Advancements in Field Testing Equipment
What will we be covering?

• Why do we field sample?
• What do we use to field sample?
Why Do We Sample?
• Regulations or Permits
  – Am I in compliance?

• Process control
  – Is my plant operating correctly?
  – Is it time for preventative maintenance?

• Problems and Troubleshooting
  – What is wrong with my system?
  – How can I fix it?
Drinking Water Treatment Flow Diagram
Applications in the System
Environmental Testing

- Real Time data
- On site recording
- Have the right equipment
What’s Available?

What Parameters can I test for?
Early Field Testing

- What are some of the oldest ways to field test?
Color Discs and Test Strips

• Features
  – Easy to use
  – Low cost
  – Portable
  – Color wheels have increased accuracy over test strips
The Simplest Method

Water Quality Test Strips
Water Quality Test Strips

Easy to use
Disposable
Inexpensive
Quick answers
Water Quality Test Strips

- Simplified Testing and get results in less than one minute
- Eliminate chemical handling and clean-up
- Reduces analytical guess work by using test strips as a pre-test validation tool
- Test strip bottle labels contain the color key for easy readings in the lab or the field.
Water Quality Test Strips

Color Key located on the bottle
Water Quality Test Strips

What parameters are available?

- Total Alkalinity: 0-240 ppm
- Arsenic, Low Range: 0-500 ppb
- Arsenic, Dual Range: 0-500 ppb, 0 - 4000 ppb
- Calcium/Hardness: 0-425 ppm
- Chloride: 30-600 mg/L or 300-6000 mg/L
- Chlorine: 0-10 ppm
- Free Chlorine: 0-600 ppm
- Copper: 0-3 ppm
Water Quality Test Strips

More Parameters

Iron 0-5 ppm
Nitrate and Nitrite 0-50mg/L and 0-3 mg/L
Nitrogen, Ammonia 0-6 mg/L
pH 0-14 pH
Phosphorus, Orthophosphate 0-50mg/L
Water Quality Test Strips

5-in-1 Water Quality Test Strips

- Free Chlorine: 0-10 mg/L
- Total Chlorine: 0-10 mg/L
- Total Hardness: 0-25 gpg
- Total Alkalinity: 0-425 mg/L
- pH: 6.2-8.4 pH
Water Quality Test Strips

Lets do some testing!
Pocket Testers

- Have been on the market for years
- pH has typically been the only parameter
- New technology provides “New” parameters
Pocket Pro Tester

Applications

• Water
• Wastewater
• Boilers & Cooling Towers
• Environmental
• Education
• Beer/Wine
• Agriculture
• Aquariums
Pocket Pro Tester

What Parameters can we test?

- **pH**: 0.0 to 14.0 pH
- **ORP**: -999 to +999 mV
- **TDS LR**: 0 to 1999 ppm
- **TDS HR**: 0 to 10.00 ppt
- **Conductivity LR**: 0 to 1990
- **Conductivity HR**: 0.0 to 19.99 mS/cm
- **Salt**: 0 to 10.00 ppt
- **Temperature**: -15 to 170 C
Color Disc Test Kits

- Sold as the most accurate visual test kit method
- Provides fast, accurate comparisons
- Very popular test kit
- Easy to use
Color Disc Test Kits

*How do you use it?*

- Grab a sample
- Get the correct measurement
- Add the reagent
- Visually calculate the residual
Color Disc Test Kits

Details for measuring Chlorine

• Use sunlight or a fluorescent light source when matching colors with the color comparator.
• Rinse tubes, insert, and bottle before testing. Reagent carryover from total testing can interfere with a free testing.
• Failure to clean the tubes regularly can create a film on the viewing tubes.
• Clean with deionized water, soft cloth or brush and mild detergent. Rinse with deionized water.
Details for measuring chlorine

- Accuracy is not affected by undissolved powder
- High levels of monochloramines will interfere with free chlorine test results
- High Range chlorine tests (range of 10-20 mg/L) are done in situations where superchlorination has been practiced. An example would be a filter startup/shut down. Also when charging a drained water line.
Color Disc Test Kits

Procedure for Measuring Mid range chlorine

Fill a tube to the bottom line with sample
Color Disc Test Kits

Insert the tube in the left opening of the comparator
Color Disc Test Kit

Fill the bottle to the 25 mL mark with sample
Color Disc Test Kits

Add one DPD Chlorine (free or total) powder pillow. Swirl to mix
Color Disc Test Kits

Fill another tube to the bottom line with the prepared sample.

Insert the second tube in the right opening of the color comparator.
Color Disc Test Kits

Hold the comparator so that the light source is directly behind the tubes. Turn the color disc to find the color match.
Color Disc Test Kits

What do we really do?

• Grab as much sample as we can
• Pour in any chlorine DPD powder pillow we can find regardless if it’s expired or not
• Look for any sign or color
• Put the instrument back in it’s storage place (somewhere behind the seat of the truck)
Color Disc Test Kits

Let’s do some tests and compare our answers
Field Testing Today
Colorimeter
Colorimeter

Simple as Ever

- Just four buttons on the Pocket Colorimeter II allow easy operation

Read/Enter

- This key is used when measuring sample concentrations or to confirm menu choices
Colorimeter

Menu

• The Menu key provides quick menu navigation and selection
Colorimeter

Zero/Scroll

• Use this key to zero the instrument or to scroll through the menu options.
Colorimeter

Power/Backlight

• This key turn the instrument on and toggles the display backlight for low light conditions.
Colorimeter

Large Display and Data Logging

• The instrument logs the ten most recent data points and the time the measurements were made – no need to record results manually.
Colorimeter

Accurate, Reproducible Measurements

• The instrument offers accuracy and reproducibility comparable to expensive lab instruments.
• Designed for a long working life in harsh conditions.
• A long-lasting LED is used as the light source.
• Low power requirements assure long battery life
Colorimeter

Pre-Programmed

• The instruments are factory programmed for one or two of the more than 30 parameters.

• Many are based on EPA approved methods
Colorimeter II

Pre-Programmed

• Simply zero the instrument with a blank, insert the reacted sample, and read the result.
Colorimeter

Parameters Available

- Aluminum
- Ammonia
- Ammonia, Free and Monochloramine
- Bromine
- Chlorine, Free and Total
Colorimeter

- Chlorine, Free, Total
- Chlorine Dioxide
- Chromium, Hexavalent
- Copper
- Fluoride
- Iron
- Lead
Colorimeter

- Manganese, High Range and Low Range
- Monochloramine and Free Ammonia
- Nickel and Cobalt
- Nitrate
- Oxygen, Disolved
- Ozone
Colorimeter

• Silica
• Sulfate
• Zinc
Colorimeter

EPA Approved for Drinking Water

- Chlorine
- Chlorine Dioxide
- Fluoride
- Phosphate
Colorimeter

EPA Approved for Waste Water

- Chlorine
- Chromium, Hexavalent
- Copper
- Fluoride
- Iron
- Manganese, High Range
- Phosphate
- Sulfate
- Zinc
Multi Colorimeter
Multi Colorimeter

Old models vs New models
What are the differences?

• Durability
• Operator friendly
• Bigger display
Multi Colorimeter

• The colorimeter is waterproof, dustproof, and field durable.

• With an intuitive user interface, easy data transfer abilities, and the ability to test up to 90 of the most commonly tested water methods.
Multi Colorimeter

Your Favorites at Your Fingertips

• Save time by storing your most standard methods for quick access.
Multi Colorimeter

Simple Data Communication

- Stores data for up to 500 tests, and comes with a USB port for easy downloading or transferring information.
Spectrophotometers
Spectrophotometers

- Generate light energy
- Select a specific wavelength of light
- Pass the light beam through a sample
- Measure the change in intensity of the light
- Convert change in light intensity to a displayed concentration
Basic Spectrophotometer

Lamp \rightarrow Monochromator or Filter \rightarrow Lens \rightarrow Sample \rightarrow Detector
Field Spectrophotometer
• The field spectrophotometer combines the ruggedness and portability of a field instrument with over 220 of the most commonly tested water methods
Field Spectrophotometer

Make Testing Easier

• Simple, easy-to-use interface plus the widest range of vial sized makes testing flexible
4 different sample cell adapters to accommodate your testing preference.
Take Into Field Environments

• Rugged construction keeps the elements out, which means you can test in the most demanding conditions.
Specifications

• Operating Mode – Transmittance (%), Absorbance and Concentration
• Source Lamp – Xenon Flash
• Data Logger – 500 measured values
• Preprogrammed Methods – 220
What Else Is There?
Portable Meter
Portable Meter

- Tests parameters with standard or rugged options.
- Uses interchangeable probes
- Automatic parameter recognition.
Portable Meter

Can I leave it in the lab if I want to?
Portable Meter

- Ideal for facilities with multiple users testing needs
- All meters connect with probes that automatically recognize the testing parameter
- The durable portable meter and optional Rugged probes are designed to withstand years of use in the field.
Portable Meter

Rugged Probe Options

• ORP
• Conductivity
• Dissolved Oxygen
• pH
portable meter

- All connections between the probe and the meter are secure and waterproof.
portable meter

Specifications

• 4 AA batteries
• Can do simultaneous readings from two probes
• 500 result – Data memory
• Data Export – Download via USB connection to PC or flash memory device.
• Water Resistance – 1 meter submersion for 30 minutes
Portable Meter

Testing Parameters

Dissolved Oxygen (2)  pH (14)
BOD                  ORP (3)
Conductivity (2)     Ammonia
Chloride             Fluoride
Nitrate              Sodium
Ammonium
Measuring Turbidity

• From the word Turbid: deficient in clarity or purity. *foul, muddy, cloudy*

• In Relation To Water
  • Turbidity: The cloudiness of water, due to the presence of suspended particles.
Measuring Turbidity

- Turbidimeter: a.k.a. Nephelometer, an instrument for measuring the extent or degree of cloudiness.
Measuring Turbidity in the Field
Portable Turbidimeter

- Easy Calibration and Verification
- Simple Data Transfer
- Convenient Data Logging
- Optical System for Precision in the Field

| HACH | Be Right™ |
Portable Turbidimeter

Simple Data Transfer

- Data transfer with the optional USB + Power Module is simple, flexible, and doesn’t require additional software.
- All data can be transferred to the module and easily downloaded to your computer with a USB connection, providing superior data integrity and availability.
Portable Turbidimeter

Convenient Data Logging

- Up to **500** measurements are automatically stored in the instrument for easy access and backup.
- Stored information includes: date and time, operator ID, reading mode, sample ID, sample number, units, calibration time, calibration status, error message and the result.
Portable Turbidimeter

Specifications

- **Measurement Method**  Ratio turbidimetric determination using a primary nephelometric light scatter signal (90 degree) to the transmitted light scatter signal
- **Light Source**  Tungsten Filament Lamp
- **Range**  0 to 1000 NTU
- **Accuracy**  +/- 2 % of reading
- **Power Requirements**  4 AA alkaline batteries
Field Test Kits

Test Kits for Specific Parameters
Field Test Kits

Hydraulic Fracturing Water Analysis Laboratory
Hydraulic Fracturing Water Analysis Laboratory

- Designed to deliver simple, fast, on-site analysis in oil and gas applications, including:
  - Source Water
  - Frac Fluid
  - Produced Water
  - Flowback Water
  - Water Treatment
  - Drilling Fluids
  - Enhanced Oil Recovery
Hydraulic Fracturing Water Analysis Laboratory

What Parameters are Measured

- Alkalinity
- Bacteria
- Barium
- Chloride
- Conductivity
- Hardness
- Iron
Field Test Kits

What Other Applications are Available?

- Drinking Water Lab
- Soil and Irrigation Water
- Nitrification Control
- Surface Water
- Waste Water Treatment Plant Lab
- Storm Water
- Boiler and Cooling Test
- Individual Parameters
Portable Sampler

- The Portable Sampler sets up easily and quickly in the field.
- Reduced maintenance and reliable results are assured.
Portable Sampler

Easy to Use

• The simplified keypad with intuitive icons and scrolling menu on the sampler assures easy setup.
• Program set up – even for first time users – is typically less than two minutes.
• Large keys accommodate gloved hands
Portable Sampler

Wide Variety of Applications

• The sampler is ideal for:
  • NPDES stormwater compliance
  • Stormwater runoff monitoring
  • Pretreatment compliance
  • Industrial water discharge
  • WWTP process control
  • Environmental testing
Portable Sampler

Programming Options

• Time based
• Flow based
• Composite sampling
• Multiple bottle sampling
Portable Sampler

Durable, heavy-Duty Construction

- Tolerates harsh environments
- The controller is tightly sealed to withstand humidity and hostile, corrosive environments.
- The housing isolates all electromechanical components.
- The keypad, switches, and display are covered by a waterproof, corrosion-resistant polyester membrane.
- The molded ABS/PC exterior of the sampler enclosure safely protects the controller.
Portable Sampler

Bottle Kits

- (1) 10 L (2.5 gal) glass bottle
- (1) 10 L (2.5 gal) poly bottle
- (1) 15 L (4.0 gal) poly bottle
- (24) 350 mL poly bottles
- (24) 1 L poly bottles
Portable Sampler

Strainers

- Teflon/Stainless Steel * standard
- High Velocity, Shallow Depth
- .406 in. Dia. 316 SS
- 1 in Dia., 316 SS
- Teflon/Stainless Steel – 11 in.
Field Testing in the Future

- Quick
- Easy
- Multi-Parameter
Portable Analyzer
Portable Analyzer

3 Steps to Faster, Highly Accurate Water Testing.

1. INSERT CHEMKEY REAGENTS
2. DIP INTO WATER SAMPLE
3. READ YOUR RESULTS

No zeroing, no mixing, no shaking, no chemicals or vials to handle.
Portable Analyzer

Chemkey Technology

• Chemkey reagents contain the same chemicals and execute the same process steps that you have trusted for decades.
• Delivered in a simple, self-contained package
• EPA Approved for reporting of Free and Total chlorine.
Portable Analyzer

Faster Testing

• Perform up to four colorimetric and two probe-based measurements in parallel.
• Complete the entire test suite in 25% of the time.
• Complete more tests on site, get the results you need faster, and visit more sites in each shift.
Portable Analyzer

Less Hassle

• A single instrument combines colorimetric and probe testing in a field kit that requires fewer bulky accessories.
• There are no powder pillows or glass vials to handle.
• All chemicals and processes are entirely contained inside the Chemkey.
Portable Analyzer

Chemkey Technology
Portable Analyzer

Specifications

• 200 Chemkey tests per full battery charge

PARAMETERS

• Free chlorine Chemkey
• Total chlorine Chemkey
• Monochloramine Chemkey
• Free Ammonia Chemkey
• Nitrite Chemkey
• Total Ammonia Chemkey
• Copper Chemkey
Portable Analyzer

Probe Options

- pH
- Conductivity
- Dissolved Oxygen
Field Testing Equipment

Any Question?