Etame Field Development
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Etame Wells Chronology

- Etame-1 Discovery Well - Jan 1998
  DST 3700 BPD
- Etame-2 Jan 1999 (Non-Commercial)
- Etame-3, February 2001
- Etame-4, June 2001 (Coring)
Etame Field Layout
Basic Information

• 76 Meters (250 Ft) Water Depth
• Oil Gravity: 36° API
• GOR 120 - 180 SCF/BBL
• 2900 psi BHP
• 68°C (155°F) BHT
• Cloud Point 39°C (102°F)
• Pour Point 27°C (80°F)
### VAALCO Etame Field Development
#### Overall Project Schedule

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fabricate Trees &amp; Tools</td>
<td>27 wks</td>
<td>Fri 8/24/02</td>
<td>Thu 2/28/02</td>
</tr>
<tr>
<td>2</td>
<td>Ship Trees &amp; Tools</td>
<td>30 days</td>
<td>Fri 3/8/02</td>
<td>Sun 4/7/02</td>
</tr>
<tr>
<td>3</td>
<td>Ship Drilling Supplies</td>
<td>30 days</td>
<td>Fri 3/8/02</td>
<td>Sun 4/7/02</td>
</tr>
<tr>
<td>4</td>
<td>Mobilize Drilling Rig</td>
<td>3 days</td>
<td>Thu 4/11/02</td>
<td>Mon 4/15/02</td>
</tr>
<tr>
<td>6</td>
<td>Complete Etame 3</td>
<td>33 days</td>
<td>Mon 4/15/02</td>
<td>Sat 6/10/02</td>
</tr>
<tr>
<td>6</td>
<td>Complete Etame 4</td>
<td>32 days</td>
<td>Sat 5/11/02</td>
<td>Wed 6/19/02</td>
</tr>
<tr>
<td>7</td>
<td>Complete Etame 1</td>
<td>19 days</td>
<td>Wed 5/19/02</td>
<td>Mon 7/8/02</td>
</tr>
<tr>
<td>8</td>
<td>Fab Flowlines</td>
<td>19 wks</td>
<td>Mon 1/1/02</td>
<td>Fri 5/31/02</td>
</tr>
<tr>
<td>9</td>
<td>Fab Umbilicals</td>
<td>18.4 wks</td>
<td>Fri 1/1/02</td>
<td>Mon 6/13/02</td>
</tr>
<tr>
<td>10</td>
<td>Load Flowlines &amp; Umbilicals</td>
<td>30 days</td>
<td>Fri 5/3/02</td>
<td>Sun 6/5/02</td>
</tr>
<tr>
<td>11</td>
<td>Pre-Install FPSO Mooring</td>
<td>14 days</td>
<td>Mon 7/1/02</td>
<td>Mon 7/15/02</td>
</tr>
<tr>
<td>12</td>
<td>Mobilize OSO Inst Vessel</td>
<td>22 days</td>
<td>Fri 7/5/02</td>
<td>Sat 9/21/02</td>
</tr>
<tr>
<td>13</td>
<td>Install Flowlines &amp; Umbilals</td>
<td>21 days</td>
<td>Sat 7/27/02</td>
<td>Sat 9/1/02</td>
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<tr>
<td>14</td>
<td>Fabricate Owner Equip</td>
<td>24 wks</td>
<td>Fri 12/14/01</td>
<td>Thu 5/30/02</td>
</tr>
<tr>
<td>15</td>
<td>Ship Owner Equip</td>
<td>30 days</td>
<td>Thu 5/30/02</td>
<td>Mon 6/29/02</td>
</tr>
<tr>
<td>16</td>
<td>Demobil / FPSO</td>
<td>10 days</td>
<td>Thu 4/25/02</td>
<td>Sun 5/6/02</td>
</tr>
<tr>
<td>17</td>
<td>Move FPSO to Shipyard</td>
<td>30 days</td>
<td>Sun 5/6/02</td>
<td>Tue 8/4/02</td>
</tr>
<tr>
<td>18</td>
<td>Gas Free FPSO</td>
<td>6 days</td>
<td>Tue 8/4/02</td>
<td>Mon 8/10/02</td>
</tr>
<tr>
<td>19</td>
<td>FPSO Upgrade</td>
<td>36 days</td>
<td>Mon 8/1/02</td>
<td>Mon 8/1/02</td>
</tr>
<tr>
<td>20</td>
<td>Install Owner Equip</td>
<td>3 wks</td>
<td>Mon 7/1/02</td>
<td>Fri 7/1/02</td>
</tr>
<tr>
<td>21</td>
<td>Move FPSO to Site</td>
<td>30 days</td>
<td>Mon 7/15/02</td>
<td>Wed 8/14/02</td>
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<tr>
<td>22</td>
<td>FPSO Customs Clearance</td>
<td>2 days</td>
<td>Wed 8/14/02</td>
<td>Fri 8/16/02</td>
</tr>
<tr>
<td>23</td>
<td>Hookup FPSO Mooring</td>
<td>4 days</td>
<td>Sat 8/17/02</td>
<td>Wed 8/21/02</td>
</tr>
<tr>
<td>24</td>
<td>Hookup Risers &amp; Umbil</td>
<td>0 days</td>
<td>Wed 8/11/02</td>
<td>Fri 8/23/02</td>
</tr>
<tr>
<td>25</td>
<td>Commissioning</td>
<td>3 days</td>
<td>Fri 8/23/02</td>
<td>Mon 8/26/02</td>
</tr>
<tr>
<td>26</td>
<td>First Oil</td>
<td>0 days</td>
<td>Mon 8/26/02</td>
<td>Mon 8/26/02</td>
</tr>
</tbody>
</table>

Note: The project schedule includes various tasks such as tree fabrication, shipping, drilling supplies, mobilizing rigs, completing Etame 3 and 4, fabricating flowlines and umbilicals, loading flowlines and umbilicals, pre-installing FPSO mooring, mobilizing OSO installation vessel, installing flowlines and umbilicals, fabricating owner equipment, shipping owner equipment, de-mobilizing FPSO, moving FPSO to the shipyard, gas-free FPSO, FPSO upgrade, installing owner equipment, moving FPSO to site, FPSO customs clearance, hooking up FPSO mooring, hooking up risers and umbilicals, commissioning, and first oil production. The schedule outlines the start and finish dates for each task, ensuring the timely delivery of the project.
Major Contracts (Drilling Excluded)

- Fred Olsen/Prosafe (FPSO Mob & Upgrades) $10MM
- KOP (Trees, UTAs, HFLs, EFLs) $4.5MM
- Coflexip Stena (Flowlines, Umbilicals & Install) $12MM
- Vosper-Thornycroft (HPU & TUTUs) $260,000
- Odessa Pumps (Pigging Pump) $180,000
- Southwest Measurement (Meter) $220,000
Project Challenges

- High Pour Point Crude Oil
- Rig Selection (Jackup or Semi)
- Diverless Sidevalve Trees on 13-5/8” Mudline Conversion Wellhead
Flow Assurance Strategy

- Conservation of Heat
- Pigging
- Hot Oil Flushing
- Bull-Heading
- Chemical Injection
- Gel-Breaking
Cold Well Restart of ET-4H Flowline
4000 BLPD, 0% Water Cut
Temperature Profiles

Temperature (°C)

Distance (meters)

Figure 4.10-2
Pigging Manifold
Jackup Rig Issues

- Deepwater Jackup
- HP Riser
- Tree Handling
- Deck Space
Rig Selection

Semisubmersible Rig Issues

- No Marine Wellhead
- High Lateral Loads
- Wellhead Structural Integrity
Max 10 Ft Offset 600 KIP Tension

Current Monitor

Marine Riser

BOP

Tree
Subsea Trees
Subsea Tree Schematic

Hydraulic Flying Lead

1/2" 2" 4"

ACV
Bleed
AMV

PMV
CIV

P/T
FLV-1
FLV-2

THOP

Tree Connector

SCSSV

SERVICE FLOWLINE

FLOWLINE PRODUCTION FLOWLINE
Flowine Installation
Riser Pull-In
Riser Lay-Down
Riser Recovery

Diagram showing Riser Recovery process with various components such as winch wire, 12T shackle, 12T swivel, 11.5T ROV hook, Nokalon buoy, soft eye wire sling, Chinese finger, EF+ stiffener, pulling head, and 12T SWL shackle.
FPSO Riser Hang-Off Detail
FPSO Petroleo Nautipa
That’s All
Thank You
Etame Field Development

FPSO Particulars

- DnV Classification
- 138,580 Deadweight Tons
- 266m LOA
- 1 MM BBL Storage
- Heating Coils in Tanks
- Gas Fired Deck Boiler
- 8 Point Spread Mooring
- 76m Water Depth
FPSO “Variation Order” Upgrades

• New Riser Porch
• New Production Manifold
• New Production Heaters
• Helicopter Refueling System
• Pigging Pump Installation
• Subsea Controls and TUTU Installation
• Production Metering Unit Installation
• New Radar Ullage (50/50)