DETAILED DESCRIPTION

Our Screw Piles System is an equipment that has a simple outlook, and able to go as deep as 30m underwater of the sea. The Screw Piles equipment can be maneuvered by a crawler crane and hoist from the ship deck to the area of work. There will be one operator on the main deck communicating with the diver under the sea for the right spot of work. Once it is ready, the operator will operate the control stand directional control valve to drill the screw piles into the seabed to stabilize the oil pipe in the seabed.

Technical Parameters

The Technical Parameters of Screw Piles System are as follows:

Total weight of the equipment	:	6000Kg
The weight of the structure	:	2000Kg
Payload weight	:	4000kg
Type	:	DNV type E
Operational Class	:	R45
Design Temperature	:	-20℃
Maximum Torque	:	14,000 Nm
Output Torque	:	2 x 30 kW
Fixable pipeline diameter	:	6 – 36 inches
Rotational anchor pipe diameter	:	2 – 6 inches
Rated speed	:	0 – 16 rpm

Hydraulic system pressure	:	280 bar
Maximum working depth	:	30 meters
Shaft Length	:	18 meters
Shaft maximum strength	:	28,000 Nm

THE TECHNICAL SPECIFICATION LIST

a) FRAME (Figure 2A)

The framework of the equipment has gone through DNV Rule 2.7.3 DNV certification processed and obtained the authentication certificate, which is designed to meet the requirement of the system working load (Load & Drop Test approval by DNV).

Material Used	:	Steel
Measurement	:	2480mm (H) x 1880mm (W) x 3460mm (L)
Shape	:	Rectangular
Total Weight	:	2012 kg
Gross Mass	:	5.8 ton
Tare Mass	:	1.8 ton
Payload	:	4 ton
Operational Class	:	R45

b) MOTOR BOX (Figure 2B)

The hydraulic system includes hydraulic power pack (taken from the ship), pressure regulating system, directional control system and actuator system. Two special locks adhere to the motors to control the oil flow to work efficiently. The low speed high torque hydraulic motor can guarantee

enough power output and be able to complete the task smoothly. Motor housing is water-tight to ensure that there won't be any leakage and rusting. The peripherals for the motor housing are anti-corrosion resistance.

Motor Brand	:	Hagglunds
Motor Model	:	CA70
Material Used	:	EH 36
Max. Torque-on-Bit	:	2 x 25000 Nm
Output Torque	:	2 x 55 kW
Unit Weight	:	824 kg
Max. System Pressure	:	280 Bar

c) SCREW SOCKET (Figure 2C)

The screw socket function is to hold the Screw Pipe to rotate clockwise for drilling in the seabed. Once it has installed the pipe, they will move anti-clockwise along the inner thread line to complete a process to detach away from a screw piles and will be lifted away together with the Frame and Motor.

d) PIPE (Figure 2D)

These are 2 length of long bar of steel being used for the screwing the pipe into the seabed to secure the pipelines.

Material Used	:	Steel
Length	:	18m

e) THREADED BUSH (Female – Figure 2E, Male – Figure 2F)

A Threaded Bush is a fastener element that is inserted between screw pipes of 6m each into a threaded hole. They may be used to repair a stripped threaded hole, provide a durable threaded hole in the material, mold or cast threads into a work piece thereby eliminating a machining unified to metric threads or vice versa.

f) VANE (Figure 2G)

The vane is a thin flat and curve device attached to the pipe as a spire that is rotated about an axis by rotating to cause or redirects a flow.

Material used	:	Steel
Thickness	:	10mm
Width	:	OD 300
Length	:	ID 6”

g) DRILLS (Figure 2H)

The drills are attached to the 2 pcs of pipes of the Screw Piles Systems for drilling purpose. The material use for the drill is steel.

h) SHAFT (Figure 2I)

The hydraulic motor drives the rotation shaft directly.

Between the spiral and the shaft is the spring connection. The shaft head has a slotted outside and use the elastic O ring to fix. The method helps

to ensure the normal working vibration and will not damage the equipment by playing the role of the buffer reducer at the same time.

Material Used	:	AISI 1045
Measurement	:	OD 6” – OD 12”
Length	:	18 m
Shape	:	Spline Shaft
Max Strength	:	20,000 Nm
Speed	:	0 – 18 R/min
Unit Weight	:	352 kg
Total Weight	:	704 kg

i) SUPPORT STRUCTURE (Figure 2J)

The support structure acts as a holding device to prevent the oil pipe from movement in the cause of undersea current. It will be clamped on top of the pipeline.

THE SYSTEM

Mechanical System

i) General Description

A Mechanical System manages power to accomplish a task that involves forces and movement. Screw Piles Framework, Hydraulic Motor and the Drive Shaft constitute Mechanical System. The top part of the Screw Piles System (Figure 1) and the Hydraulic Motor Output Shaft (Figure 10) are connected together via

Screw Sockets (Figure 4). The middle part of screw pile has 6 pieces of Vane (Figure 8) or Helical Blade on each pipe, and, the Drill (Figure 9) is equipped at the bottom. The mechanism of a Mechanical System is assembled from components called Machine Elements. It provides structure for the system and Controls its movement. The structure components are generally, the Frame members, Bearing, Splines, Springs, Seals, Fasteners and Covers.

Hydraulic System

i) General Description

The basic principle behind any Hydraulic System is the force that is applied at one point and transmitted to another point using an incompressible fluid. The force is almost always multiplied in the process.

Hydraulic system includes i) Pressure Regulating System, ii) Directional Control System (Figure 13), and, Actuator System.
The Pressure Regulating System includes the logical cartridge manifold, poppet solenoid valve, relief valve, counter balance valve. The maximum pressure system can be up to 280 bar.

The Directional Control System mainly comprised of a 3 ways, 4 positions directional control valve. The flow can reach up to 150L/M. The actuator system includes two Hagglunds CA70 hydraulic motors (Fig 2K). And the motors are submersible into the sea water during operation. Two special blocks adhere to the motors to control the submersible oil flow to work efficiently.

The great thing about hydraulic system is that the pipe connecting the local control stand to the manifold block that is attached to the frame, can be any length and shape, allowing it to snake through all sorts of things. The neat thing is that it is easy to add force multiplication to the system. The hydraulic motor drive the rotation shaft directly .The transmission shaft key is fit for hydraulic motor. The bottom and the threaded guide sleeve also have the key connection together. The method helps to ensure that the normal drilling vibration will not damage the equipment and will play the role of the buffer reducer at the same time.

ii) Manifold Block (Figure 2M and 2N)

The Manifold Block was attached on the top of the beam of the frame where it is like the heart of the Hydraulic System. It is also alike to a neuron in controlling the oil flow, the oil pressure and also had a function of balancing the Screw Piles System while it is at work.

Start up and Operating Procedure of Screw Pile System

a) Check hydraulic hose connections between screw pile systems, local control stand and diesel engine power pack. (see above schematic drawing)

b) Start diesel engine power pack.

c) Check hydraulic pressure at power pack and local control stand. Waiting for pressure to build up to 20 bar.

d) Start drilling operation by holding joystick up and down.

e) Hold the joystick up for operating Screw Pile System In forward direction.

f) Hold the joystick down for operating Screw Pile System in reverse direction.

g) Monitor hydraulic pressure at local control stand and it is recommended to operate not more than 210 bar.

Claims

1. **The FRAME (Fig 2A)**, made up of hollow bars joining together (with an open concept) to form rectangular shape.

   The length and width have a few hollows placed diagonally at an angle of 45° to form back support.

2. **The Motor Boxes (Fig 2B)**, are fixed onto the beam of the frame by lifting lug plates.

   Inside motor boxes are compact hydraulic motor. It also attached several hoses that were joined to manifold blocks (Fig 2M and 2N) on top of the frame (Fig 2A) to control the oil flow and pressure.

3. **The Shaft (Fig 2I)**, connects the motor boxes and the drilling pipes to transmit torque and rotation.

   The shaft protruding out at the base of the motor box and to join with the pipe.

4. The Screw Socket (Fig 2C) acts as a clamp between the shaft and the pipe.

   It will turn counter-clockwise along the inner thread line to detach from the pipe after the pipes are submerge into the seabed.

5. The Threaded Bushes (Fig 2E and 2F), acts as a Fastener that is inserted between the pipes of 6m.
6. The pipe (Fig 2D), has a total length of 18m.

7. The Vanes (Fig 2G), are welded along the body of the pipe.

   There are 6 pieces of Vanes in the shapes of helical blade at every 3m per pipe.

8. The Drill (Fig 2H) acts as a pointer to anchor onto the work spot for drilling purpose.

9. The Supporting Structure (Fig 2J) is place between the two pipe, adjacent to the pipe.

10. The Local Control Stand (Fig 2L) is a stand-alone with Joystick movement for Pay In (↑), Pay Out (↓).

    It has a pressure gauge onto it. And connect to the Manifold Block (Fig 2M and 2N).

11. Manifold Block (Fig 2M and 2N) is rectangular shape. All corners to radius R2 & all chamber at C2 X 45°. Edges are deburred, break and sharp.

    Male and Female NPT socket connectors to connect 2 major inlet hoses to allow oil flow out to 4 different outlet hoses.