FISH 503 Advanced Limnology (University of Idaho, Moscow Idaho Campus)

Oxygen Module probe / meter lab

Purpose: Experience the commonly available industry 'standards' currently in use for field deployment of dissolved oxygen measurements; undertake the assembly, set-up, calibration, and running of various commercial oxygen sensors to evaluate overall unit performance; perform oxygen measurements and compare to standards.

Outcomes: Appreciate complexity of current technology used in measurement of dissolved oxygen measurements; understand function of LDO and membrane sensors; be able to install, set-up, calibrate and operate membrane and LDO sensors; interpret data; discuss strengths and weaknesses of various units.

Overall Description: Congratulations - as part of your new employment and the start of a new project, your employer has and provided you with a new oxygen measuring system. You need to get it setup, calibrated and running so you can collect meaningful and 'trusty' data. Is your meter the right one? Can you work with it? You will determine this in this lab by setting up, calibrating, and comparing a variety of commercial oxygen sensors.

**** Note: Much of the equipment used in the lab today is generously loaned by manufacturers (Hach and YSI) - it is to be treated with care so that it can be returned in the condition in which it was received)****

You tasks:

1) Prepare an equipment overview and demo an oxygen calibration on 'your' assigned piece of equipment for class/lab on Friday morning during the lab component between 10:00-12:00 when we take the meters through the paces.

Specifically, each of you will be expected provide a general overview of the equipment assigned to you (components - how they go together, what's needs to make it run, options (if exist), set up, software installation, ease of use - collecting data on unit - versus in book - versus on computer - what you like dislike about it - frustrations).

As part of this you are expected to provide a step by step guide of how to calibrate the oxygen sensor of the unit. This will be a hands on / handout part of your demo. You can do this one of several ways - provide a handout to the class (if its' reasonably short - written and figures (photos, schematics) -we don't want to kill too many trees), or you only print one for your demo that you let everyone see and submit a file to me which I put on the web page. (You may need to do some leg work here in terms of taking apart the company PDF manual, creating your own files, scanning etc.). Plan ahead.

Once all the equipment has been introduced, you will then perform an actual calibration of the unit during the lab. You will do your own equipment first, then demonstrate to the class. Once all of the units are calibrated, we will then compile 'test' readings from all calibrated units. Ideally they will all be the same - these will be scored against Winkler titrations you undertake of the same water from the same bucket in which the probes are located (yes, I'm going to assign some grades here - see attached).

Be prepared to show up with your laptop with software loaded and 'your' unit running through it - if that option exists. This will allow you to experience installation of drivers, making the things talk to each other, and generally experience the setup as you would if you

bought a new piece of equipment.

Equipment assignment

Cindy - UI Limnology lab EUREKA Manta LDO oxygen probe and amphibian
Ben - YIS demo unit - MPS650 and 6920 V2 sonde LDO oxygen probe
Dan - Hydrolab demo unit - Surveyor 4 and MS-5 data sonde with associated software LDO oxygen probe
Tim - UI Limnology lab YSI MPS 556 and oxygen sensor including standard Clarke-style membrane oxygen sensor.

1) Give general overview
2) Everyone calibrates their unit
3) Give calibration overview to others (we may combine 1 &3)
4) Use probe to record multiple readings or however many you feel you need to obtain an accurate measurement of the quantity of dissolved oxygen in the 'common' bucket.
5) Record your measurements - however you are doing this with your probe - paper, computer, or hand held unit. Bottom line - you need to be able to get your numbers on the class spreadsheet.
6) Everyone performs 1-3 Winkler titrations on the 'common' bucket to determine the actual amount of dissolved oxygen in the water.
7) Record Winkler titrations on class data spreadsheet.
8) Calculate your 'error' if any exists - from
    i) your 'individual' Winkler determinations;
    ii) the 'class' mean Winkler determinations;
    iii) other meter / sensors.

9) Prepare a very short (max 3 pages single spaced - not including any figures) summary of your results and interpretation from the day II lab. I'm not looking for volume or this to be onerous for you - but to be a summary of what you accomplished and found as well as some thoughts on why you got what you got. Include a very brief objective section, results section in which you summarize data as figures and/or tables with appropriate summary/descriptive statistics, and a discussion/ interpretative section.

Grading Criteria: (includes evaluation by other workshop members at 7:3 Instructor:class ratio)

Overview presentation of assigned meter

5 (A) - provides good overview of all components in a logical manner so audience can understand required components to make the unit work; good grasp on available options and presents these clearly; confidently understands necessary procedures to calibrate unit; has prepared a clear and organized sequence and handout material for calibration procedures of oxygen sensor; able to make unit function; install necessary software and drivers; can answer all audience questions confidently.

4 (B/C) - provides overview of all components, but jumps from place to place; understands most available options, but may be uncertain on some; understands basics of calibration procedures, but may be unclear on some steps; prepared steps available but not necessarily clear to all; able to make unit function, may have some communication problems to computer; unable to answer all questions confidently.

3(D/F) - no preparation, can not discuss meter features, unclear of operation.

Sensor Calibration

5 (A) - able to calibrate meter to obtain readings within ±0.5 mg/L DO of 'class' average Winkler titrations.

4 (B) - able to calibrate meter to obtain readings within ±1.0 mg/L DO of 'class' average Winkler titrations.

3 (C) - able to calibrate meter to obtain readings within ±1.5 mg/L DO of 'class' average Winkler titrations.

Write-up

5 (A) - succinctly and correctly states objective(s); all results clearly summarized in correctly captioned tables and/or figures with appropriate summary statistics; clear and succinct interpretation that returns to examine objectives, discusses variation in measurements/data, and examines all possible sources of error.

4 (B) - correctly states objective(s); results summarized in tables and/or figures with appropriate summary statistics; interpretation returns to objectives, discusses data, and examines possible sources of error.

3 (C) - some objective(s); results not clearly summarized in tables and/or figures and/or without with appropriate summary statistics; interpretation diffuse and without focus; little examination of variation in measurements/data; or no discussion of possible sources of error.