forms using Inventor.

Our mission statement is simple – Assist our clients in engineering the most elegant and cost effective solutions for their needs.

Past and current clients for whom we have successfully created engineering solutions and equipment include:

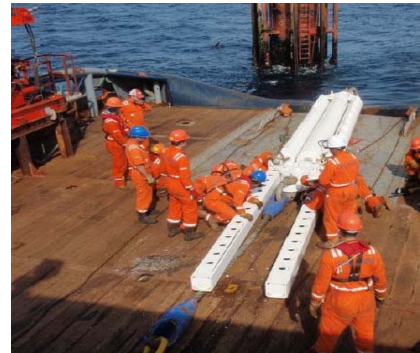
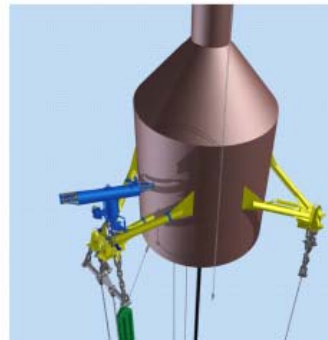
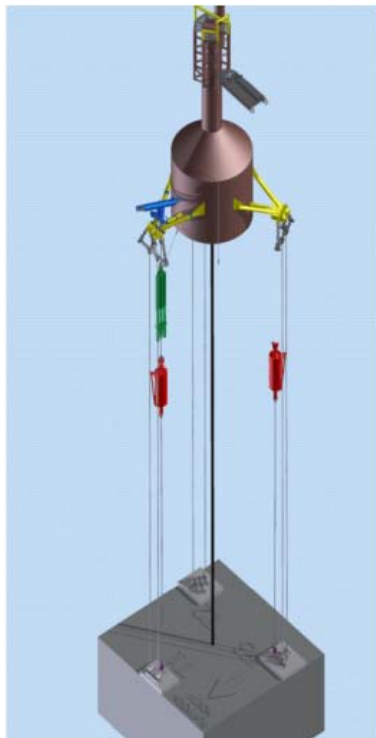
- Acergy (previously Stolt Offshore and Stolt Comex Seaway or SCS)
- SMIT Subsea
- Petro SA (previously Mossgas)
- Murray and Roberts Marine
- Cape Diving
- Leighton India
- Hydro Dive
- SAIPEM
- Bourbon

This brochure is intended to give an overview of the typical services and solutions that we have supplied to the industry over the last decade by showing pictures together with brief descriptions of selected projects. An index of contents of the specific pages that follow is given overleaf.

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Repair of Tether System for Petro SA EM Control Buoy (2010).



Having been extensively involved in the initial installation of the EM control buoy in 2000 (see pages 5 and 6) Wale Marine were commissioned by Petro SA to engineer a remedial solution when it was identified that the tether system was fatiguing and in imminent danger of one of the tethers failing, with major consequences including the shut down of the EM field. This installation is situated in a water depth of 90 metres about 70 miles south of the exposed Southern Coast of Africa.

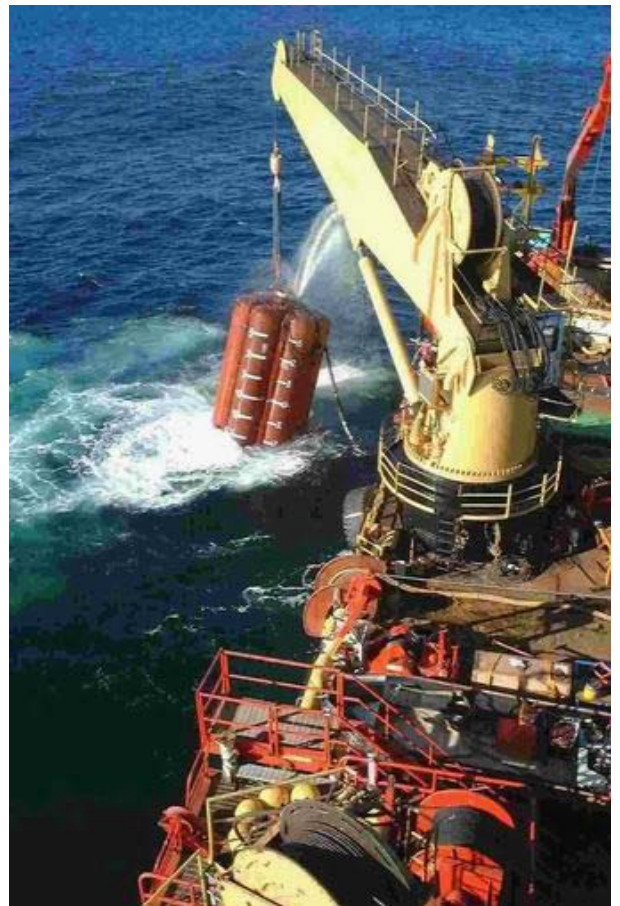
After investigation it was established that the head of the 300Te SWL shackle pin on one of the tethers had sheared off with the pin migrating into the shackle jaw; on a second tether the universal hanger had significant cracking. These items needed to be removed and replaced. Initial contemplations were that a construction vessel would need to be brought in, but after review it was decided to engineer a solution that could be executed from the Seacor Achiever. This small SOV (sub-sea operations vessel) is a converted supply vessel which Petro SA has on charter. The Achiever has a small air diving and saturation diving spread that is supplied and operated by Cape Diving. This had significant beneficial implications to Petro SA with respect to time and cost.

Using the original hard copy fabrication drawings of the EM installation, Wale Marine transposed the EM buoy system into a three dimensional computer model, and in co-operation with Cape Diving engineered a viable "diver friendly" solution conceived along the following lines:

- Design and fabrication of new shackle pins for the permanent tether system which would not be fatigue prone and fitted with installation aids for easy diver installation;
- Design and fabrication of a hydraulically operated temporary parallel tether system incorporating a 4 m stroke hydraulic puller which could relieve the load on the adjacent main tether;
- Separation of the temporary tether into a saturation diving installation (below 35 metres) and an air diving system separated by a ballast-able tension buoy;
- Incorporation of 200 Te SWL eye and jaw swivels into the tethers to allow easy diver connections;
- Engineering of a sub-sea davit system with hydraulic winch to be installed on the control buoy outrigger for executing the installations and replacement works. This winch was operated from the same hydraulic power unit and umbilical system that was used on the hydraulic puller; and
- Development of a new HDPE workboat to be suitable for these works.

The equipment was all launched and recovered over the Achievers stern roller, and the full works from conception to completion of installation was effected in a period of two months. Equipment fabrication was executed in parallel with the design evolution. The 3D inventor model proved invaluable during the repair works.

Installation aids for EM Buoy installation Stolt Comex Seaway (SCS) - 1999-2000



In order to give a better perspective of scale of the control buoy a picture taken during fabrication is shown top left with the 6 m Rhino work boat shown next to the bow catcher boat landing below it. The right hand picture shows the 100 cubic metre stabilising buoy that Wale Marine engineered and fabricated for SCS for the controlled lowering of the 3,000 Te caisson gravity base used for tethering the EM control buoy to the sea-bed. The right hand picture shows the recovery of the buoy onto the DSV Discovery after successful deployment of the caisson.



The stabilizing buoy was multi-compartmented to allow for controlled flooding and evacuation of the 11 compartments, with each compartment and its separating bulkhead being capable of resisting 110 m of submergence pressure (110 tonnes per square metre). Wale Marine also supplied and installed all of the piping for the flooding umbilical. Fabrication of the structure was sub-contracted to Concrete Units in Meyerton with pontoon shells being fabricated from spirally wound pipe. The time between award and delivery was ten weeks. The structure was fabricated in 4 modules in Meyerton (3 x double pontoon units and 1 x central unit) and truck transported down to Cape Town for final assembly, in situ welding and installation of the flooding

umbilical. Further pictures of the associated rigging and ancillaries relating to the stabilising buoy and the gravity base and control buoy installation are included below.



The above pictures show the floating caisson being towed from Simonstown to the EM field. These show the temporary tripod structure we designed and supplied together with the deployment pendant for the lowering of the caisson. The Wale Marine supply included the removable steel works platform atop the caisson gravity base. The tripod connections were designed to be compatible with the tether clevises used for anchoring the control buoy, and ten years later we used the same anchorage points for installing the temporary hydraulically operated retractable tether used in the repair works discussed on page 4.



Other equipment supplied by Wale Marine for the project included 100 tonne swivel (top left), the subsea hydraulic shackles for quick release (bottom left), a friction drum tensioning system that we used for spooling of the steel wire rope onto the 50 tonne deployment winch, 50Te SWL deflector sheaves for over-boarding winch cable from the DSV Discovery, the over-boarding chutes for umbilicals, chain forks and flooding manifolds, as well as the riser installation winch and 25 tonne SWL deflector sheaves used to install the EM risers onto the FA platform.

The picture above right shows the 120 Tonne SWL emergency replacement snatch block that was used for the installation of the EM Control Buoy onto the gravity base. This snatch block was an emergency replacement block to be used in the pull-down rigging because the initial block had failed. The order for the works was given to Wale Marine at noon on a Friday and the completed item was designed, built and dispatched by 08h00 the next day, having been tested to 150 tonnes on a test bench. The reported comment from the DSV superintendent on receiving it was "This is almost as quick as ordering pizza".

Dry-docking Blocking Line for Stolt Offshore's 25,000Te "Seaway Polaris" (2002).



This reinforced concrete blocking line was engineered for Stolt Offshore and installed in Cape Town's Sturrock dry-dock by Wale Marine as a turn key solution. The fabrication of the 144 No cruciform shaped 200 Te SWL precast concrete units was sub-contracted to Concrete Units. This contract received the Fulton Commendation for excellence in Design in the use of concrete by The Concrete Society of Southern Africa.

In 2008 the converted Polaris incorporating a new J lay tower and weighing 30,000 Te was re-docked for maintenance in Cape Town by Acergy. Once again the new blocking line that was engineered and installed by Wale Marine (in JV with Concrete Units). The new blocking line design incorporated the original blocks, but required further blocks and extra modifications to allow for a quicker installation time.

Pre-commissioning of the Bonga Pipelines (2004 - 2005).



In 2004 Wale Marine were engaged by Stolt Offshore as their resident pre-commissioning engineer for the 16" Gas Export Pipeline between the Bonga FPSO and the OGGS RPA platform. Top left is the FPSO in 1000m depth with the Seaway Polaris alongside. The Polaris was used for the pipe-lay and sub-sea operations. Above right is the RPA platform (about 90 km away in 25m) during the dewatering of the 16" gas export pipeline. Ancillary works by Wale Marine included the re-design and fabrication in Port Harcourt of the bow-catcher boat landing for the Surfer 140 for easy deployment and recovery from the side of the Seaworker, as well as all pipe and valve work for the dewatering dump-line, plus significant removal and blinding of pipework and valving on the RPA top-sides owing to a 10" ball valve casing leak on the top-sides identified during the pressure testing of the pipeline.

On completion of the gas line, Wale Marine were engaged further to pre-commissioning the flow lines and water injection lines for the FPSO itself. BJPPS were subcontracted for the pumping and pressurising operations. The work essentially comprised the pressure strength-testing of the individual flowlines (400 bar for the PFL's and 310 bar for the WFL's), the cleaning of the PFL loops using bi-directional brushing pigs, and hydrotesting of the PFL loops (including manifolds, well jumpers and boarding valves) to 330 bar.

Knuckle-boom ships crane for SCS DSV American Pride (1999-2000).



This crane was designed, fabricated, supplied and installed on the Stolt Comex Seaway DSV “American Pride” based in Lagos Nigeria. The crane has a 19 metre reach and a 75 tonne metre moment capacity, with a maximum lift capacity of 12 T (single line pull of 6T). The crane has a detachable fly-jib for long reach operation. **Above right** - Function testing of the crane in Cape Town Harbour before final painting & despatch. **Below right** - Load testing of the crane on the American Pride at Nigerdock in Lagos

Modular Jack-up Barge for Geotechnical Sampling – Franki Pile (2005).



Wale Marine were commissioned by Frankipile (Africa) to design and manage the fabrication of a 20 Tonne lifting capacity modular jack-up barge from which to undertake a geotechnical investigation drilling project in 15 metres water depth off Lobito in Angola. The structure was fabricated by Concrete Units in their Meyerton factory (picture on right). The 35 tonne basic barge is modular with a maximum module mass of 6 tonnes. It comprises two 12 m long by 1.9 m diameter steel pipe pontoons flange connected in a T configuration and fitted out with modular decking, leg-guides and ancillary components such that the full system could be transported in three 12 metre open top containers.

Transport barge Calshot harbour Tristan du Chuna – Apple Projects 2009.



Wale Marine were commissioned to design a light-weight, low draught self propelled transport barge for transporting dollosse and construction equipment from a supply vessel to the Calshot harbour. The barge was fabricated from HDPE pontoons with a steel space frame superstructure.

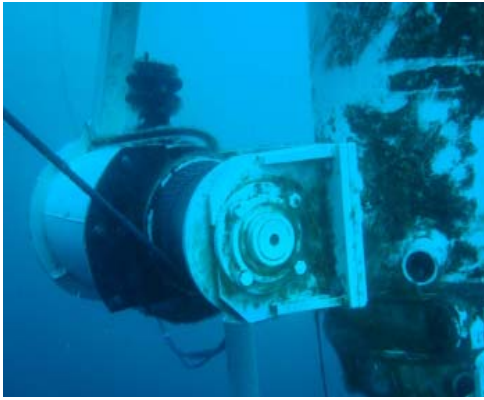
The steel superstructure and timber decking was fabricated in Cape Town (under our management) and the HDPE pontoons were supplied by Wale Marine using Customised Plastic Products in Pretoria as our fabrication sub-contractor.

Hydraulic/Electric Dredge Pumps – Murray and Roberts 1999/ Seychelles 1998



In 1999 Wale Marine was commissioned by LAMA/Murray and Roberts to assist them in the engineering related to the SAPREF replacement pipeline installation to the CALM Buoy. One major problem encountered was the dredging of sand before pipe pull. For this we designed a system for a submersible electric motor as well as a hydraulically driven unit for use with the 100kW 10" gravel pumps that have been developed for the West Coast alluvial diamond pumping. Bottom right shows a simple modular dredger using spirally wound pipe and a submersible dredge pump that we engineered for the dredging of the Fregate Island harbour in the Seychelles.

Drum Winches



Above Left – 10 Tonne Subsea winch installed on davit for the EM tether repair (2010 - see page 4).

Centre - 2,5 Tonne SWL Air Diving Man Rider Winch (2002). Winch designed and supplied to Hydro Dive (Nigeria) - designed to DNV & IMCA rules.

Above Right - Riser Pull-in Winch 15 tonne SWL (2000) for Stolt installation of the flexible riser from the EM field to the FA Platform.



Set of 4 mooring winches (2002) for the Hydro Dive DSV "HD Commander" in Nigeria. Each winch carries 1,500m of 28mm SWR and has a bare drum pull capacity of 30 tonnes. The winches are driven via a 110 kNm final drive planetary gearbox mounted inside the winch drum to minimise the space requirements. Winches are horse-power controlled for power efficiency. The two bow winches are fitted with automatic spooling.



Above Left - 12 Tonne High Speed Tool Deployment Winch Stolt Offshore(2000 – 2001) Winch with 140 kW power-pack– Designed for 1,500 meters of 26mm SWR and used by Stolt Offshore in deep water oil field installation (Girrasol Field) activities off Angola.

Centre - 10 Tonne Sub-sea Winches – Murray and Roberts Marine (2010). Compact 10 te sub-sea pull down winches for water inlet system installation at Trejkoppie in Namibia.

Above Right – HRC deployment winch SMIT SAT3 System (2006). This winch was part of the HRC Launch and Recovery system – see page 14.

Powered Reels



Above Left. Hydraulically Powered Reel (1998 - 2001). This powered reel was initially supplied by Wale Marine to American International Divers which was subsequently taken over by Stolt. This reel is used for the installation of sub-sea flexible flowlines and control umbilicals, accommodating up to 3,000m of 150mm ϕ flexible pipeline weighing up to 120 tonnes. In 2001 the reel was upgraded for Stolt for the installation of the 6" flexible flow-line for the Moss gas E-M satellite field development. The upgrade entailed incorporation of a 2nd pinion drive unit in order to double the drum torque.

Above Right. Two of three hydraulically powered reeler systems supplied to Leighton India 2008. These chain drive reelers were designed to accept the supply drums for 1000 metres of 86mm SWR to be used on a pipeline pull with a 300 Te linear Winch that we supplied to them (see next page).



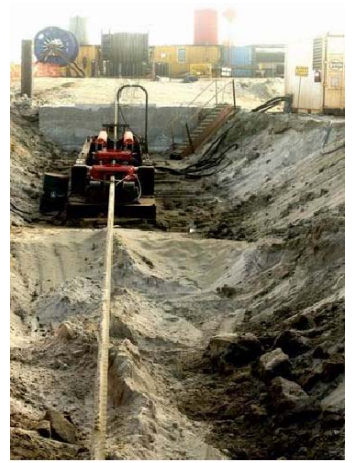
Above Left. Two pneumatically powered umbilical reels fabricated in Cape Town and supplied via Wale Marine Australia (no longer operating) for Well Ops in Australia

Above Left. Two pneumatically powered umbilical reels supplied via Wale Marine Australia to Well Ops UK. These reels have fail safe calliper brakes which engage onto a stainless steel liner.



Above Left: Hydraulically powered reel for sub sea hydraulic hose umbilicals. **Centre:** Hydraulically powered reel with rim drive pneumatic wheel **Right:** Hydraulically powered reeling system for varying drum sizes

Linear Winches and Ancillaries



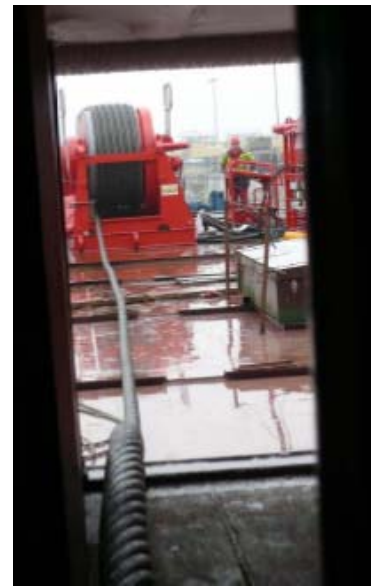
Above 300 Te Pipe-pulling Linear Winch for Murray and Roberts 2007 Hydraulic power unit, cylinders and controls by Hyflo. The winch operates with Amclyde Lucker grippers and is designed to allow the pulling through of spelter connections.

Below 300 Te sheaves and fairleaders designed to allow splatters to pass through.

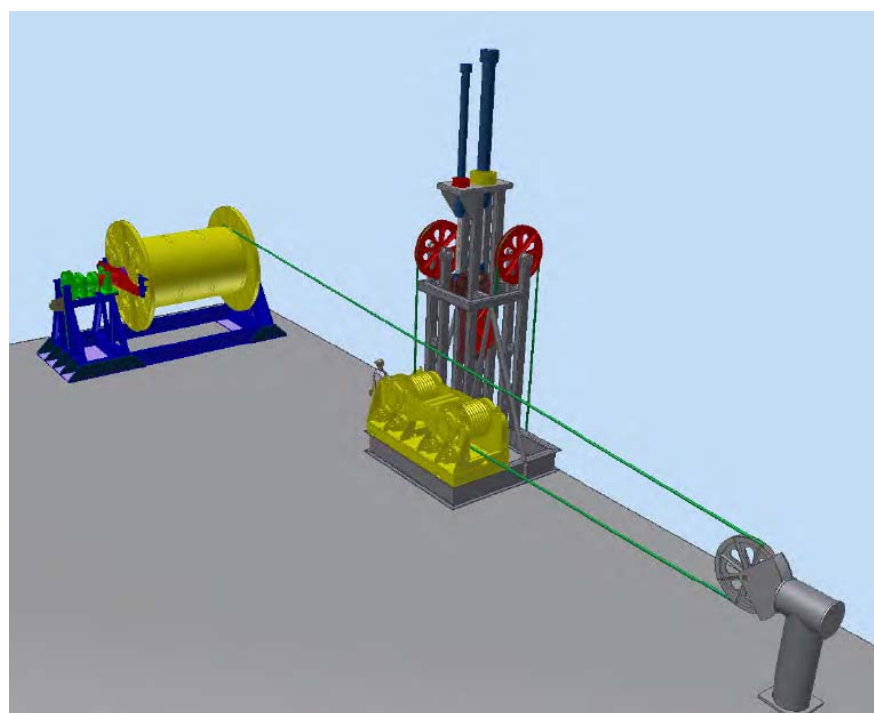
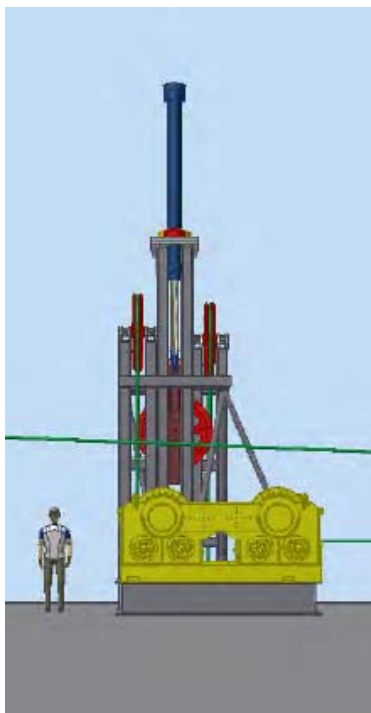


Above 300 Te linear winch supplied to Leighton India for onshore pipe-pull during test loading. Balancing sheave in foreground. **Above right** 300 Te swivel supplied with winch.

Traction Winches



100 Te traction winch for steel wire ropes of up to 127 mm diameter that we engineered and supplied to Endenburg Holland (2010). This winch can either be used as a conventional pulling winch, or as a dynamic brake for back-tensioning when spooling onto winches.

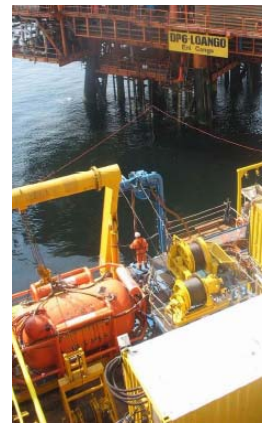


The Inventor generated model depicted above represents a 50 Te Active Heave Compensation system that we are offering to Hallin for potential use on the Ullswater SOV for operating in 2000 metres water depth in a sea state 4. This system we are developing together with Hyflo who have extensive experience on the active heave compensation systems based primarily on the West Coast alluvial diamond mining operations.

This system that is being developed incorporates a low constant tension powered reel capable of taking 2000 m of Samson synthetic ropes (Dyneema) which is neutrally buoyant, with the 50 Te traction winch driving the load up or down via the over-boarding sheave tower. The central sheave is mounted on an active heave compensation slide system such that the vessel movement is effectively negated with respect to the winch.

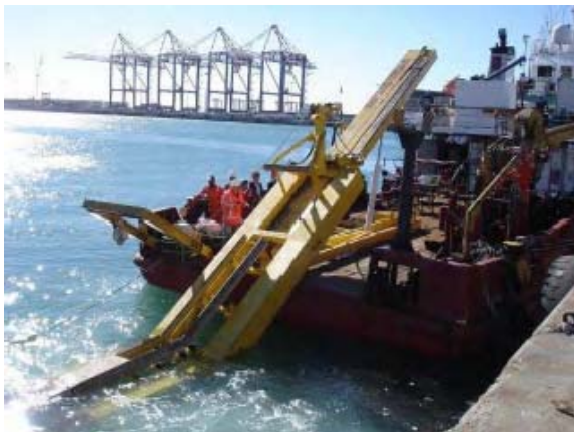
This minimises the inertial effects that need to be overcome with respect to the vessel movement.

Launch and Recovery Systems



Above Left: Modular "A" Frame for Swire Pacific (2005). This 10 Te SWL luffing "A" frame was fabricated for the Swire AHT "Pacific Warrior" for use with one of its main winches. The system is being test loaded at Concrete Units in Cape Town under Lloyds witness before despatch.

Centre and Above Right: Modular LARS for 15 Te SWL SMIT SAT 3 HRC (2006) designed to fit into a standard 40' container. Test loading at centre, and installed system on the Bourbon Peridot at the Hess Okume Field Development in Equatorial Guinea.



Above series - Launch and recovery system for survey boat daughter craft - Fugro 2009 Wale Marine were commissioned to engineer a launch and recovery system for Fugro such that they could launch their aluminium daughter craft from the mother vessel at sea in order to perform shallow water surveys. The LARS is articulated and telescopic, with a floating lower section such that the daughter craft can ride onto the ramp without swamping herself. Once the craft is on the lower ramp, the ramp is luffed down so the daughter craft can be winched up and the ramp can be brought in-board.

Rhino Craft HDPE (High Density PolyEthylene) Workboats

In 2003 Wale Marine was commissioned by Hydro Dive Nigeria to engineer and supply three 6 metre HDPE workboats suitable for use in the Offshore Oil and Gas Industry and compatible with conventional bow-catcher landings. These and subsequent HDPE workboats ("Rhino Craft") have an excellent track record in the harsh operating environments off West Africa. These Rhino Craft were initially developed, fabricated and sold by Wale Marine, until in 2005 a sister company (Rhino Marine Products (Pty) Ltd) was formed to fabricate and distribute these "proven" boats under license to Wale Marine. Wale Marine continues to develop and refine the range of Rhino Craft to suit the industry needs.



Above left Rhino 590 workboat being used on EM tether repair - 2010 (see page 4). **Top right** Rhino 850 workboat (2006), an evolution of the original 5.9 m workboat into an 8.5 metre workboat powered here by twin 200 hp outboards. **Bottom right** 8.5 metre Alamarin jet drive boat with 160 hp Steyr inboard diesel.



Above Rhino 9.5 m with 280 hp inboard diesel Volvo Penta Z drive for Perenco 2008 on sea trials in Cape Town (left) and in use being lifted onto jack up rig near Douala Cameroon.