PHSEN Tech Refresh & Quality Assessment

OOI MIO Instrument & Data Teams

Instrument Tech Refresh Prioritization

OOI 2.0 – Instrument Tech Refresh	Prioritization											
			1 = good, 2 = adequate, 3 = bad					1 = not anytime soon, 2 = next few years, 3 = now		1 = none, 2 = one, 3 = more than one		
Instrument Class	Model	Vendor	Data Quality	Relia-bility	Ease of Use	Safety	Vendor Quality	Obsolescence	Alternative from same vendor	COTS Alternatives	Alternative within OOI?	Sum
CAMDS		Kongsberg	2	3	3	2	3	3		2	No	18
PHSEN	SAMI-pH	Sunburst	2	2	3	3	3	1	No	3	No	17
PCO2W	SAMI-CO2	Sunburst	2	2	2	3	3	1	No	3	No	16
VEL3D-B	MAVS	Nobska Scientific	2	2	2	1	3	1	No	3	Yes	14
OPTAA	AC-S	WET Labs	2	3	3	1	2	1	No	1	No	13
DOFST	SBE43	Sea-Bird	2	2	2	1	1	1	Yes	3	No	12
ZPLSC/G	AZFP	ASL	2	2	1	1	2	1	No	2	Yes	11
WAVSS	Tri-Axys	Axys Technologies	1	1	2	1	1	3	No	2	No	11
PARAD	QSP	Biospherical	1	1	1	1	1	3	No	3	Yes	11
VEL3D	Aquadopp2	Nortek	2	1	1	1	1	2	Yes	3	Yes	11
VEL3D	Vector	Nortek	1	2	2	1	1	1	Yes	3	Yes	11
VELPT	Aquadopp	Nortek	1	2	2	1	1	1	No	3	No	11
PRESF	SBE26plus	Sea-Bird	1	1	1	1	1	3	No	3	No	11
ADCP	WorkHorse	Teledyne RDI	1	2	1	1	2	1	Yes	3	No	11
FDCHP	DCFS	WHOI	1	3	2	1	2	1	No	1	No	11

Instrument Tech Refresh

PHSEN

- Specification 1336-00012
  - Range: 7.3 - 8.5 units
  - Accuracy: ±0.01 units
  - Precision: 0.005 units
  - Annual Drift: < 0.001 units
- Selected Instrument
  - Sunburst Sensors SAMI-ph
- Quantities in OOI
  - CGSN – 45
  - EA – 20
  - RCA – 18
- Initial procurement costs
  - CGSN/EA – $1,545,250
  - RCA – $204,750

PCO2W

- Specification 1336-00013
  - Range: 100 - 2,000 µatm
  - Accuracy: ±4 µatm for concentrations of ≤400 µatm, or ±1% of value for >400 µatm
  - Precision: ±2 µatm for concentrations of ≤400 µatm, or ±0.50% for >400 µatm
- Selected Instrument
  - Sunburst Sensors SAMI-CO2
- Quantities in OOI
  - CGSN – 35
  - EA – 12
  - RCA – 14
- Initial procurement costs
  - CGSN/EA – $685,600
  - RCA – $114,400

PHSEN Instrument Issues

- Ease of Use
  - Manual flushing required before deployment to prevent air-locking
- Vendor Quality
  - Issues with incorrect wiring for inductive units
  - No controlled schematics/drawings, units not consistently manufactured to a spec
  - Buggy software
- Safety
  - Leak issues results in seawater-battery interactions and over-pressurization
    - Root cause not definitively determined – likely leaking around fiber entry
    - Vent plug added to housing to allow for venting on recovery
- Reliability
  - Issues with batteries – discharging quicker than anticipated
  - Housing not sufficiently robust for SUMO mooring riser deployments

PHSEN Quality Assessment

Data Availability

- All PHSEN data downloaded from OOINet via M2M
- Identified gap/missing days from Telemetered, Recovered, Streaming data
- Days Missing = Total deployment days - Number of data with data
- Opportunity Days = Total deployment days - days of infrastructure downtime

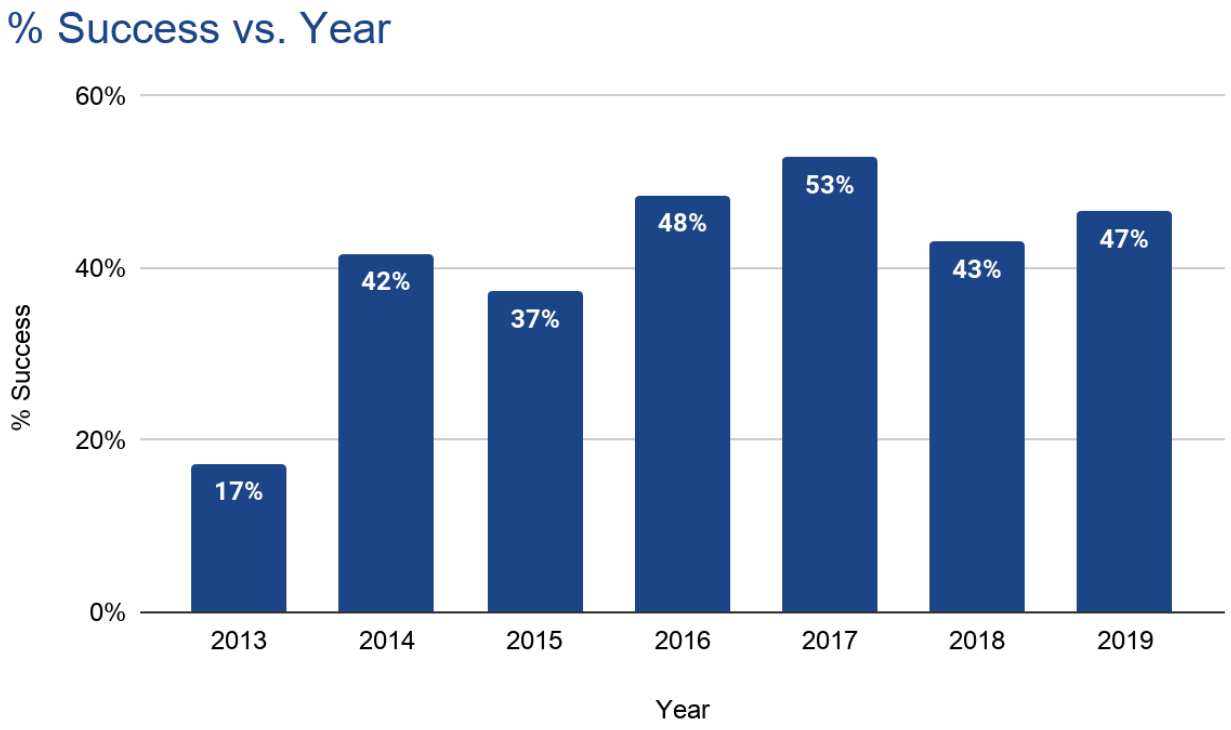
Data Collected 71% of the total deployment time (all Arrays, all deployments)

Data Quality

- Performed on “preferred” data stream with most data – e.g., Recovered, Streaming, Telemetered
- Evaluated
  - Global Range Test of pH values
  - Range Test of blank signal at 434 and 578
  - Noise defined by point-to-point variability
- “Good” data passed all three evaluations
- % Success = Good Days / Opportunity Days

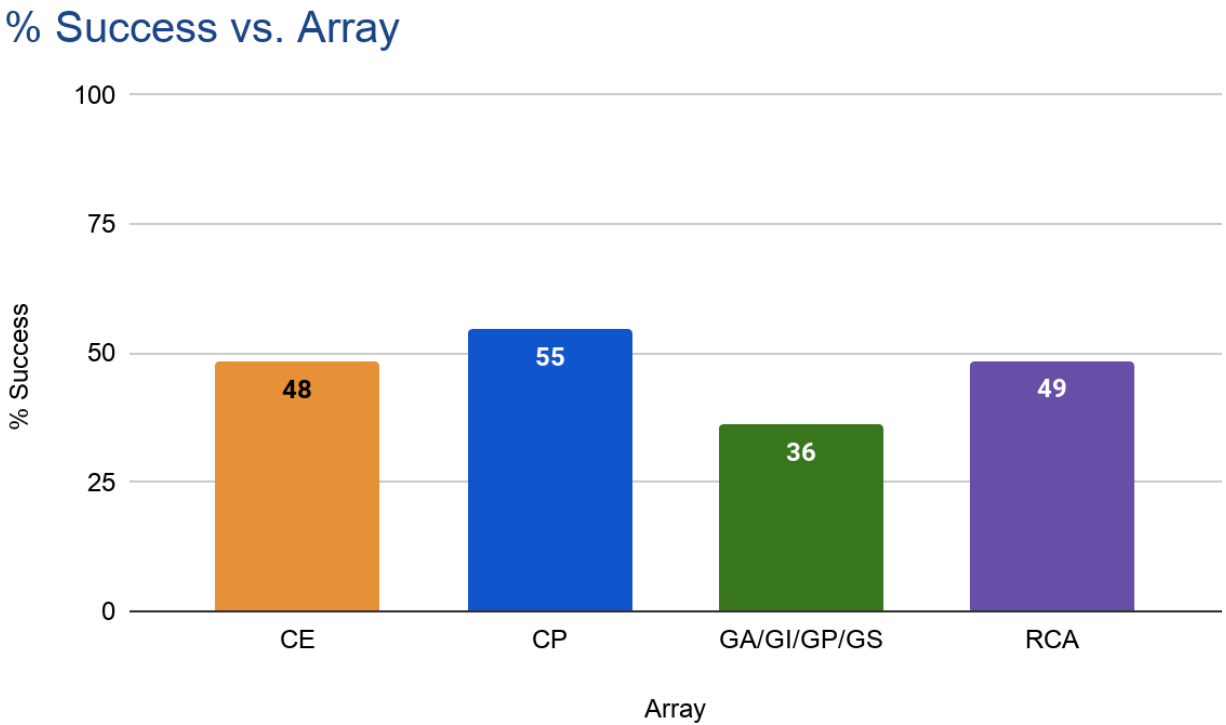
44% Success Rate (collected “good” data)

PHSEN Quality Assessment

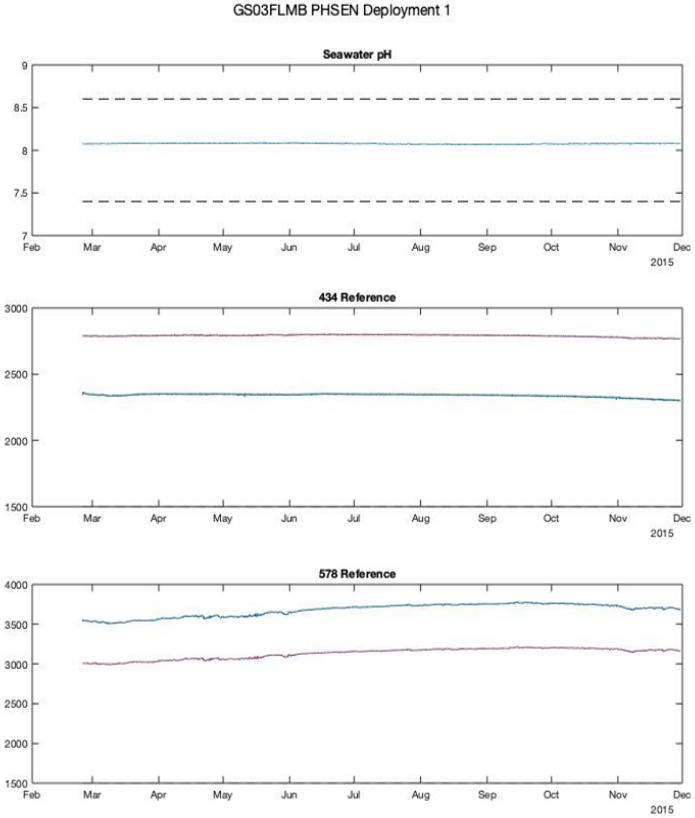


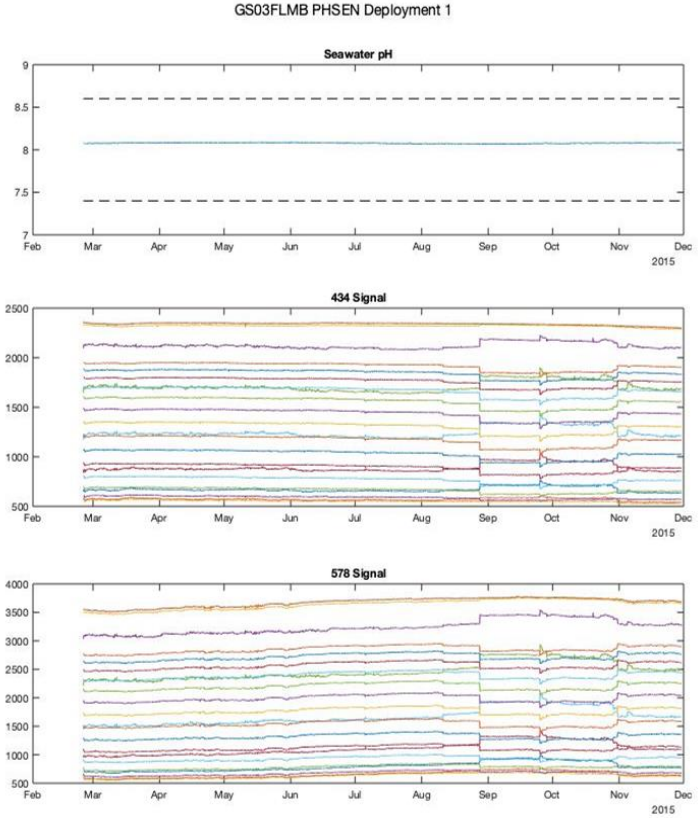
Total Percent Good
over all deployments
44%

PHSEN Quality Assessment

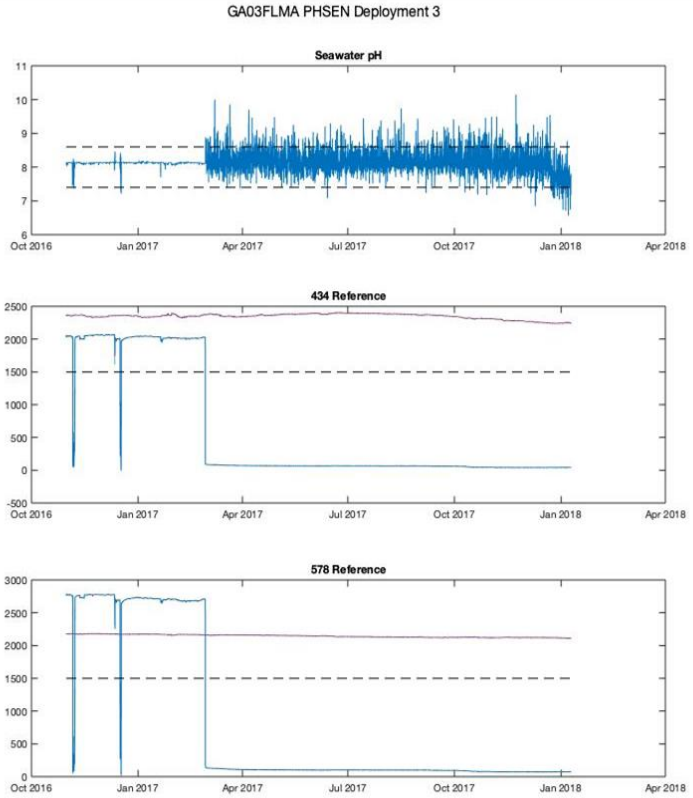


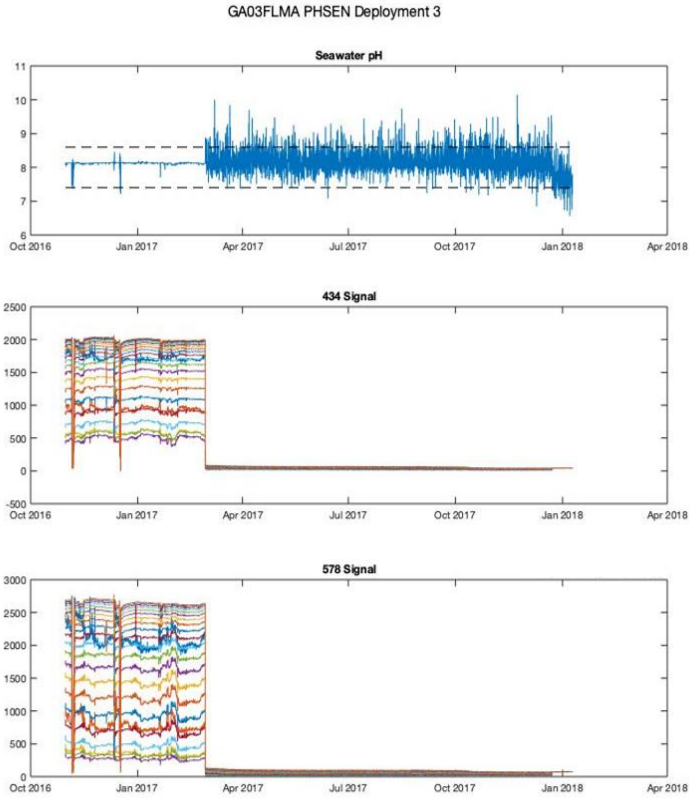
PHSEN Quality Assessment – ”Good” Data





PHSEN Quality Assessment – ”Bad” Data





PHSEN Failure Modes

INSTRUMENT ISSUES

- Firmware – 3%
- Battery – 37%
  - Instrument stopped before the end of the deployment
- Obstruction – 28%
  - Potentially air-locked pump, or sand or other obstruction
- Lamp – 5%
- Pump – 9%
- Leak/Flooded – 4%

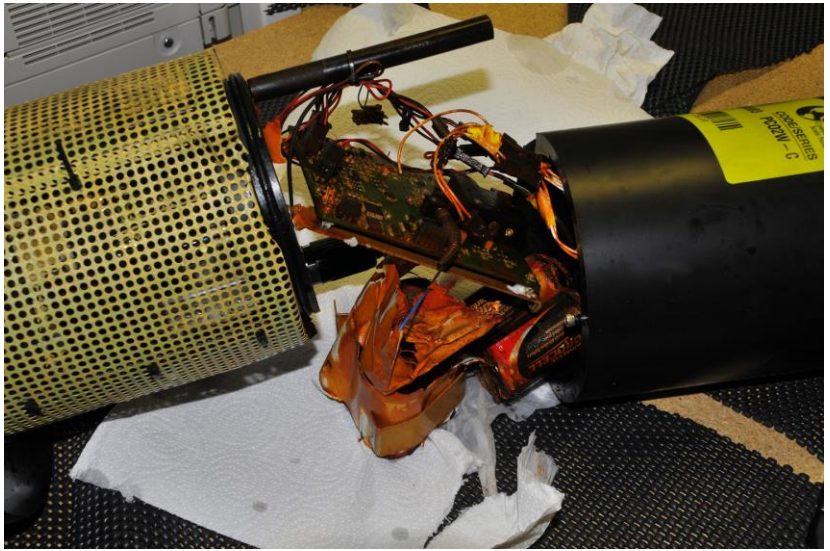
EXTERNAL ISSUES

- Physical Damage – 5%
  - Instruments mounted on the rise of Global Surface Moorings
- Lost – 3%
  - Instruments mounted on the rise of Global Surface Moorings
- Vendor refurb timing – 3%
  - Not returned in time to be deployed
- OOI Schedule – 5%
  - Not enough time between cruises for refurbishment

PHSEN Instrument Issues

GS01SUMO-00004

GI01SUMO-00002



PHSEN Tech Refresh – Path Forward

COMPLETED TASKS

- Prioritized instrumentation for tech refresh
- Updated Common Instrument Specification (1336-00000)
- Drafted Instrument Tech Refresh Process Document

- Quality assessment of PHSEN data
- Identified potential pH instrument vendors
- Drafted RFI document

NEXT STEPS

- Evaluate PHSEN requirements w/ SME input
- Issue RFI
- Assess RFI responses
- Conduct an Analysis of Alternatives, if necessary
- Issue RFQ
- Generate recommendation plan
- Generate ECR for implementation of procurement
- Procure & Test