IHC SETT

Subsea Excavation Trenching Technologies

The technology innovator.
Subsea Trenching Equipment
Specialist Burial Tools

Product Types

Rigid
- Pipelines
  - Export
  - Infield

Flexible
- Pipelines
- Infield

Cables
- Control Umbilicals
- Fluid Injection Umbilicals
- Fibre Optic Communication Cables
- Export and Infield Power Cables
Specialist Burial Tools

Product are buried for:

Protection
- Trawlers
- Anchors
- Icebergs
- Dropped Objects

Thermal Insulation
- Keep thick waxy oil flowing

Upheaval Buckling
- Expansion / Contraction

Trenching Methods;
- Ploughing – Pre or Post Lay
- Jetting – Post Lay
- Cutting – Pre or Post Lay

Image courteous of: www.jydeskdyk.dk

Image courteous of: www.afaa.co.uk
Specialist Burial Tools

Trenching Products Manufactured by IHC EB

- Pipeline Ploughs and Backfill Ploughs
- Jet Sleds
- Tracked Trenchers
Specialist Burial Tools
Jet Sleds

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Ideal for soft materials up to 150kPa</td>
<td>✗ Pre-lay suitability only</td>
</tr>
<tr>
<td>✓ Product friendly</td>
<td>✗ Not suited to clays 100kPa maximum strength or cemented materials</td>
</tr>
<tr>
<td>✓ Suited to shallow water (vessel fed)</td>
<td>✗ High power requirement</td>
</tr>
<tr>
<td>✓ Lower technical solution</td>
<td>✗ Restricted to shallow water depths</td>
</tr>
<tr>
<td>✓ Lower equipment weight in air / less deck space (typical weight – 150te)</td>
<td></td>
</tr>
<tr>
<td>✓ Lower bollard pull requirement</td>
<td></td>
</tr>
</tbody>
</table>
### Specialist Burial Tools

#### Ploughs

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Suited to a wide range of soils</td>
<td>✗ Large equipment foot print / deck space used</td>
</tr>
<tr>
<td>✓ Higher efficiency rates</td>
<td>✗ Higher vessel requirement – tow forces</td>
</tr>
<tr>
<td>✓ Deep trenches achieved with multi-pass</td>
<td>✗ Reduced turning capability</td>
</tr>
<tr>
<td>✓ Good backfill Quality</td>
<td>✗ Pre-lay suitability only</td>
</tr>
<tr>
<td>✓ Robust lower technical solution</td>
<td>✗ Backfill operation requires second pass with backfill plough</td>
</tr>
<tr>
<td>✓ Better out of straightness characteristics</td>
<td>✗ Lay backs become long in deep water</td>
</tr>
<tr>
<td>✓ Provides a stable trench</td>
<td>✗ Sinkage in very soft soils – 3kPa</td>
</tr>
</tbody>
</table>

![Specialist Burial Tools](image)
## Specialist Burial Tools
### Mechanical Trenchers

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Suitable for trenching through higher strength materials up to 500kPa</td>
<td>✗ Pre-lay suitability only</td>
</tr>
<tr>
<td>✓ More of a versatile solution with choice of interchangeable tooling</td>
<td>✗ Digger chain not suited to soft clays up to 100kPa</td>
</tr>
<tr>
<td>between jet swords and digger chain</td>
<td>✗ High power requirement</td>
</tr>
<tr>
<td>✓ Backfill tool available</td>
<td>✗ Larger power requirement</td>
</tr>
<tr>
<td>✓ Pre or post lay suitability</td>
<td>✗ Lower productivity rates</td>
</tr>
<tr>
<td>✓ Higher sea state launch and recovery</td>
<td>✗ Issues with traction in softer materials</td>
</tr>
<tr>
<td>✓ Self propelled vehicle</td>
<td></td>
</tr>
<tr>
<td>✓ Higher manoeuvrability</td>
<td></td>
</tr>
</tbody>
</table>

- [Image of a trenching vehicle]
# Equipment capabilities

## High level Summary

<table>
<thead>
<tr>
<th>Density</th>
<th>Very Loose</th>
<th>Loose</th>
<th>Medium Dense</th>
<th>Dense</th>
<th>Very Dense</th>
<th>Cemented</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equipment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strength</td>
<td>Very Soft</td>
<td>Soft</td>
<td>Firm</td>
<td>Stiff</td>
<td>Hard</td>
<td>Rock</td>
</tr>
</tbody>
</table>

- Jetting
- Ploughing
- Cutting
Trenching Equipment
Pipe Line Plough – PL3

(Sea Titan 3) Multi-Pass
Customer – Saipem
Basic Dimensions:
  Length, breadth, height = 25 x 11 x 9.5m
  Weight = 205 Tonnes
Key Specifications:
  Operating Depth = 0-1000m
  Tow Force = 350 Tonnes
  Rated to Max. = 400 Tonnes
  Product Diameter = 1220mm (42”)
  Trench Depth = 0-2.5M
Product Handling:
  Fore = 200 Tonne
  Aft = 200 Tonne

- PL3 is the largest pipeline plough in the world
- BPL3 – Backfill Plough is operated from the same vessel using the PL3 control system
Trenching Equipment
Tracked Trenchers – SeaTrac 100 (i-Trencher)

Pipe Line Trencher
Customer – Canyon
Weight – 85t in air
Dimensions – 14 x 10 x 6m

Supporting Equipment
LARS Breakdown
- A-Frame
- Snubber
- Snatch Limiter
• Capable of trenching to depths of 2 metres in a single pass at an operating depth of 1500 metres

• An versatile system for post lay, simultaneous lay and burial and trench backfill (Note - backfill tool optional extra)

• The vehicle can be configured with a chain cutter or jet swords depending on soil conditions

• Backfill tool option available to cut virgin material from each side of the preformed trench to fill

• High powered eductor system for spoil removal including back wash facility

• Product handling equipment fitted for picking up the product whilst mechanically trenching

• Directional thrusters for manoeuvring the vehicle over a pre laid product through vehicle launch
Product Overview
Tracked Trenchers – SeaTrac 100 (i-Trencher)

Product tracking equipment (TSS)
Buoyancy
Thrusters
Eduction System
Fore and aft product grabs
Bullet cage
Product guide rollers
Compensated hydraulic reservoirs
Sea Bed Preparation Tool

- Level uneven sea beds
- Pre-rip a furrow through particularly hard soils, boulder clays up to 450kPa
- Clearance width 8m
- Pre trenched depth 2m, width 0.6m
- Cobble and large gravel particle clearance
- Concepts investigated incorporate ripper teeth and dozer blade
Hi-Traq Capabilities

Specifically designed for shallow water environments, high currents, uneven seabeds and soft soils

- Minimum machine weight of 30t submerged
- High tractive effort achieved through 4 individually driven undercarriage units
- **Articulated hydraulic suspension system**
  - Capable of negotiating 400mm high boulders
  - Capable of climbing 20 deg slopes
  - Maintains a level platform during trenching and manoeuvring operations
- 2 sets of bogey arrangements per undercarriage unit for even ground pressure copes with sand ripples
- **Individual steering** through each undercarriage unit gives;
  - Crab steering
  - Reduced turning circle whilst trenching
- **Wide track pads** to reduce machine ground pressure
Launch and Recovery

- **Wide Angle A-Frame** rated to sea state as required
- Bucket linkage design for extra reach
- **Stabilising Snubber unit** with 180 degree rotation
  - Stabilising scissor frame utilised with a plough
  - Snubber unit utilised with a tracked vehicle
- Designed to **Lloyds standard**
- Survey of Manufacture to Lloyds available
- Ceramic cylinder rods for improved life
Control System

In-house skills to design and build state of the art hydraulic, electrical and software control systems.

Containerised Control System:
- SCADA system incorporating self diagnostics
- Safety PLC rated
- Remote modem link to shore based facility
- Designed to ISO 9001
- Designed and built to IEC 65108
The importance of IRM is great for the assurance of system integrity and reaching infrastructure life without unplanned loss of power production.

The extensive experience in multiple offshore technologies gives IHC the ability to bring a complete suite of tools to the market for this application.

- Dredge Crawler with ejector pump or dredge pump
- Stand alone ejector or dredge pump
- Cutting shears
- Electric and hydraulic submersible pumps
- Mass flow excavator
IHC SETT offers a range of peripheral equipment to cover a range of applications

- Mass Flow Excavators
- Dredge Pumps
- TT Pumps
- Jet Pumps
- Ground Engaging Tooling;
  - Digger Chains
  - Jet Swords
- Agitation Tooling – Jet Rings
- Spoil Relocation Skids
Subsea Tooling Suite

- Grabs & Handling Equipment
- Cutting Shears
- Hydrohammer
- Drumcutters
Mission

IHC SETT

Full Life Cycle Coverage