



Trading as JBS Fabrication Ltd.

**Using the best available  
technology to deliver  
innovative engineering  
solutions globally**

**Sea Axe Controlled Flow Subsea Excavation**



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01.

# Overview

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# 01.

# Overview

## Sea Axe Subsea Excavation System

The mass flow excavation (MFE) market has exhibited little innovation over the last 25 years. Rather than develop a new product, JBS have delivered a **next generation** improved product designed to provide the **best available solution** to controlled subsea excavation.

JBS have advanced the technology from traditional mass flow systems to produce an optimum controlled flow excavation tool. Sea Axe is a controlled flow advanced excavation system, which works through natural erosion of the seabed hence it is the **most environmentally acceptable** method available. Natural erosion significantly reduces the impact on the ecological environment.

It is easily adaptable and can excavate a wide range of seabed materials including sand, mud, rocks, gravel, clay and drill cuttings.

It is non-contact and non-intrusive making it ideal for offshore wind and subsea cable work in addition to other industrial work scopes.

With the flexibility to ship by air or sea, Sea Axe can **be leased, or purchased** and on-site at project locations across the globe at short notice.



01.

# Overview



**Oil & Gas**



**Nuclear**



**Defence**



**Renewable  
Energy**



**Marine**



**Salvage**

## Applications

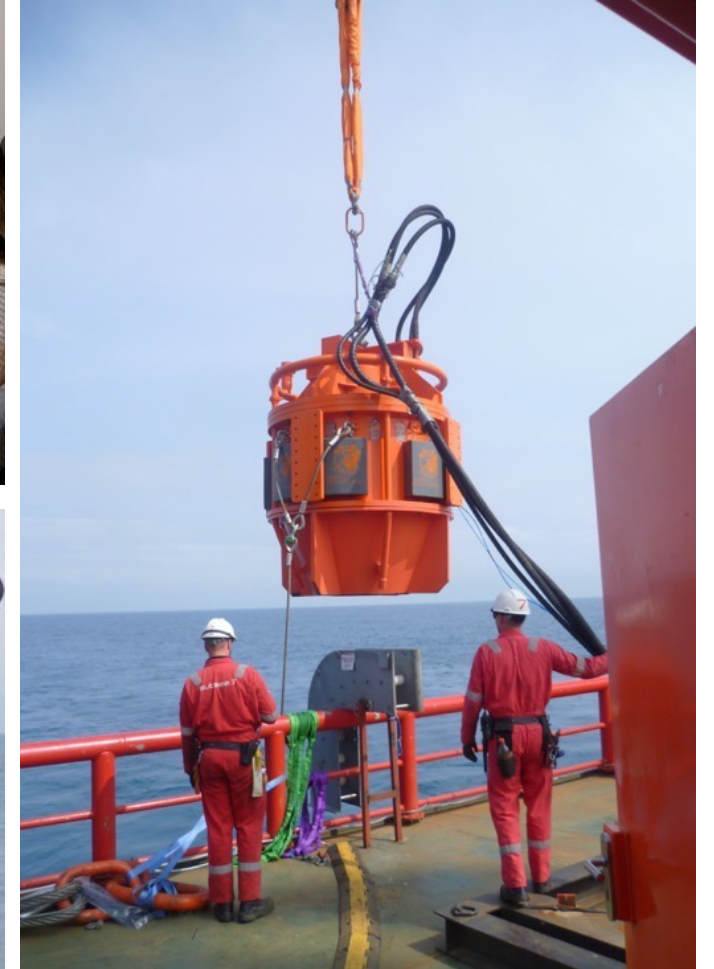
JBS Sea Axe Technology can be used across many different sectors.

Applications include:

- Pipe/Cable Burial/Deburial
- Seabed Preparation
- Freespan Correction
- Sand Wave Levelling
- Salvage/Recovery
- IRM
- Decommissioning
- Power Plant Outlet Pipes
- UXO Clearance
- Harbour Clearance
- Subsea Structure Foundation Access

01.

# Overview



**02.**

**How does  
it work?**

## 02.

# How does it work?

### Sea Axe Controlled Flow Subsea Excavation

JBS patented Sea Axe controlled flow subsea excavation tool generates a large controlled water column which is applied to the seabed.

The system draws seawater in from above and exits the tool at the base, fluidising the seabed material.

Working at depths from 1m, the technology utilises a patented vortex chamber to ensure complete control and stability during operations, directing water over the target area to achieve uniform excavation in minimal time with less passes.

### Deployment

Sea Axe simply requires vertical access above the targeted area and is deployed by a vessel crane or A frame. Close communication with deck and bridge is maintained at all times, whilst the system is lowered through the splash zone.

Progress is able to be viewed in real time with integrated multibeam sonar equipment, allowing visibility of the cable, trench profile, depth, width and product position.



Sea Axe can remain under water for up to 72 hours.



Easily adaptable and can excavate a wide range of seabed materials.



Non-contact and non-intrusive excavator, ideal for offshore windfarm use.



Environmentally focused solution, works through natural erosion.



Sea Axe can operate in depths from only 1m.



Next generation design with minimal downtime.

# 02.

## How does it work?

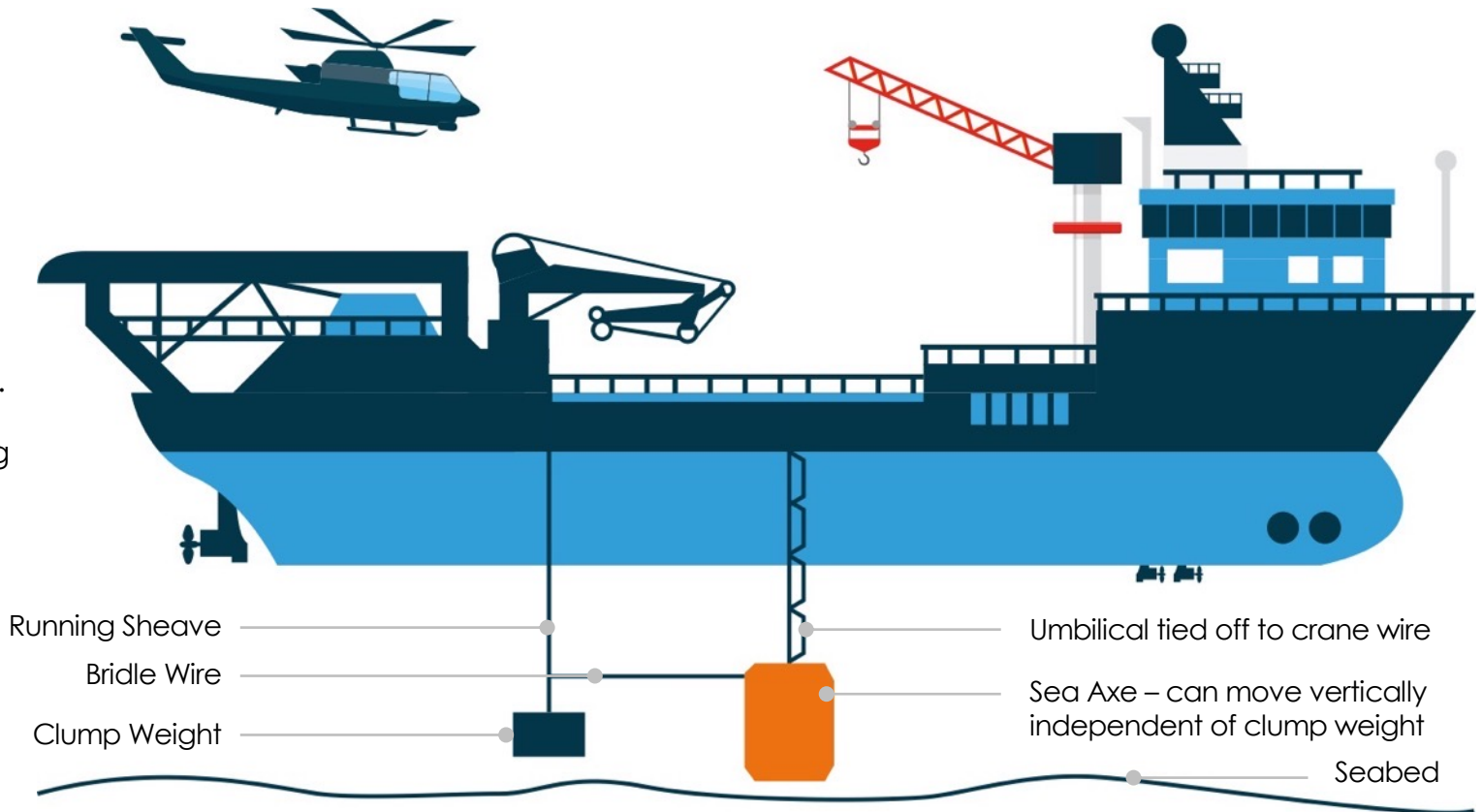
### Deployment

Sea Axe is designed and built in the UK and then shipped by air or sea to our clients' locations. It is then deployed using a vessel crane or A frame.

The tuggers and clump weight are used for sonar orientation only.

- Water depths up to 30m use the vessel tuggers.
- Water in excess of 30m use a clump weight.

The graphic shows a typical deployment using a clump weight.



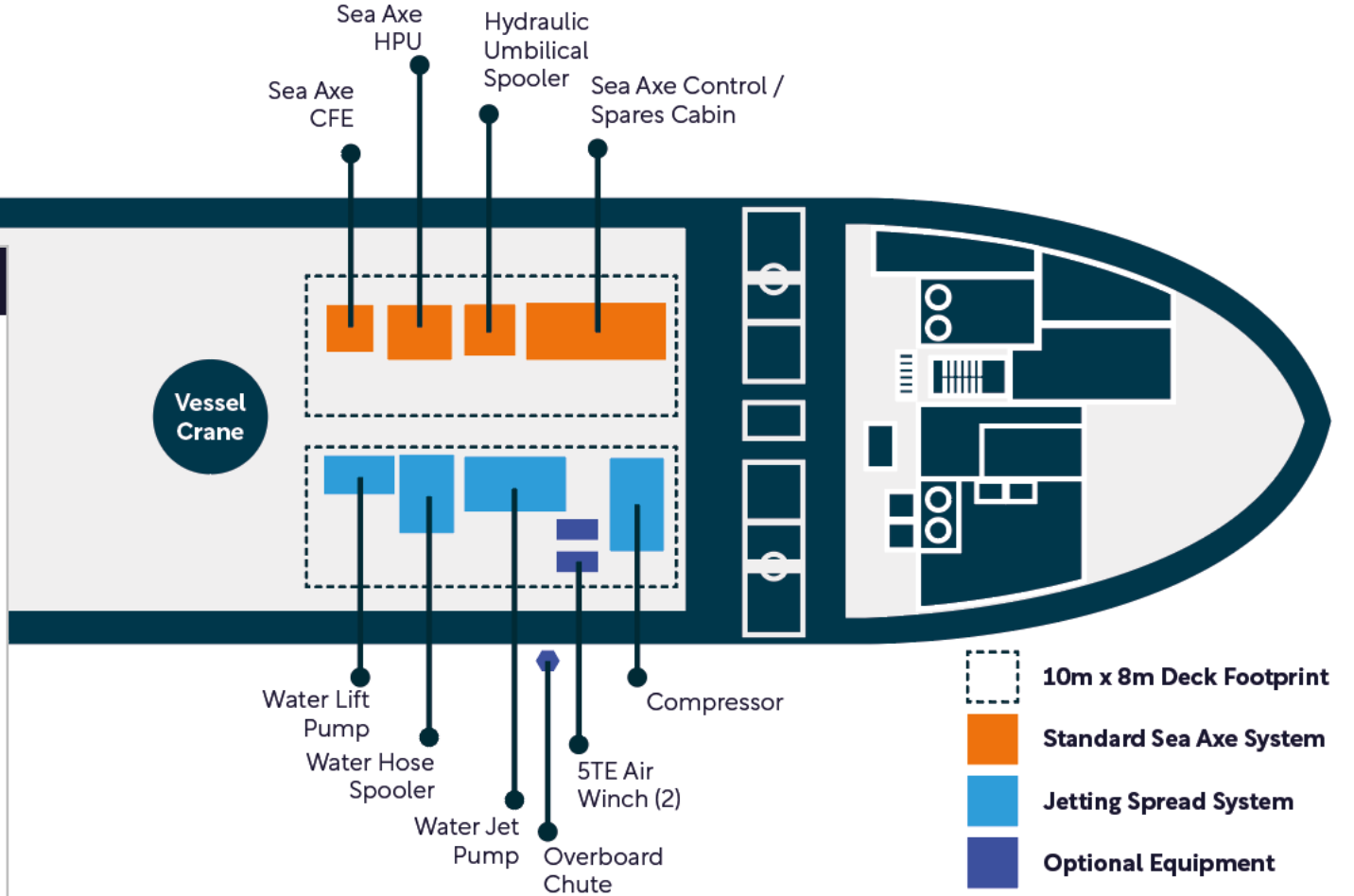


# 02.

# How does it work?

Standard Sea Axe Deck Plan Example

Name	Weight (Te)	Dimensions (LxWxH) (m)
Sea Axe HPU	6	2.99x2.46x2.66
Sea Axe CFE	8	2x2x2.5
Hydraulic Umbilical Spooler	7	2.32x2.32x2.43
Sea Axe Control / Spares Cabin	8	6.1x2.45x2.6
Water Lift Pump	4.5	3.3x1.6x2.5
Water Hose Spooler	8.42	3.3x2.9x3.1
Water Jet Pump	15	6.1x2.4x2.9
Compressor	7	4.32x2.43x2.44
5TE Air Winch	1.2	1.85x1.85x1.45
Overboard Chute	0.2	1.4x0.25x1.4



**03.**

**Key Benefits**

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# 03.

## Key Benefits

### Next Generation Subsea Excavation

Designed to lead the market, JBS patented Sea Axe solution combines subsea excavation with ancillary equipment to provide the following benefits:

### Improved Controllability

Patented vortex chambers ensures complete control and stability

### Efficient Operation

Increased productivity and less vessel time due to single pass capability

### Increased Reliability

Less rotating components, therefore minimum maintenance required

### Minimal Risk of Damage

Non-intrusive and non-contact solution eliminates the potential for pipeline/cable/product/asset damage

### Equipment Flexibility

Sea Axe can be supplied inclusive or exclusive of ancillary equipment, with minimal deck space requirement

### Reduced Personnel Requirements

JBS will work with client and vessel personnel to increase the efficiency of operations and reduce overall project costs

## Environmental Benefits



Works through natural erosion to minimize seabed disturbance.



Significant reduction in noise and vibration levels. Electric power pack option available – zero emissions.



Decreased energy consumption due to depths reached in single passes.



Increased efficiency, utilizing only one hydraulic motor (electric available).

**04.**

**Technical  
Data**

# 04.

# Technical Data

## Technical Data

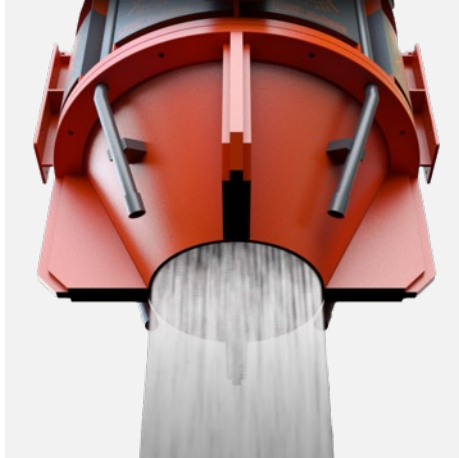
Equipment Footprint	2m x 2m x 2.5m (h)
Deck Spread Footprint	Standard Footprint 10 x 8m Ancillary Jetting System 10 x 8m
Weight	8 Tn
Nozzles	Variable Exit Diameter
Working Depths	Shallow – 1m Standard 1m – 300m Deep Water 300m+
Deployment	Vessel Crane, A Frame
Impeller Speed	500 rpm
Flow Rate	> 14,000 ltr/s
Exit Water Column Velocity	> 14 m/s
Sonar	Tri-tech Gemini Multi-beam
Soil Shear Strength Cutting Capabilities	Standard System > 80kPa Ancillary Jetting System 80kPa > 200kPa



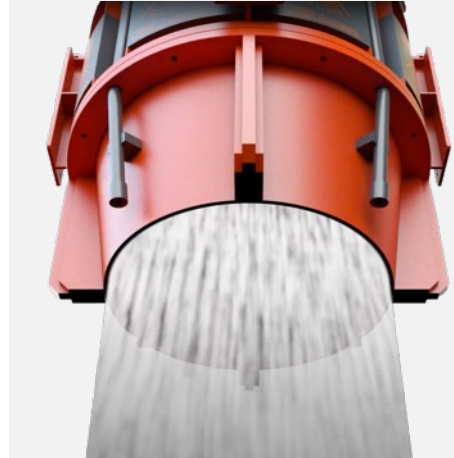
# 04.

## Technical Data

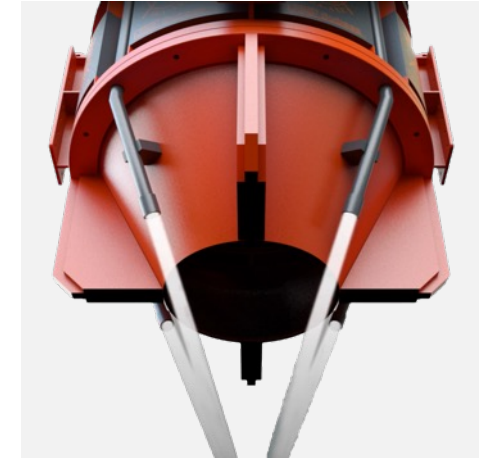
### Exit Nozzle Diameter Variables



**Interchangeable Exit Nozzles - Narrow**  
Narrower high velocity nozzle for more cohesive seabed materials.



**Interchangeable Exit Nozzles – Wide**  
Wider exit nozzle for sand and rock armour removal.



**Ancillary Agitation Lances**  
Fitted as standard and utilised for breaking more cohesive surface materials 80 kPa – 200 kPa.

# 04.

# Technical Data

## Gemini NBI Sonar Beam

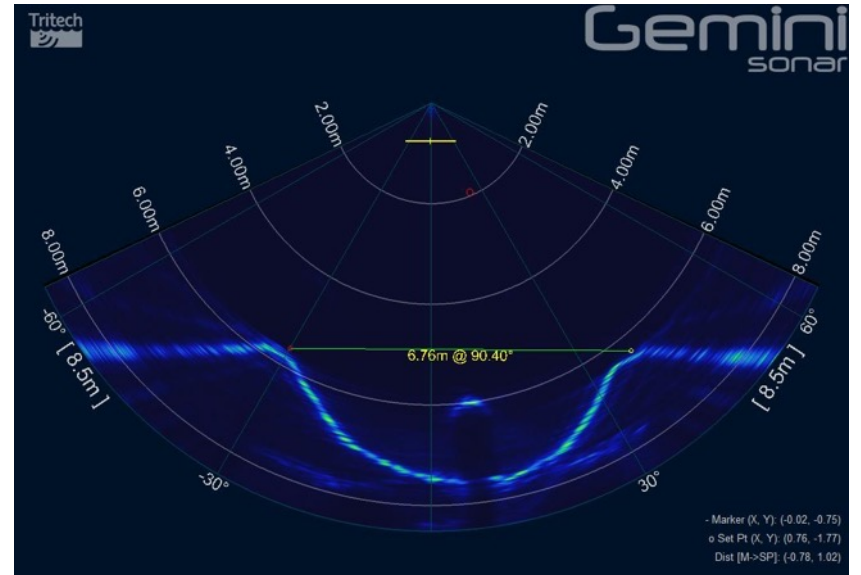
JBS Sea Axe is fitted with a multi beam sonar system, this allows the operator to monitor both the position of the Sea Axe and the seabed, enabling the trenching profile to be inspected using one sonar unit. Sea Axe has the capacity to install up to four sonar units, however only one unit is required for normal operations.

The Gemini NBI offers a narrow vertical beam and 130° swathe, resulting in an extremely sharp sonar image. It produces an acoustic image, cutting through water with a narrow acoustic beam and at the high refresh rate offered from the Gemini range of multi beam sonars.

With wide angle imaging and a high refresh rate, the user is able to quickly and effectively manoeuvre the sonar to a target in poor visibility conditions.

JBS Sea Axe includes a spare sonar as part of its operational spare parts kit in case of any emergency.

JBS Sea Axe utilises a **state of the art multi beam sonar** to provide real time monitoring of trench profile, depth, width and product position.



# 04.

## Technical Data

### Equipment Set Up

**Sea Axe Standard Equipment is used in soils with a shear strength  $> 80\text{kPa}$  and comprises:**

- Sea Axe Excavator
- Spooler with Umbilical
- Powerpack (Diesel or Electric)
- Control Room / Workshop

**For soils with a shear strength from  $80\text{kPa} > 200\text{kPa}$  an Ancillary Jetting System is added. This comprises:**

- Water Lift Pump
- Water Pump
- Fuel Tank
- Water Hose Spooler complete with Water Hose

### Operation of Ancillary Jetting System

The lift pump lifts the sea water over the bulwark of the ship and feeds the water pump. The water pump then pressurises the water which flows through the water hose to the jetting system on Sea Axe. This produces an extra 30 bar at each nozzle which will break open hard clay surfaces allowing Sea Axe main excavation nozzle to remove natural sea bed to client's specifications.

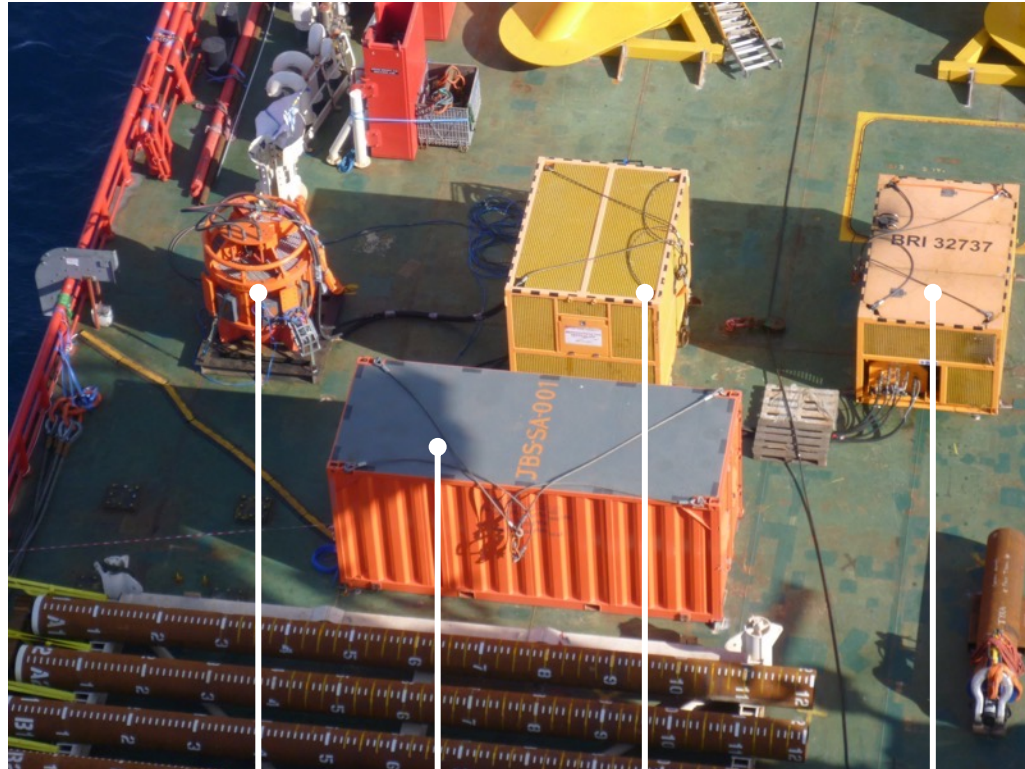




# 04.

# Technical Data

## Sea Axe Standard Equipment



Sea Axe CFE  
Excavator

Control Room  
Workshop

Spooler

Power Pack

## Ancillary Jetting System



Water Lift  
Pump

Water Pump

Fuel Tank

Water Hose Spooler  
& 400m Hose

**05.**

**Case**

**Studies**

# 05.

## Case Studies

### Deburial Works (Valhall Field Norway)

#### The Project

- JBS were contacted by Subsea 7 Norway to carry out excavation works from the Geosund 52 offshore supply vessel in the North Sea.
- The excavation work scope was to debury designated areas of the 20" concrete coated EKO Pipeline to allow access for concrete removal.

#### The Challenge

- The operation was particularly sensitive as Sea Axe could not over excavate the area in case any freespan was created.

#### The Solution

- Sea Axe was the ideal tool for the project due to its versatility and controllability.
- The vessel first cut a perpendicular trench across the designated pipeline area to find that it was buried 1.1m deep.
- Deburial of the pipeline also required an additional 1m clearance below the pipeline for the concrete removal manipulator access.
- It was recommended to the client that a 3m trench was excavated over a 25m length to achieve the required specification.
- The operation was monitored topside using real-time image sonar.
- The required area was prepared for Subsea 7 to carry out and complete their development work scope for BP quickly and professionally, without incident.



# 05.

## Case Studies

### Post Lay Pipeline Trenching (Caspian Sea)

#### The Project

- JBS were contracted by Vimar Offshore to provide Sea Axe to carry out post lay trenching works in the Caspian Sea.
- The scope of work comprised of burying 4km of 38" pipe to client specification.

#### The Challenge

- The cohesive strength of the subsea soils was approximately 160 kPa, therefore JBS also provided an ancillary jetting spread.
- The jetting spread uses the Sea Axe built in auxiliary jet lances to break open the hard cohesive soil surface allowing the water column to excavate required depth to client specification.

#### The Solution

- Sea Axe was mobilised on a multipurpose offshore support vessel and deployed using the vessel crane.
- It was operated at depths of up to 30m, experiencing soil conditions of heavy clay mixed with shale and coarse sand.
- Sea Axe worked efficiently, recording zero unplanned outages, for intervals of 72 hours to achieve a trench depth of 2.5 - 3m at a progress rate of 3m/min in a single pass.



# 05.

## Case Studies

### Cable Trenching (German North Sea)

#### The Project

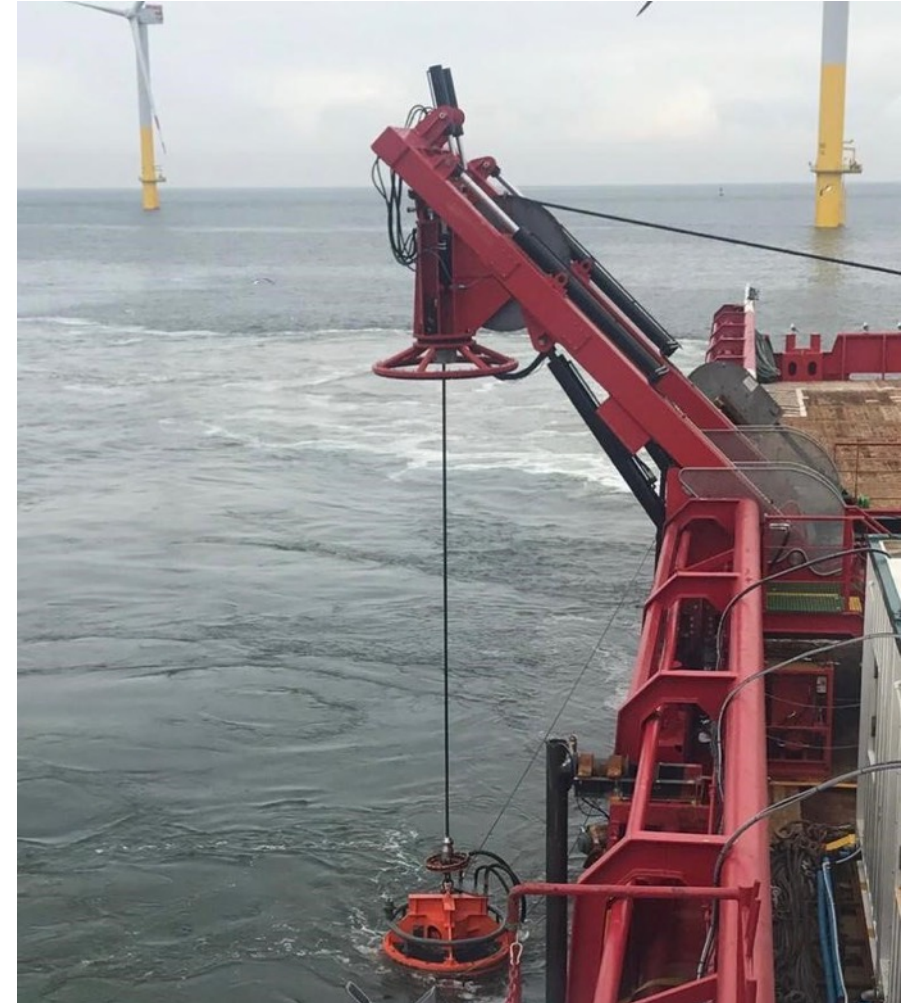
- JBS were contracted by NSW and Fletcher Marine to provide Sea Axe Controlled Flow Excavation services at the Nordegrunde OWF in the German North Sea.
- The work scope was to assist client to identify and log the position of the cables transiting 70 metres out and up to the individual monopiles.
- Proof of cable lay and acceptable required protection depths for the cables was completed for a total of 19 monopiles and 38 cables.

#### The Challenge

- Sea Axe was selected due to its ability to work in shallow tidal waters with strong currents in an environmentally challenging area.
- Depth from natural seabed was 5 metres transiting gradually to 1 metre depth, 2 cables per location with every transition route pre-surveyed.

#### The Solution

- Data was recorded by Fugro and JBS Gemini Multi Beam Sonar equipment to produce a post operation proof survey report for the client.
- Seabed comprised mixed medium strength clay up to 3 metres below natural seabed with firm clay from 3 to 5 metres depth.
- JBS Sea Axe standard equipment was used with no requirement for the ancillary jetting system.
- Project was a success with the cables trenched to client specification at an average rate of 1m/min to 4m/min.



# 05.

## Case Studies

### Subsea Fibre Optic Cable (Offshore, North West Poland)

#### The Project

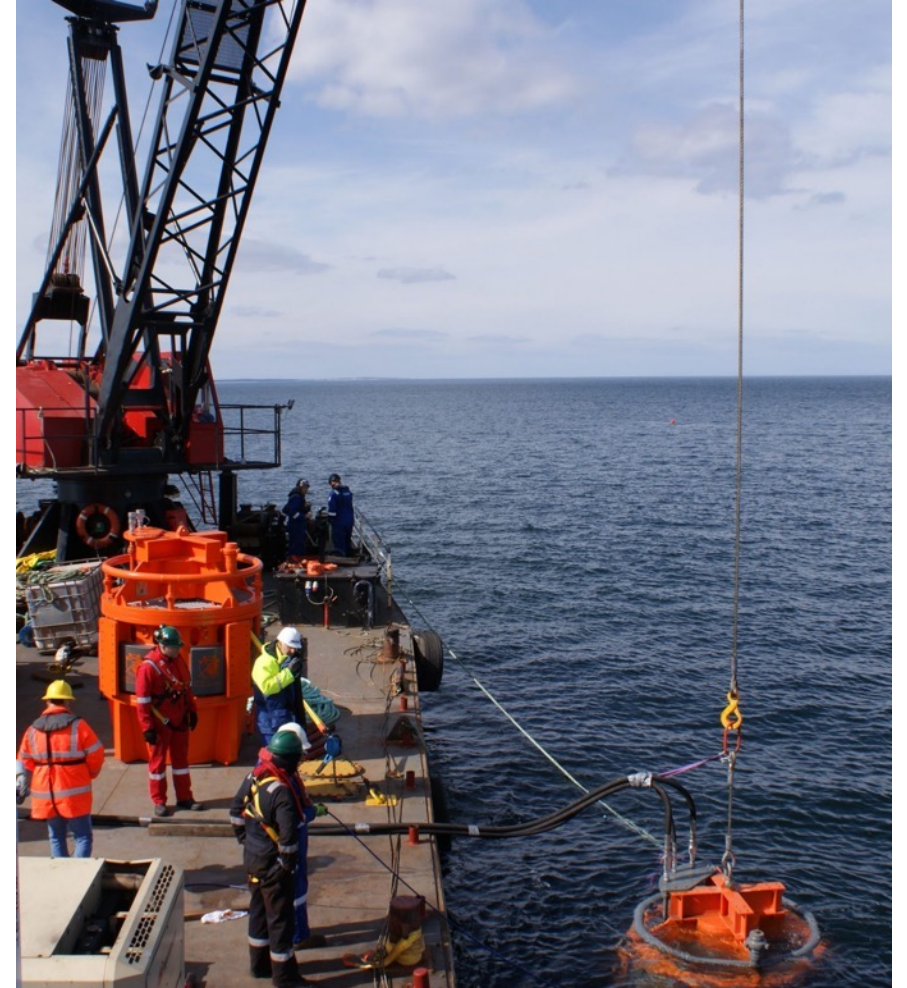
- JBS were contracted by Logi Point Polska (for Van Oord) to provide Sea Axe CFE equipment and operational team members for a project offshore Swinoujscie, North West Poland.
- JBS were contracted to locate a subsea fibre optic cable and then excavate the area to allow cable repairs to be completed.
- Water depth was 20 metres, and the equipment was deployed from the vessel Baltic Worker.

#### The Challenge

- The fibre optic cable had very small diameter of 22mm, burial depth 3m with “as laid” survey data dating back to 1989.
- Client initially requested the JBS Sea Axe team to create a 3.2m deep x 16m wide trench over a 100m length. Bottom of trench width was 4.56m.
- Trench still had soft backfill so it was decided to increase the trench width at port and starboard side to approximately 20m wide at the top of trench.
- Sea Axe then went back to centre area and continued to excavate at “as laid” area.

#### The Solution

- JBS Sea Axe team located the cable, completed the excavation to allow for diver access and cable repair.
- Project completed successfully and client delighted with the performance.



# 05.

## Case Studies

### Pipeline Burial (Offshore, Bangladesh)

#### The Project

- JBS were contracted by Excelerate Energy USA to provide an urgent Sea Axe CFE standard system to the Moheshkhali Floating LNG Terminal offshore Chittagong, Bangladesh.
- The project entailed lowering an LNG pipeline, approximately 3000m long, to a 3m depth cover, to minimise future remediation works due to uncovering.

#### The Challenge

- Due to the urgency of the project JBS airfreighted the Sea Axe CFE system to Singapore to join the vessel prior to its departure to the Bay of Bengal.
- Working in extreme conditions with currents, in excess of 4 knots the controllability of Sea Axe ensured that the excavation was completed on time.

#### The Solution

- Sea Axe was mobilised to the diving support vessel Fire Opal and operated in water depths of approximately 35 metres. Soil conditions were found to be firm clay in some sections.
- The JBS standard equipment system is utilised for soils strengths up to 80 kPa with the ancillary system added for soil strengths between 80 kPa and 200 kPa.
- An **electric power pack** was used for this project replacing the traditional diesel power pack. The electric power pack produces **zero emissions** and removes the requirement for diesel. It produces less noise and is the most **environmentally acceptable** power pack available.



# 05.

## Case Studies

### Sandwave Presweeping (Gulf of Cambay, India)

#### The Project

- JBS was tasked with lowering or removing large sand waves along a route for a new 20" Gas pipeline as part of the Tapti Field development.
- The goal was to prevent serious free spans and facilitate the installation of the pipeline.

#### The Challenge

- The project involved creating a 10m wide lay corridor at the base of 19 sand waves, each ranging from 3 to 6m in height and 80 to 280m in length.
- The conditions were challenging, with strong currents up to 5 knots and a tidal range of 5m.
- The dynamic nature of the sand waves in high currents led to rapid backfilling, necessitating immediate action to avoid complications for the pipelay barge.

#### The Solution

- JBS mobilised a dedicated crew and Sea Axe technology onto the vessel REM Fortress.
- Despite the adverse conditions, the team successfully cut lay corridors through the sand waves in a **total excavation time of 320 hours**.
- This **efficient approach** averaged approximately one sand wave every 17 hours, mitigating the challenges posed by the dynamic environment and ensuring the timely progression of the pipeline installation.





# 05.

## Case Studies

### Gas Pipeline Excavation (Tyra Field, Denmark)

#### The Project

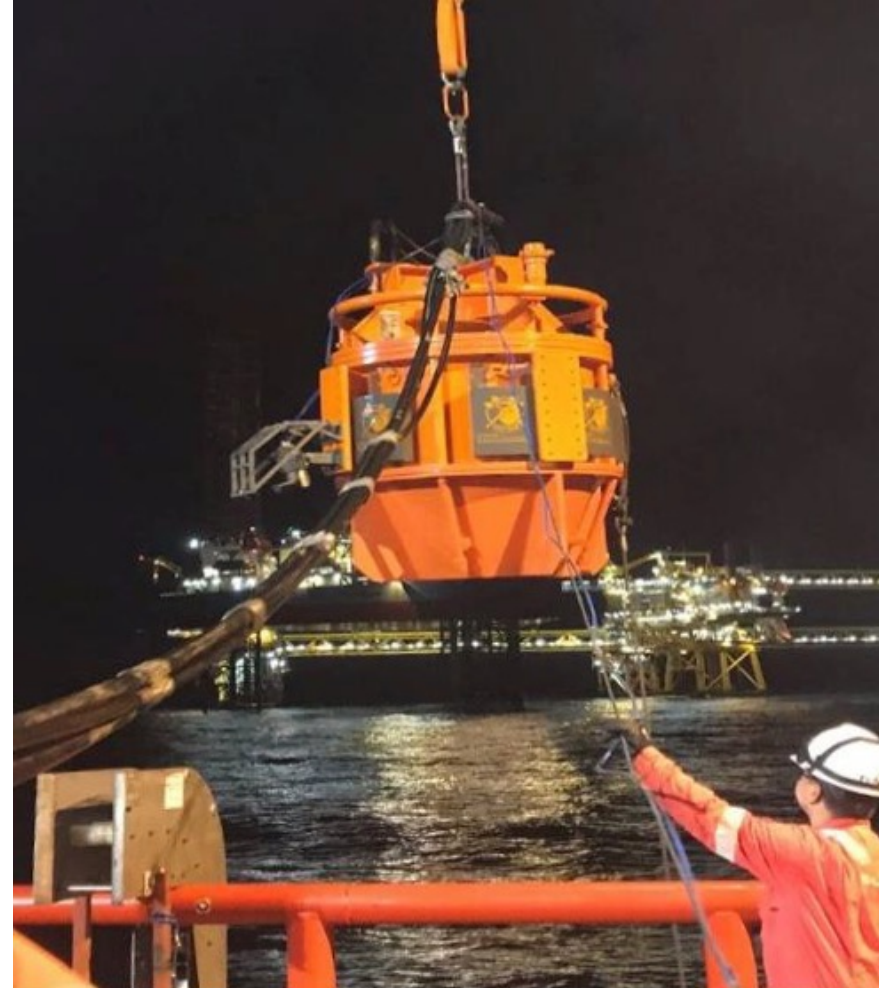
- JBS undertook a contract aboard the Seven Arctic offshore Denmark for post-excavation operations at Tyra.
- The project involved assisting the client in excavating areas over 8', 12' and 26' gas pipelines and facilitate morgrip installation below the natural seabed.

#### The Challenge

- The project faced the challenge of excavating and clearing areas around gas pipelines to provide safe access for diver operations.
- Close communication and collaboration with the vessel bridge and DP officers were crucial for the project.
- The excavation required precision, as such a test run was conducted to ensure Sea Axe's performance in comparable conditions.
- The project also included clearing an area for an ROV to fit a clamp around the 12' line, adding an additional layer of complexity.

#### The Solution

- Sea Axe with its power, enhanced stability and inner vortex chamber, proved effective in concentrating the water column accurately above the target areas during excavation.
- It demonstrated successful and safe clearance of all designated areas, meeting client specifications.



06.

Our  
Clients

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