

Meeting at CRP to discuss MTM Cable floatation and bending strain relief changes.

June 24, 2005 – Skelmersdale, UK

Present: A. Hamilton (MBARI), Frank Tyson (OCP), Mark Church (CRP)

Agenda:

- Outline results of MTM2 deployment and needed refinements to system for MTM4..
- Discuss possibility that Linksyn is weakening cable and possible mitigation strategies.
- Discuss required changes to bending strain relief units at top and bottom of linksyn.
- Discuss changes to floatation clamp to avoid failure as occurred in MTM2.
- Discuss benthic floatation syntactic foam requirements.

Notes:

Linksyn issues

- Damage to cable due to sharp bend inside of LinkSyn. I described in detail the residual strength results from the MTM2 deployment and showed video of the ongoing test to try to re-create the result. If the sharp bend inside the LinkSyn proves to be the culprit, CRP was willing to investigate a mold modification to alleviate the problem. However, it is acknowledged that this will probably be expensive and obsolete the existing units. We had general discussions of other mitigation techniques that include an additional sleeve or lining of the LinkSyn elements. The existing tests need to be completed before further work here is sensible.
- Durability. We discussed what damage to these elements would look like, and how the syntactic foam degrades if overloaded as we suspect was done during the recovery. Mark's basic advice was that if we don't see deformed polyethylene, there is probably no significant weakening. He also reports that failure of the syntactic foam is likely to be in the form of large-scale cracks that don't significantly affect the buoyancy of each module. He would not expect a "powdering" of the material.
- I explained some of the fit problems we had with the interface between the LinkSyn elements and the clamps and strain relief's. A more carefully toleranced drawing of the LinkSyn elements is needed, and we may be in the best position to generate that because we have hundreds of samples.
- I inquired about the availability of polyurethane filled LinkSyn elements to be used at the top of the string to create a variable density distribution. This is apparently easily achieved and costs would be "slightly less" than the foam filled units.

Bending Strain Relief's

- The bending strain relief's at the anchor and below the buoy have performed well and there is no need for changes to these items. They both fit the larger, fish-bite protected cable, so extending the outer jacket won't affect this situation.
- The bending strain relief's that act as the transition units above and below the LinkSyn will need to be redesigned for three reasons. (1) They don't hold the correct bend radius under bending encountered in use. (2) They are too stiff at the root to install easily, and (3) They won't fit the larger, extended fish-bite cable. Frank suggested it would be possible to mimic the length, diameter, and profile of the upper and lower units in this section. Because the root diameter will now be 156mm, a

transition piece between the LinkSyn and the strain relief will be required. Frank will prepare a proposal for these strain relief's and transition pieces. I explained the installation difficulties and Frank agreed to make an estimate of the opening force required for the new units. We can also soften the hardness of the polyurethane in these units if necessary.

Floatation Clamp

- The failure of the previous floatation clamp was discussed. There is general agreement that the failure was due to a larger than anticipated diameter reduction of the cable, removing all frictional force from the clamp polyurethane liners. Two suggestions were put forward to accommodate this shrinkage. (1) Thicken the polyurethane liners and apply a greater pressure such that all shrinkage is absorbed by the polyurethane. (2) Incorporate spring elements into the clamp to allow it to apply a constant pressure over a range of diameters. One concern of mine with option two is the long term stability of these springs, corrosion issues, etc.
- I explained JDR's suggestion to incorporate an overmould onto the cable. OCP/CRP's suggestion is to still apply a clamping arrangement over this bump to be sure to have constant contact between the clamp and the cable. It should be possible to set up a system that utilizes friction, but maintains a mechanical interference in the high-pressure state.

Benthic Floatation

- I explained the design of the floatation at the anchor termination and inquired about CRP's ideas for protecting this syntactic piece from impact. They suggested a polyurethane coating similar to what they would do with a ROV pack. They also provided example drawings of ellipsoid foam pieces they've made as floats that may be applicable to this part of the mooring.

Actions:

- Frank to prepare a proposal and quote for the transition bending strain relief items, changing the dimensions to match the upper and lower pieces, and softening the PU slightly. A transition element to match the Linksyn will be required as part of this. This proposal will include an estimate of the force required to spread the split BSR for installation.
- Frank to prepare a concept clamp design that clamps over the PE overmould, and is fail safe in the event of PU delamination, etc.
- Andy to provide refined estimates of bend vs tension treatment at the top of the LinkSyn.
- Andy to provide a refined estimate of total axial load the float clamp must withstand.