

Universal Subsea System

Connectable eSHPU/eSEAWOCS

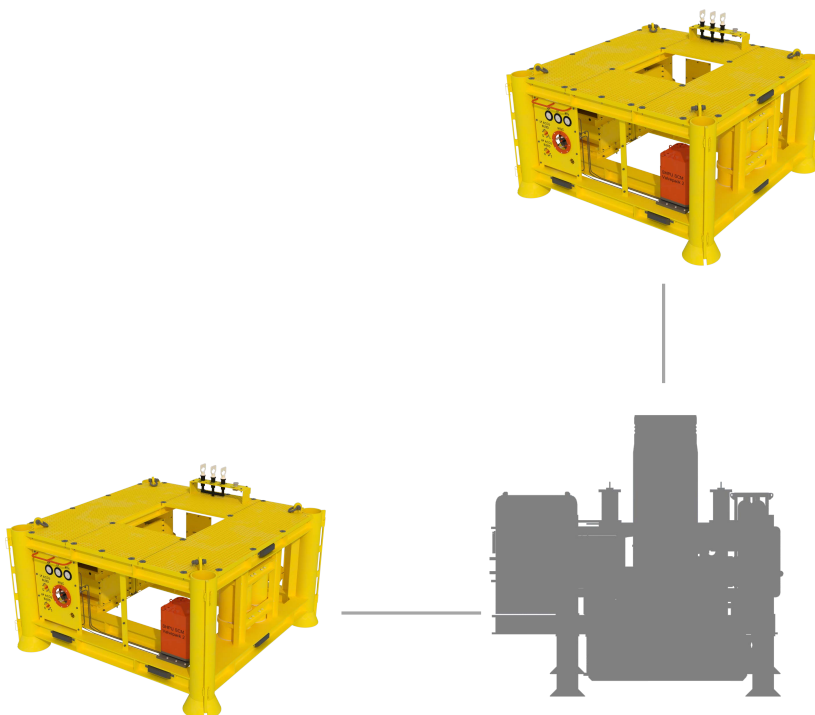
Power and com. connector

Hydraulic connector



Installation on or next to XT

Electrical XT or standard XT



Introduction



The electrical Subsea Hydraulic Power Unit, eSHPU/eSEAWOCS, is designed to simplify well access, well interventions, production, and work over operations from any type of vessel/rigg.

The system comes with a closed or open loop hydraulic control system. The relocation of hydraulic power to the seabed eliminates the need for large equipment, long lead times.

With a universal interface, light and small size, the eSHPU/eSEAWOCS removes the need for time consuming and costly mobilizations and demobilizations.

Combined with a high efficiency and increased functionality, the eSHPU/SEAWOCS ultimately delivers lower CAPEX and OPEX across the operations – benefitting everyone.

FROM VESSELS/FPSO

- XT (“Christmas Tree”) Installation – Installation & functional testing of subsea
- XT Testing – Follow-on testing & diagnostics for installed subsea trees
- XT/PRT (Plug Retrieval Tool) Control – Control of the XT/PRT during VXT installation or PRT operations
- WI (Light Well Intervention) XT Control – Control of the XT for LWI operations, including intervention and full P&A (Plugging & Abandonment)
- XT SCM (Subsea Control Module) Testing & Diagnostics - using electrical downline umbilical only
- Manifold Control & Functional Testing
- Hydraulic Intervention – Well stimulation

FROM RIGS

- XT installation – full testing capability
- XT Production – Installation & functional of subsea trees and SCSSV, both HXT and VXT.
- HXT Completion Control – Control of HXT’s during completion operations on HXT’s having no UDF (Umbilical Disconnect Function) on the BOP (Blow Out Preventer)
- XT control during completion (HXT systems, i.e. no UDF system on BOP)
- XT control during work operation, open water riser systems

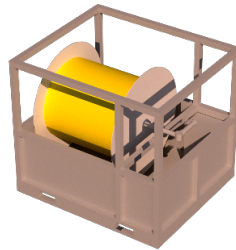
eSHPU/SEAWOCS CONNECTABLE AND SCALEABLE

XT interface

The system connects to all types of XT systems, from any manufacturer. The XT test equipment to be connected and controlled either from an XT tool or through Habu's software. This is possible through dedicated lines in the umbilical

Umbilical Reel for installation

The system uses all-electric umbilical, self supported without any need of clamps. Communication on redundant fiber and twisted pair are included for SCM superimposed communication to XT.



eSHPU Software

Tailor made software for proper interface to any XT type or manufacturer.

eSHPU SCM VALVEPACK

Scaleable control module. System set up to have 1 or multiple functions.

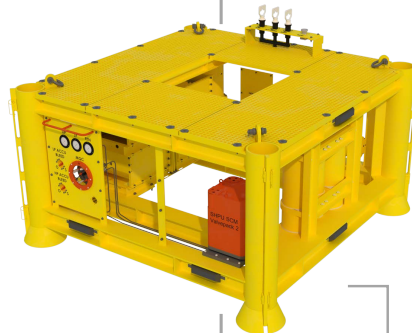


Subsea Reservoir

200 liter reservoir scalable with a filter to ensure clean fluid. Tank can be filled both above and below surface



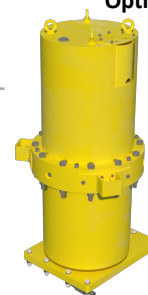
Hydraulic Pump – LP



Optional - Hydraulic Pump – HP



Optional - Chemical Pump



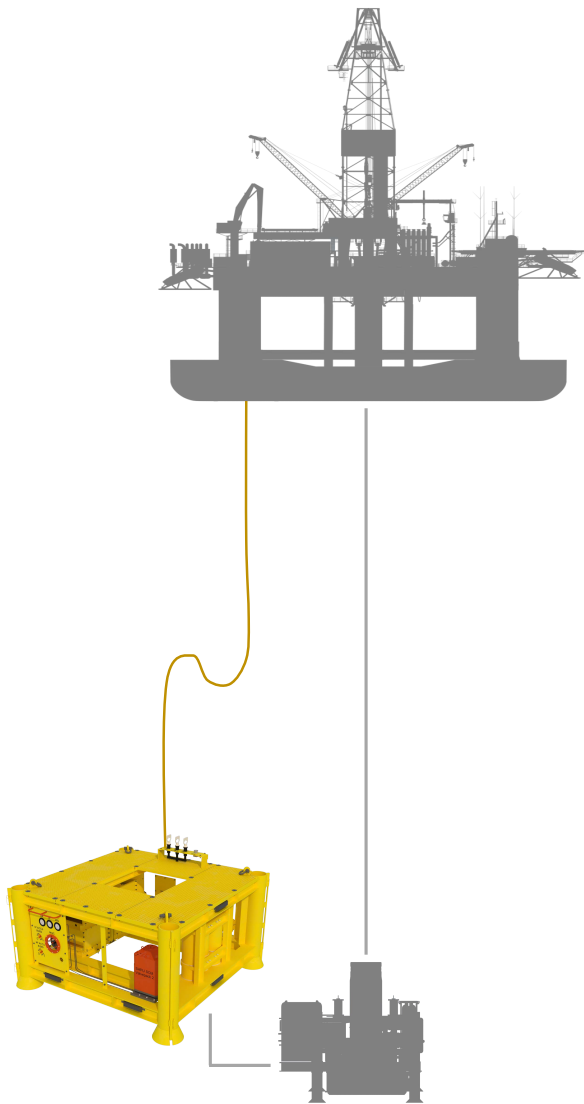
3rd Party XT and umbilical

eSHPU is designed and qualified to interface any XT with or without umbilical in the market. SHPU will adapt to any control system, hydraulic and electrical. SCM superimposed or Ethernet are standard



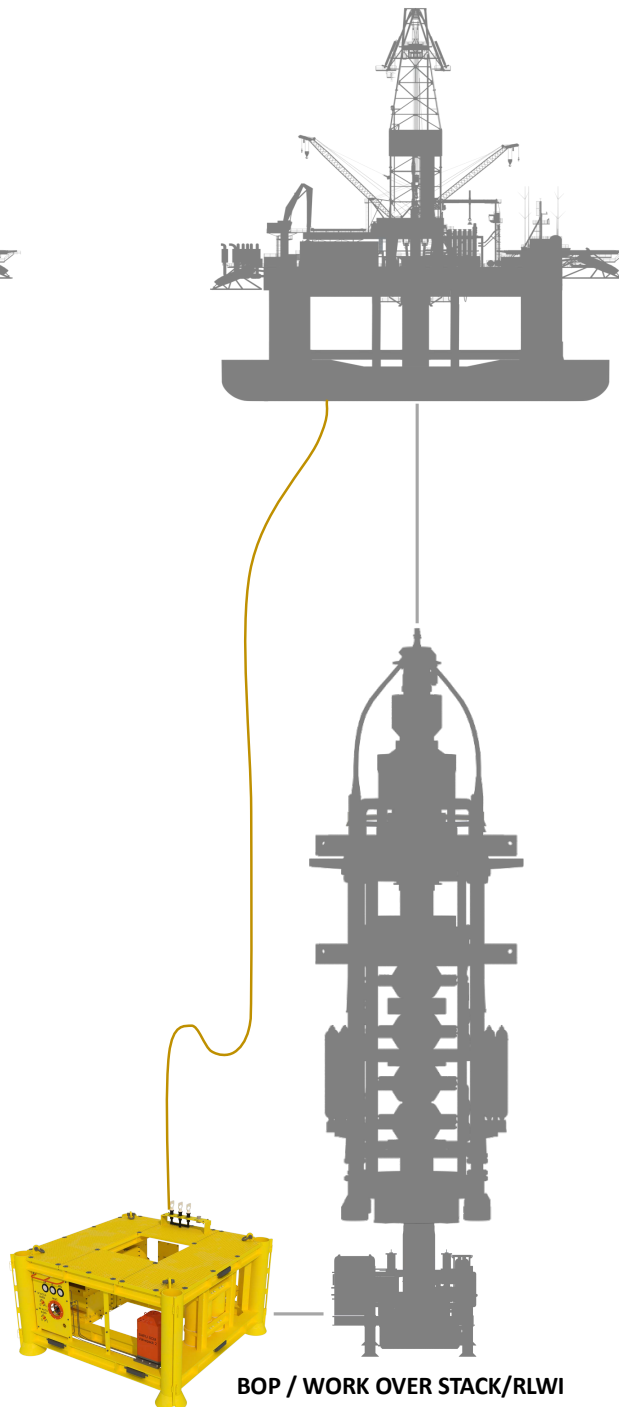
RIG OPERATIONS

Hookup layout



Running XT or SHPU(SEAWOCS)

Used for connector, seal and/or XT valves OR control SCSSV .

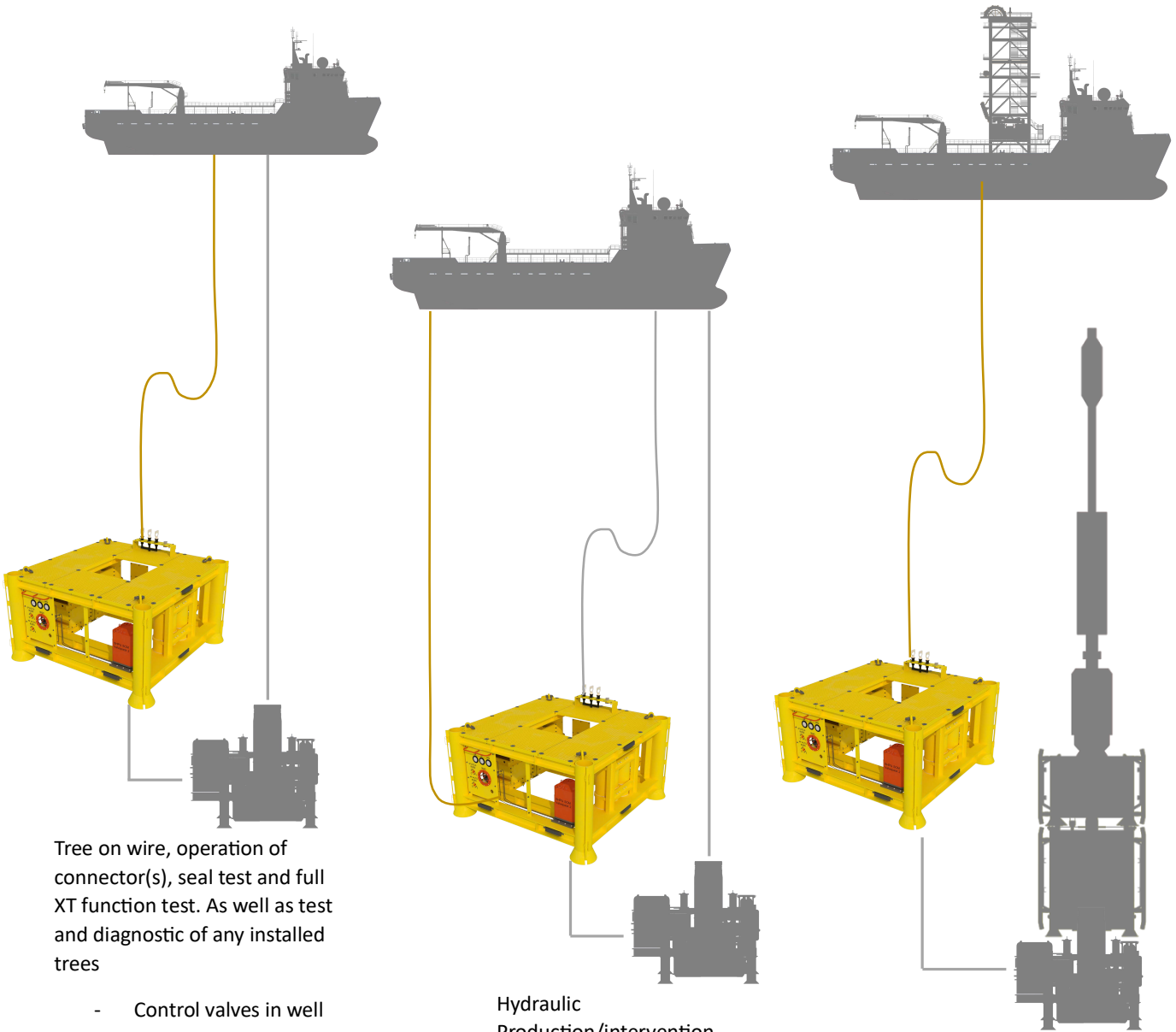


BOP / WORK OVER STACK/RLWI

Using a BOP or WOS on top of the XT, eSHPU /SEAWOCS can be used for XT control. There is no need for interface towards BOP or WOS. SHPU is powered from dedicated umbilical or BOP/WOS.

VESSEL OPERATIONS

Hookup layout



Tree on wire, operation of connector(s), seal test and full XT function test. As well as test and diagnostic of any installed trees

- Control valves in well or
- Control valves in XT

Hydraulic Production/intervention skid for:

Electrical XT (HP ,chemicals)

Hydraulic XT(HP-LP-Chemicals)

NOTE: We have smaller units for HP only.

XT control (IWOCS) during any LWI operation, as well as controlling LWI. Includes interface with all types of fluid, pressure and control systems

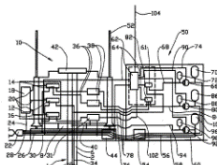
eSHPU patent Global IP



US009033053B2

(12) **United States Patent**
Borsheim (10) **Patent No.:** **US 9,033,053 B2**
(45) **Date of Patent:** **May 19, 2015**

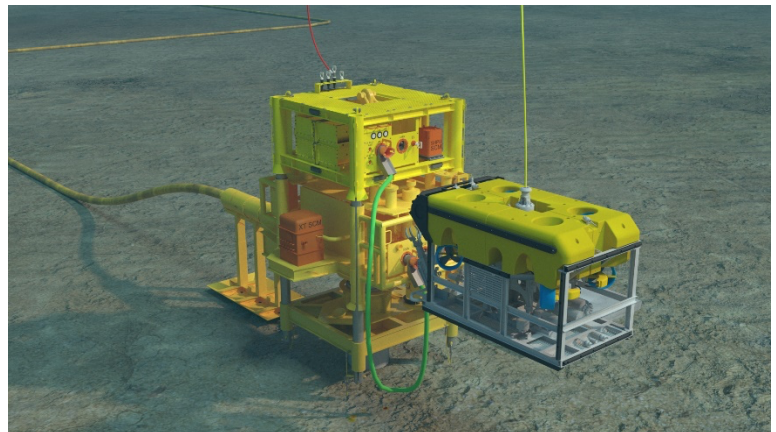
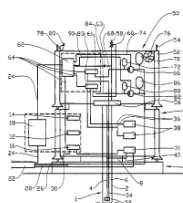
(54) **METHOD AND DEVICE FOR EXTENDING LIFETIME OF A WELLHEAD** (56) **References Cited**
(71) Applicant: **Subsea Solutions AS, Sandnes (NO)** U.S. PATENT DOCUMENTS
(72) Inventor: **Torfinn Borsheim, Sandnes (NO)** 3,142,337 A * 7/1964 Pottman, Jr. et al. 166,338
(73) Assignee: **Subsea Solutions AS, Sandnes (NO)** 3,804,560 A * 7/1975 Baugh 137,606
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days. (Continued)
(21) Appl. No.: **14/032,198** FOREIGN PATENT DOCUMENTS
(22) PCT Filed: **Oct. 25, 2012** NO 20110754 1/2012
(86) PCT No.: **PCT/NO2012/080208** WO 20130387 A1 * 11/1982 E21B 34/04
§ 371 (c)(1), (2) Date: **Apr. 16, 2014** OTHER PUBLICATIONS
(87) PCT Pub. No.: **WO2013/062421** International Search Report for PCT/NO2012/080208, dated Jan. 18, 2013.
(88) PCT Pub. Date: **May 2, 2013** (Continued)
(65) **Prior Publication Data** **Primary Examiner**—James G. Sayre
US 2014/0246202 A1 Sep. 4, 2014 (74) *Attorney, Agent, or Firm*—Andrus Intellectual Property Law, LLP
(30) **Foreign Application Priority Data** (57) **ABSTRACT**
Oct. 27, 2011 (NO) 20111456 A method and a device are for extending the lifetime of a Christmas tree. The Christmas tree is provided with at least a first high-pressure hydraulic valve pack, a first low-pressure hydraulic valve pack or a first chemical valve pack, and the Christmas tree is arranged to be connectable to an umbilical, which comprises at least electrical power or control cables, hydraulic tubes or chemical tubes. The method comprises: retrofitting an upgrading module to or by the Christmas tree and connecting the upgrading module to the Christmas tree with the necessary number of tube and wire connections, the upgrading module comprising a second control module, and at least a hydraulic high-pressure pump with a second high-pressure valve pack and a hydraulic reservoir, a hydraulic low-pressure pump with a second low-pressure hydraulic valve pack and a hydraulic reservoir or a chemical pump with a chemical reservoir; supplying the second control module with electrical power and control signals via the umbilical or from vessel; and supplying at least the high-pressure pump, the low-pressure pump or the chemical pump, directly or indirectly via their respective reservoirs, with hydraulic fluid via the umbilical or from a vessel.
(51) **Int. Cl.** (2006.01)
E21B 34/04 (2006.01)
E21B 33/035 (2006.01)
E21B 33/037 (2006.01)
(52) **U.S. Cl.**
CPC **E21B 34/045** (2013.01); **E21B 33/0375** (2013.01); **E21B 33/0355** (2013.01)
(58) **Field of Classification Search**
USPC 166/368, 335, 351, 360, 65.1
See application file for complete search history.



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Borsheim (10) **Patent No.:** **US 9,145,750 B2**
(45) **Date of Patent:** ***Sep. 29, 2015**

(54) **METHOD AND DEVICE FOR EXTENDING AT LEAST THE LIFETIME OF A CHRISTMAS TREE OR AN UMBILICAL** (56) **References Cited**
(75) Inventor: **Torfinn Borsheim, Sandnes (NO)** U.S. PATENT DOCUMENTS
(73) Assignee: **Subsea Solutions AS, Sandnes (NO)** 3,804,560 A * 7/1975 Baugh
3,174,000 A 11/1979 Milberger
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 173 days. (Continued)
(21) Appl. No.: **13/982,735** FOREIGN PATENT DOCUMENTS
(22) PCT Filed: **Jan. 25, 2012** WO 2008/154486 A2 12/2008
(86) PCT No.: **PCT/NO2012/000008** OTHER PUBLICATIONS
§ 371 (c)(1), (2), (4) Date: **Nov. 27, 2013** International Search Report for parent application PCT/NO2012/000008, having a mailing date of Apr. 24, 2012.
(87) PCT Pub. No.: **WO2013/112054** (Continued)
(88) PCT Pub. Date: **Aug. 1, 2013** **Primary Examiner**—Matthew Buck
Assistant Examiner—Aaron Lembo
(74) *Attorney, Agent, or Firm*—Andrus Intellectual Property Law, LLP
(65) **Prior Publication Data** (57) **ABSTRACT**
US 2014/0151060 A1 Jun. 5, 2014 A method and a device are for extending at least the lifetime of a Christmas tree or an umbilical. The Christmas tree is provided with a high-pressure hydraulic valve package and a low-pressure hydraulic valve package and the umbilical includes electrical power and control cables and hydraulic pipes. The method includes: retrofitting an upgrading module including at least a control unit, a hydraulic high-pressure pump, a second high-pressure hydraulic valve package, and a hydraulic reservoir onto or at the Christmas tree; supplying the high-pressure pump, directly or via the reservoir, with hydraulic fluid from a pipe in the umbilical; the high-pressure pump being connected to the second high-pressure hydraulic valve package; connecting the second high-pressure hydraulic valve package to a downhole safety valve; connecting the electrical power and control cables of the umbilical to the control unit; and connecting control cables between the control unit and valves in the low-pressure hydraulic valve package.
(30) **Foreign Application Priority Data**
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May 24, 2011 (NO) 20110764
(51) **Int. Cl.** (2006.01)
E21B 7/12 (2006.01)
E21B 33/035 (2006.01)
(52) **U.S. Cl.**
CPC **E21B 33/035** (2013.01); **E21B 33/0355** (2013.01)
(58) **Field of Classification Search**
CPC **E21B 33/035**; **E21B 33/0355**; **E21B 34/04**
USPC 166/368
See application file for complete search history.



eSHPU /eSEAWOCS device

Subsea HPU/SEAWOCS unit

Green Fields/Brown Fields

- Operate only by electrical power and communications lines.
- Supply High or low pressure.
- Enable longer step out

Tie back to existing fields

- Lower cost of tieback of new satellites to an existing installation
- Low-cost repair method to remedy failures in hydraulic control Umbilicals



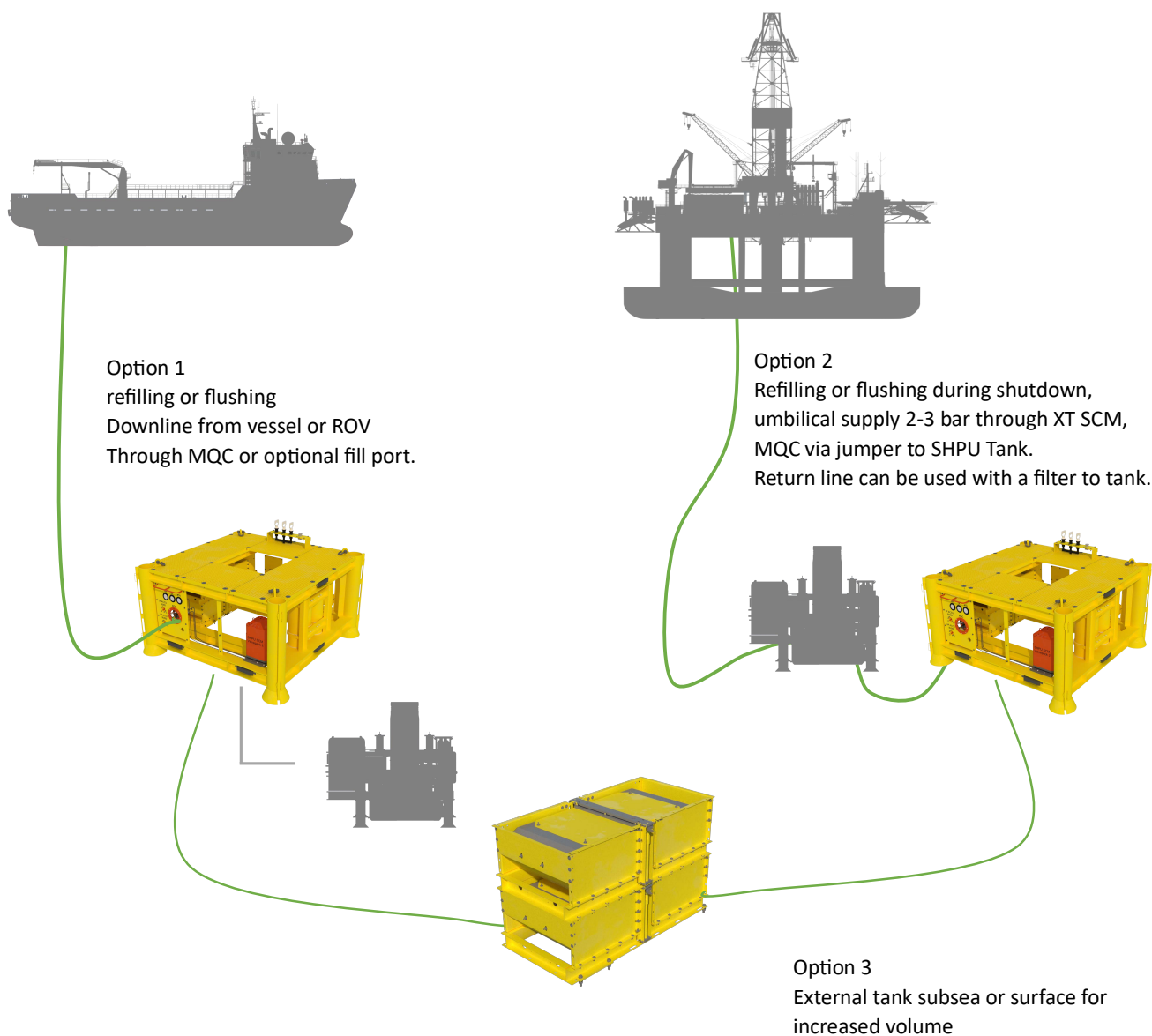
Typical arrangement example with hydraulic problem in the umbilical



Typical arrangement example when
1. XT installation
2. Production
3. Work-over scenarios

Filling Tank system

Hookup points – connectable above and below surface



Description

Technical data

Design codes and standards	ISO 13628-6/ISO 13628-7, API17D/API 17F/API 17G, DNV 2.7-3
Water depth	Up to 4000 meter
Hydraulic control fluid	Water and/or mineral based
LP pressure	Optional and scalable to request
HP pressure	Optional and scalable to request
LP lines	Scalable to request
HP lines	Scalable to request
Reservoir capacity	Standard 200 liters (52 gallon) – Scalable – option chemicals
Electric interface XT	Ethernet – superimposed power com – xx watts power
ESD	Fail safe close – Power-loss shut in system
Weight subsea module	xxx kg (depending on requested compliance)
Weight topside module (reel)	xxxkg