Improved “CTD” Cable

- Design process
- Discussion of the “problem”
- Discussion of how to move forward

“Always be aware of the unintended consequences of what you design/build.“ -Yvon Chouinard

A process

- Define the problem (simply)
- Investigate the problem
- Develop multiple alternatives
- Choose a solution
- Model(s) and prototype(s)
- Test and evaluate
- Procure and deploy
- Evaluate performance

Goals

- Reduce ship to ship variability in operating limits
- Improve the ratio of working load to yield strength (or breaking strength)
- Define (uniform) bounding procedures

Questions (1)

- What are the (future) science drivers?
  - What does/will CLIVAR require?
  - What other programs will drive requirements?

Questions (2)

- What is the distribution (of depths, package weights, sea states….?) of historical CTD casts?
- What else do we do (and how often) with “CTD” cables?
- How well could we use this data (if we had it) to predict future use?
- Is there a rational approach to solving 9X% of the needs?

Assumptions (1)
(to evaluate)

- “CTD” cable is our biggest (current) problem
- CLIVAR will not go deeper than WOCE
- CLIVAR “knows” package size/weight
- We can define (and measure) maximum sea state or ship motion
- We can measure tension uniformly
- We can characterize the impact of current and sea state on wire loading

Assumptions (2)

- We don’t need three conductors
- We need power and can define how much
- We can dynamically monitor limits and (uniformly) define shutdown limits
- We could switch to fiber (with adapters)
- There will be significant impact on existing sheaves, winches, a-frames that have to be addressed as part of the solution.

Assumptions (3)

- This isn’t going to happen in our spare time
- We will need support from professional wire designer(s)
- We must be technically engaged in the end to end process

Possible Process for discussion

- Proposal (funded)
- Careful design requirements (science and operation)
- Multiple cable designs
- Evaluate designs and impact, choose
- Build and test (lab then ship) prototype(s)
- Evaluate test results

References

- Design:
  - www.bergen.org/technology/despro.html
  - http://www.ecsel.psu.edu/setce/EDG100/Database/Design_Front.html
  - http://singer.kettering.edu/design-process.htm
- Cables
  - http://www.camesainc.com/catalog/4h18.htm (lots of online cable specs)
  - The Rochester Corp (very little on line)
  - UNOLS Winch and Wire Handbook, 3rd edition, (there are errors)
  - Rich Findley's spreadsheets