

## Ocean Networks Canada Ferry Maintenance Report – Queen of Alberni

#### Date: August 29, 2014

Arrival: 12:45PM sailing to Tsawassen. We signed in at terminal supervisor at Duke Point.

Reporter: Chris Sundstrom (Servicing), Akash Sastri (Science Analysis)

Attending Personnel: Chris Sundstrom (ONC-Operations), Jeremy Krogh (ONC-Science/MEOPAR)

#### **Reason for Visit**

Regular instrument servicing

#### Observations

- 1. There were no signs of moisture or leaks In the Instrument Box.
- 2. The AADI optode was very dirty with sediment/biofilm growth within the housing.
- The BBFL2 had a partial layer of sediment in the housing and fouling on the sensing surface.
  Fouling was noticed on the "bottom" surface of the horizontal housing.
- 4. The Seabird 45 CT sensor very dirty, with to mussels approximately 3/8" long found growing within the housing on the sensor outlet port.
- 5. The flex tubing was in good shape, having been replaced on the previous trip.
- 6. The sea chest showed no signs of leaks.
- The inline filter (sea strainer) was checked and was found to be dirty and required cleaning. Mussel growth was found inside the strainer basket.
- 8. The CT connector corrosion appears to have been halted due to maintenance activities with no evidence for signal degradation yet.

#### **Actions Taken**

- 1. Opened both boxes and observed function. Both were working well, no leaks anywhere.
- 2. Powered down and disassembled instruments in lower assembly.
- 3. Cleaned and checked over instruments in Engineering room. Cleaned CT sensor connector to remove sediment and biofouling growth. Removed three mussels from interior of housing.
- 4. Ran pre- and post- calibration with standard solutions and with Pink test stick and blue test stick for CDOM fluorescence and Chl fluorescence.



Ferry Maintenance Report – Queen of Alberni

- 5. Re-assembled the instruments in the lower box.
- 6. Checked over Sea chest and valves, no leaks apparent.
- 7. Checked and cleaned the sea strainer. Removed mussels, biofilm and sediment fouling from the strainer.
- 8. Turned ON the system.
- 9. No leaks in instrument housing and checked flow output at sea strainer. Flow was good. Visually confirmed flow direction at the BBFL2 and confirmed the volume filled with water and began draining correctly.
- 10. Signed out at Engineering room.

#### **Future Actions**

- 1. Potentially replace CT connector (shipboard connector will need to be re-soldered).
- 2. Monitor growth of Mussels within the system.
- 3. November refit, replace all metallic connectors on upper boxes with plastic glands.

#### **Discussion of Test Procedures and Results**

The test procedures used are documented in the supplemental report, which also provides preliminary analysis of the data and its consequences.

#### PICTURES



Ferry Maintenance Report – Queen of Alberni



Figure 1: Instrument box upon arrival



Ferry Maintenance Report – Queen of Alberni



Figure 2: CT sensor fouling



Ferry Maintenance Report – Queen of Alberni



Figure 3: Fouling within the CT sensor (Temp sensor at top)



Figure 4: BBFL2 Fouling



Ferry Maintenance Report – Queen of Alberni



Figure 5: Optode fouling



Ferry Maintenance Report – Queen of Alberni



Figure 6: Optode fouling



Figure 7: Fouling of Sea Strainer with example mussel from strainer



Ferry Maintenance Report – Queen of Alberni



Figure 8: Instrument box operating as closed up



Ferry Maintenance Report – Queen of Alberni





Figure 1. Time series of a) un-corrected; and b) corrected CDOM fluorescence measured en route between Duke Point (Vancouver Island) and Tsawwassen (Mainland, BC) by the BBFL2 unit of the SeaKeeper 1000 instrument suite on board the BC ferry, the Queen of Alberni. Red and blue symbols are used to distinguish between instrument cleaning dates. The difference between pre- and post-cleaning fluorescence of diluted tonic water was used to calculate a correction factor (%) which was applied as a linear correction retrospectively between cleaning dates. The most recent cleaning event took place on August 29, 2014. Pre- and post-values for Sprite Zero were used for corrections to CDOM between August 16 and August 29, 2014. Note: an instrument inter-calibration applied to all data following day 149 when BBFL2-786 was swapped out for BBFL2-787.



### Ocean Networks Canada Ferry Maintenance Report – Queen of Alberni



Figure 2. Time series of a) un-corrected; and b) corrected Chl fluorescence measured en route between Duke Point (Vancouver Island) and Tsawwassen (Mainland, BC) by the BBFL2 unit of the SeaKeeper 1000 instrument suite on board the BC ferry, the Queen of Alberni. Red and blue symbols are used to distinguish between instrument cleaning dates. The difference between pre- and post-cleaning fluorescence of diet coke was used to calculate a correction factor (%) which was applied as a linear correction retrospectively between cleaning dates. The most recent cleaning event took place on August 29, 2014. On this date, we measured a negative esponse in Chl fluorescence of diet coke to cleaning (see Table 1). No correction was applied to the most recent period (August 16-August 29, 2014). Note: an instrument inter-calibration applied to all data following day 149 when BBFL2-786 was swapped out for BBFL2-787.



Table 1. August 29, 2014. Mean (±standard error) values of pre- and post-cleaning fluorescence for solutions/fluorescent sticks specific to CDOM and Chlorophyll fluorescence. ' $\Delta$  fluor' values for Diet Coke (Chl) and diluted tonic water (CDOM) have been used at every cleaning since March 14, 2014 to assess the degree of signal decay between cleanings. Neither the pink fluorescent stick nor Diet Coke (standards for Chlorophyll fluorescence) responded in a positive fashion to cleaning. The response of the pink stick can be attributed to variability of this approach, however, this is the first instance in which we have noted a negative response for Diet Coke. It is not clear why, however it may be possible that the extreme sedimentation noted above may have resulted in a poor "pre-" set of measurements. We have applied the correction factor derived from ' $\Delta$  fluor' for Sprite Zero to the "corrected" 2014 time series.

CDOM/Chl Fluorescence	Method	Pre- (mean± SEM)	Post- (mean± SEM)	∆ fluor (%)
CDOM	Diluted tonic water	73.69±0.12	88.13±0.18	0.16
CDOM	Sprite Zero	38.85±0.10	49.07±0.01	0.20
CDOM	Blue fluorescent stick	60.48±0.04	39.48±0.01	-0.53
Chl	Diet Coke	5.67±0.003	5.35±0.002	-0.05
Chl	Pink fluorescent stick	0.989±0.001	0.836±0.001	-0.18