Load Handling System Update

R/V *SHARP* and *KILO MOANA*

Matthew J. Hawkins

University of Delaware

Current Status

- *SHARP's* system:
  - Caley Ocean Systems, Ltd
  - Delivered and installed May 2006
  - Year and a half in operation.
  - Only one system failure at depth (knock on wood) - bad connection. ~ 4 hrs to find/fix.

- *KILO MOANA's* system:
  - Caley Ocean Systems, Ltd
  - **ABS approval just received!** (finally)
  - Delivered Early 2008?

R/V SHARP

Overall…

- Problems have been associated with manufacturing details by vendor.
- “Proof of Concept” designs have all been successful.
- Some improvements and testing still needed.

So…

- Don’t throw the proverbial “baby out with the bathwater!”

Docking Head

- Capture by cable tension. Proximity sensor gives feedback to “smart” winch.
- No physical latches.
- Owner-supplied “bumper” to match package – easily changed/modified.

Docking Head

- Complete “Hands-Free” deployment and recovery – works GREAT!
- Result:
  - Less stress for winch operator in rough weather,
  - Science party more productive,
  - Lonely technician!
- **Important:** Adequate clearance between “bumper” and top of rosette. 12” – 24” (ship specific).

Docking Head Improvements (Minimal)

- Compression on rosette – frame needs to be robust.
- Fine tune winch speed with docking head proximity sensor to reduce “pumping”.
- Secondary proximity sensor (back-up)? Safety limit switch not ideal due to “pumping” of docking head.
- Resistance rams needed? Not adjustable (yet).

Control Panel and Display

- Touch screen alarm and monitoring.
- Integrates with MTNW cable monitoring system.
- Manual controls.
- Audible and visual alarms per draft wire SWL standards being developed.

Operation

- Easy to use. Controls logically placed.
- Well accepted by crew and techs.
- Up-grade one lever to to proportional control – Main Boom (in progress)

“Smart” Winch

- 75 HP electric motor, reduction gear.
- “Industrial-grade”, fully enclosed.
- Raw water cooled resistor bank for dissipating excess energy/heat on down-cast.
- S.S. spray shield.

“Smart” Winch

- Plenty of power & speed for routine operations and motion-compensation
- Quiet, fast, smooth.
- Compact motor drive – easily configurable. US rep available.
- PLC controlled – logic easily modified to suit operation at any time.
- Allows precise AND easily adjustable (by operator) “Auto-Render”

PLC's
(Programmable Logic Controller)

- ALL new ship's will be PLC controlled!
- Very reliable.
- HIGHLY flexible and readily configurable.
- CRITICAL to new capabilities (mo-comp, "Auto-Render", and "Auto-Position" of docking head).

PLC's
(Programmable Logic Controller)

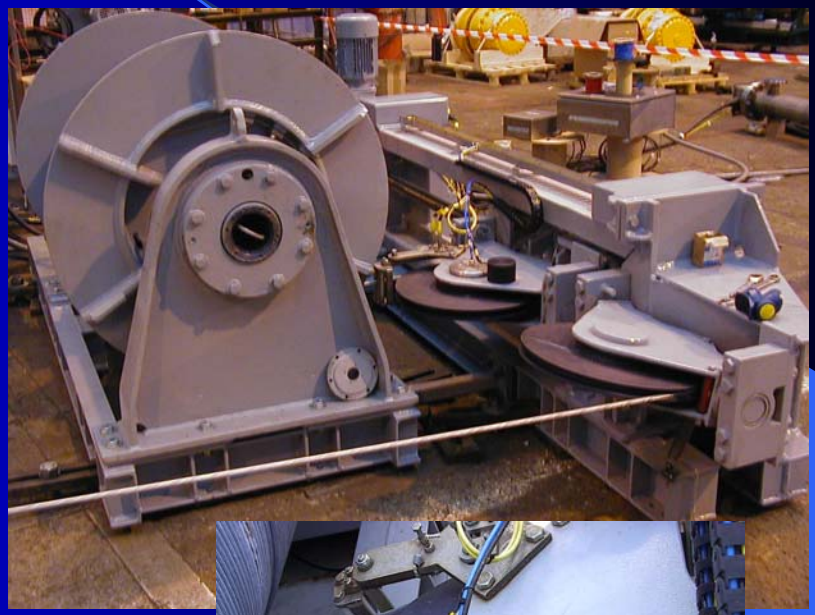
- Fear NOT! Even the Marine Superintendents can understand!
- Software upgrades easily "up-loaded" with minimal skill and training.
- Local support/training (Rockwell).
- Chief Engineers and Lead Techs must be prepared to learn the basics.

PLC's
(Programmable Logic Controller)

- Get over it!
- Electrical connections and routing of cables critical.
- Long-term programming support from vendor needed.

Level Wind

- Good spooling.
- Multiple turns in wire train – however, cable testing and observation show no apparent problems with wire (yet).
- Improve machining on sheave fit-up?
- Improve sensors?



Drum

- Grooved 0.322
- “S-kick” - Not true LEBUS shell
- Works on SHARP.

Handling Apparatus

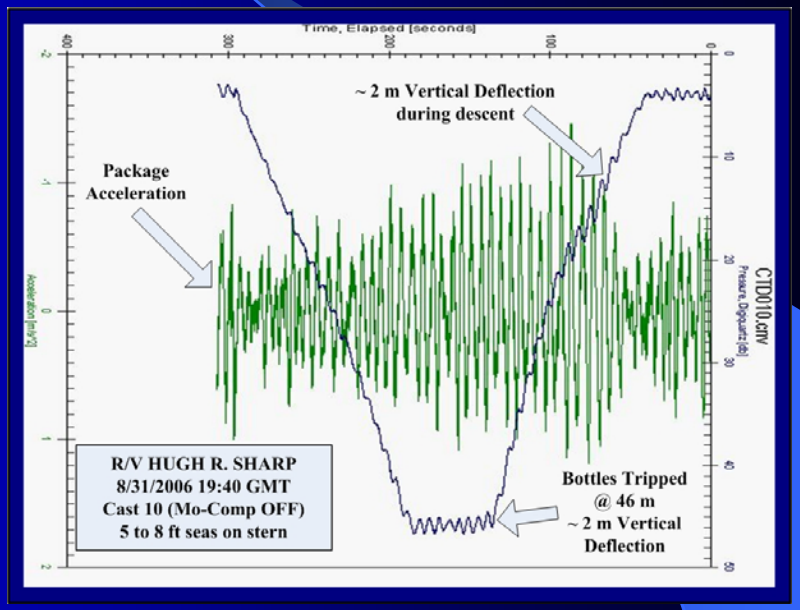
- SHARP = “Side Arrangement” (similar to G.O. SARS)
- KILO MOANA = “Aft Deck Arrangement”
- No problems – works as designed.
- Geometry requires proportional control on main boom (not realized by anybody).
- SWL’s pretty standard by class.
- Geometry SHIP SPECIFIC!

Auto-Render

- Factory/acceptance tested and during commissioning at yard.
- Only used operationally to limit load until ABS approval of foundations and final load testing.
- Allows winch to pay out under tension when SWL of cable is reached.
- EASILY adjustable by Operator!
- Fully dependent on reliable load cell and PLC.

Motion Compensation

- Winch pay-in/pay-out.
- MRU on crane boom supplying feedback to “Smart” winch.
- VERY LOW space and weight impact.
- Reasonable cost.
- Easily configurable.



Motion Compensation

- Proven at shallow depth (100m)
- Need to test at full depth (Fall ’07/Winter ’08).
- Reduces package heave (~75%)
- Reduces package acceleration and cable loading (~70%) – allowed per draft Wire SWL Standards.
- Slow creep up when CTD stopped at depth (software patch pending).

Challenges – R/V *SHARP*

- Control cable connections – more robust/ “marine”
- Cable capture details – jumping sheaves
- Bushings (better materials), grease fittings
- False alarms
- Programming “bugs”/up-grades.

Recommended Changes
(Nothing Major)

- Redundant Sensors (proximity, load cell, etc.)
- Eliminate need for cable cutter – rely on Auto-Render (new LHS design standards)
- Wire counter by US method (magnets)
- Smaller power/control panels (custom)
- Passive shock absorber for when near surface? (Already in requirements – waived this time)
- True LEBUS shell? *KM* results to help evaluate
- All controls proportional (missed one control on *SHARP*)

Has it been worth it?…

YES!

Future Systems

- Don’t allow vendors to drive design based only on what they build – or their view of what works – insist on what is desired.
- Pre-Qualify based on experience with technologies requested AND overall quality/references.
- Domestic vendors able to supply?

  YES - If they wanted to.

More to follow…