FODTS Experiment: Bucket to Test Fiber Homogeneity

Home Experiment Series
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Purpose:

The purpose of this experiment was to test the homogeneity of the fiber measurements by placing a length of fiber in a bucket of uniform heat. Calibrated XT DTS system probe (+/-0.5% Accuracy as compared to YSI Model 30) was used also placed in the bucket to determine temperature differences and percent differences along the fiber relative to the probe.

Experimental Set-Up:

- 150m of Custom Fiber Optic Fishing line was measured out and coiled, leaving about 3m loose at the start.
- Coil was plugged into XT DTS system Channel 1.
- Bucket filled with sink-warm water.
- Temperature probe connected to P001, placed with tip in water
- Coil placed in bucket, and let to rest approximately 5 minutes
    - Coil weighted down with 2 lbs weight to make sure it remains under water.
- XT DTS system set to start sampling for approximately 2 hours.

XT Client Configuration:

- Units: Metric; Time zone: (UTC-05:00) Eastern Time (US & Canada)
- Fiber length set to 2 km
- Zero reference set to 1m
- Sampling Interval: 0.25 m; Measurement Length: 160 m; Acquisition time 180s
- Probe 1 selected – Probe section: 10m – 150m (entire length in bucket)
- Differential loss correction: Fixed Value: 0.25 [dB/km]
- Temperature offset correction: External Probe
- Measurement mode: Continuous

Experiment Notes:

- Initially, fiber floated, a 2 lbs weight was placed on top of fiber to keep it in the water.
- Room significantly colder than water in bucket.
- Taped bundle came undone throughout the experiment, lead to enormous knot of fiber that was difficult to undo.

Results Notes:

- Results show significant fluctuation from the +/- 2 deg C from temperature probe throughout the length.
- An overall parabolic relation along the fiber:
    - First 40 m: Avg fiber > Probe
    - 40m – 100m: Avg fiber < Probe
    - 100m – End: Avg fiber > Probe
- Likely Error: Temperature differential between water in the bucket and the surrounding room created a gradient of temperature in the water from sides to core.
- .ipynb script contains example to find difference and %difference between probe and every node measurement along a selected length of fiber.