DP Pipelaying
Dynamic Positioning Conference
October 13-14, 1998
Global Industries Offshore

Everything you never wanted to know about DP pipe laying
While eating lunch.
by
Sean Hickey
Pioneer
Chickasaw
Hercules - Before Conversion
DLB Hercules - Major Modifications

- Mid body section installed to lengthen to 440’.
- Focslle added to accommodate power equipment.
- Six thruster wells and thrusters installed.
- New control tower added.
- Pipe ramp and covers added.
- Stinger hitch added.
- New stinger built.
**DLB Hercules - Principle Dimensions**

- Length - 440 feet
- Width - 140 feet
- Depth - 25 feet
- Operating Draft - 15 feet
- Displacement - 28,875 tons
DLB Hercules - Plan View w / Reel
DLB Hercules - Installed Power

- 6 - 2600 kW EMD 4160 VAC Generators
- 3 - 500 kW 480 VAC Cat Ships Service Generators
- 1 - 315 kW 480 VAC Cat Emergency Generator
DLB Hercules - DP Propulsion

- 6 - 3000 HP KAMEWA azimuthing fixed pitch thrusters. 28 lb. / HP
- Driven by 3000 HP GE DC Motors.
- Power converted and controlled by GE 750 VDC SCR systems.
- KAMEWA - Manual Thruster Control Console.
DLB Hercules - Electrical One Line
DLB Hercules - Mission Equipment

- 2000 ton Clyde crane.
- Manitowoc 4100 crawler crane.
- Two 600 kip pipeline tensioners.
  - Fixed for conventional pipe lay.
  - Fleeting for reel pipe lay.
- Reel capable of reeling up to 48 miles of 8” pipe.
- A&R winch.
- Skid launching frame.
DLB Hercules - Dynamic Positioning System

- Nautronix ASK4002 Dynamic Positioning System
- 2 - Anschütz Standard 20 Gyro Compasses
- 2 - Watson Vertical Reference System
- 2 - R.M. Young Wind Sensors
- 2 - Deltec UPS Systems
- DMS with active Power Management
DLB Hercules - Positioning Sensors

- 1 - Ashtech GG24 DGPS / GLONASS w/ C&C SatLoc Corrections
- 1 - Ashtech GG24 DGPS / GLONASS w/ USCG Corrections
- 2 - Contract Survey DGPS inputs.
- 1 - RS914 Acoustic Positioning System
- 1 - ATS Acoustic Positioning system
- 1 - MDL FanBeam
DLB Hercules - Holding Capabilities

- 504,000 lb of bollard pull thrust.
- .61 HP / ton of displacement.
- Beam wind holding capability in excess of 70 knots.
- With 6% inflow degradation 80% thrust capable of holding station in coincident 3 knot current, 6’ significant wave height, and 45 knot winds at the worst angle of attack.
### DLB Hercules - Beam wind holding capability

**Total Thrust Available - 504,000 lbs.**

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Total Thrust Available - 504,000 lbs.
DLB Hercules - Holding Study with Pipe Tension

- 0.0 kt - 3.0 kt coincident current.
- 50 KIPS pipe tension at starboard stern quarter.
- Power degraded for one engine down.
- 80% thrust.

Figure 11
0.0kt - 3.0kt Current Comparison
W/ 50 kip Pipe Tension

Vessel
Global Industries - DB "Hercules"

Propulsors
6 X 3000hp Azimuthing thrusters
80% operating thrust available to maintain safety margin
8%/kt inflow current degradation applied
Reduced Generator Capacity – ~17% thrust reduction

Environment
Maximum Wind Speed
70.0 kt
Current Speed
0.0 - 3.0 kt
Sig. Wave Hgt.
6.0 ft

Date: 10/10/98
Created by: MCF
Why Dynamic Positioning?

- Unlimited water depths
- Accuracy.
- Congested areas.
Dynamic Positioning - Pipe Laying Vs. Drilling

- Drilling - Stay put.
- Pipe Laying - Keep on truckin’.
- Drilling - Weather vane.
- Pipe Laying - Hang on and pray.
- Drilling - Environmental forces only.
- Pipe Laying - Pipe tension included in environment..
Pipe Laying 101 - Pull Real Hard !!

- Not hard enough, pipe kinks.
- To hard, the pipe will be over stressed.
- J-Lay
  - Pipe laid from nearly vertical position.
  - Has only one significant bend near bottom.
- S-Lay
  - Pipe laid in horizontal plane.
  - Has two bends; one near surface and one near bottom.
  - Pipe is supported by a stinger near the surface.
Hercules - Stinger Attached
Pipe Tension and Dynamic Positioning

- Tension is seen by the control loop as an environmental force.
  - No tension sensor inputs other than for display and logging.
- Tension helps to stabilize the system.
  - Something to lean on.
- Tension can have a dramatic effect on heading control.
- Tension may diminish or augment holding.
Hercules - Track Mode
Conventional Pipe Lay

- **Positives**
  - Can lay larger diameter pipe.
  - Lower buy in cost.

- **Negatives**
  - Lots of people offshore.
  - Slow, therefore weather sensitive.
  - Quality control problems
Reel Pipe Laying

- Positives
  - Good quality control.
  - Fewer people offshore.
  - Fast trips offshore to hit weather windows.

- Negatives
  - Practical limits to size which can be spooled.
  - Shore base requirements.
  - Initial investment.
Initiating Pipelines

- From platform or shore based structure.
- From deadman anchors.
- From a deadman pile.
Terminating Pipe Lines

- Shallow water
  - Terminated by crazy person under water.
- Deep water
  - Terminated by crazy person driving ROV.