



Soil Moisture Sensor Pilot Project *2010-2011*

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May 9, 2014



Project Overview

- Investigate ability of soil moisture sensor irrigation technology to efficiently water turf areas in medium to large-sized commercial properties.
- Provide information to customers who might consider using technology for irrigation.

Project Consultant

- Competitive bid given to Teufel Nursery, Dr. Steve Carlin, PhD, CLIA, CID, CLWM, project manager.

Project Participants

- Medium/large commercial properties, some with history of high peak season use.
 - One small property participated.
- Signed a Customer Agreement.
 - Willing to make upgrades to reach minimum of 50% efficiency after an audit. Four sites over 50%; three needed to make improvements.

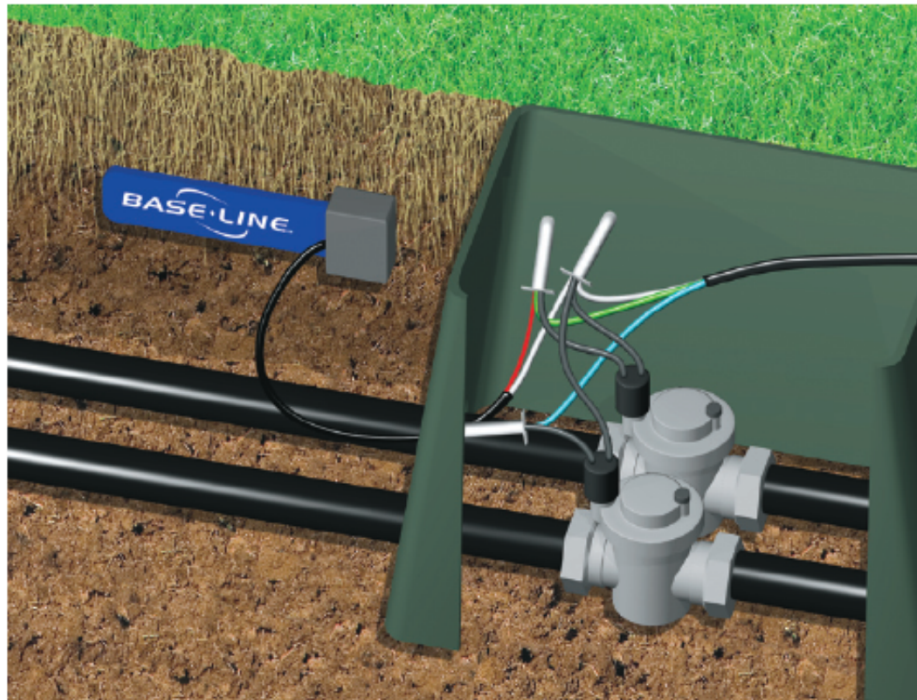
About the technology

- Baseline 3200 controller and bi-sensors (soil moisture sensors) used for six sites.
- Baseline WaterTec S100 used for one site – an add-on to existing controller, using bi-sensors.
- Ability to do real-time monitoring and moisture level changes via internet.

About the technology

- Bi-sensors buried in soil towards the end of the root zone in a representative area of turf.
- Hard-wired, using existing field wire if already installed, to controller.
- Moisture level set for level of depletion (Lower Moisture Threshold)

Bi-Sensor Wiring

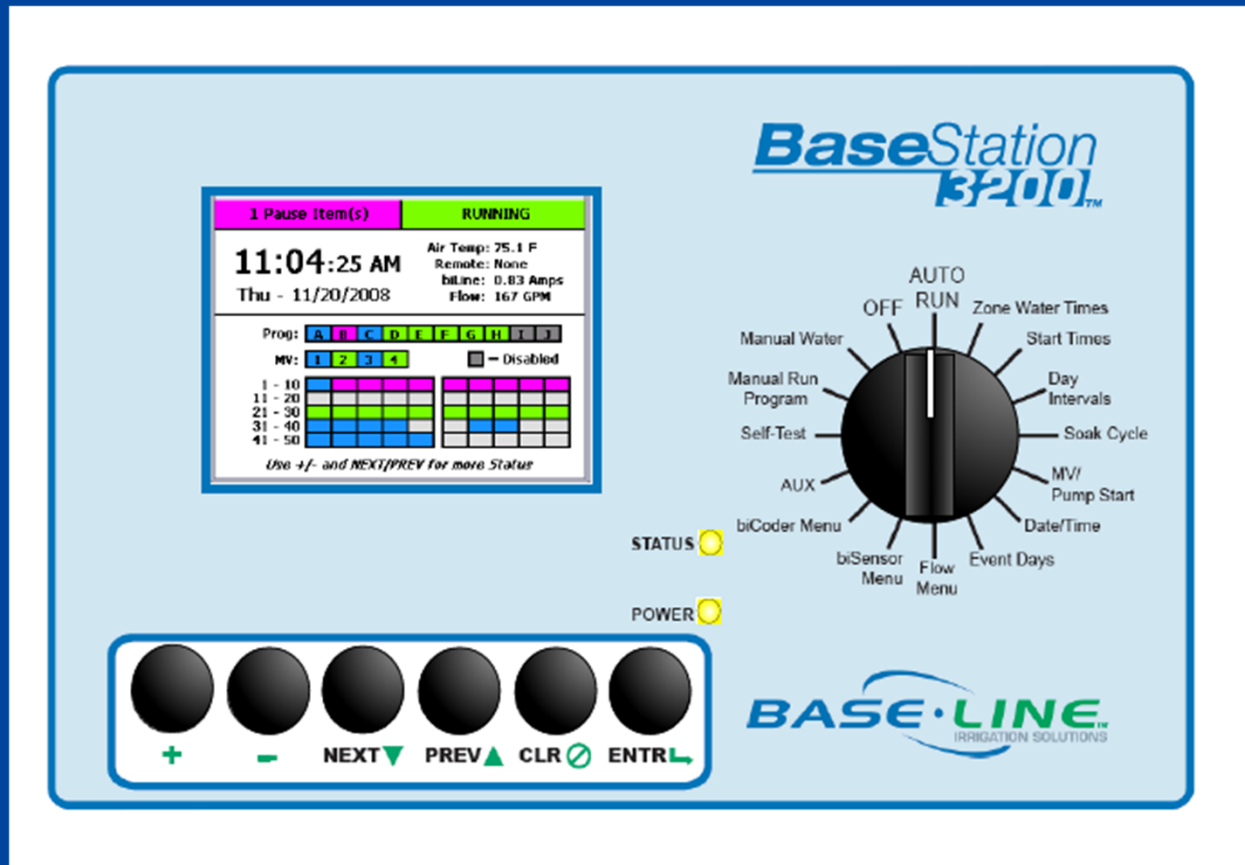


Connect via two-wire or over valve wires

About the technology

- Irrigation schedule programmed into controller, e.g., every day, 10 minutes, etc.
- When soil moisture detected to be below Lower Moisture Threshold, controller enabled to irrigate.
- If above, no irrigation allowed.

Baseline 3200 Controller



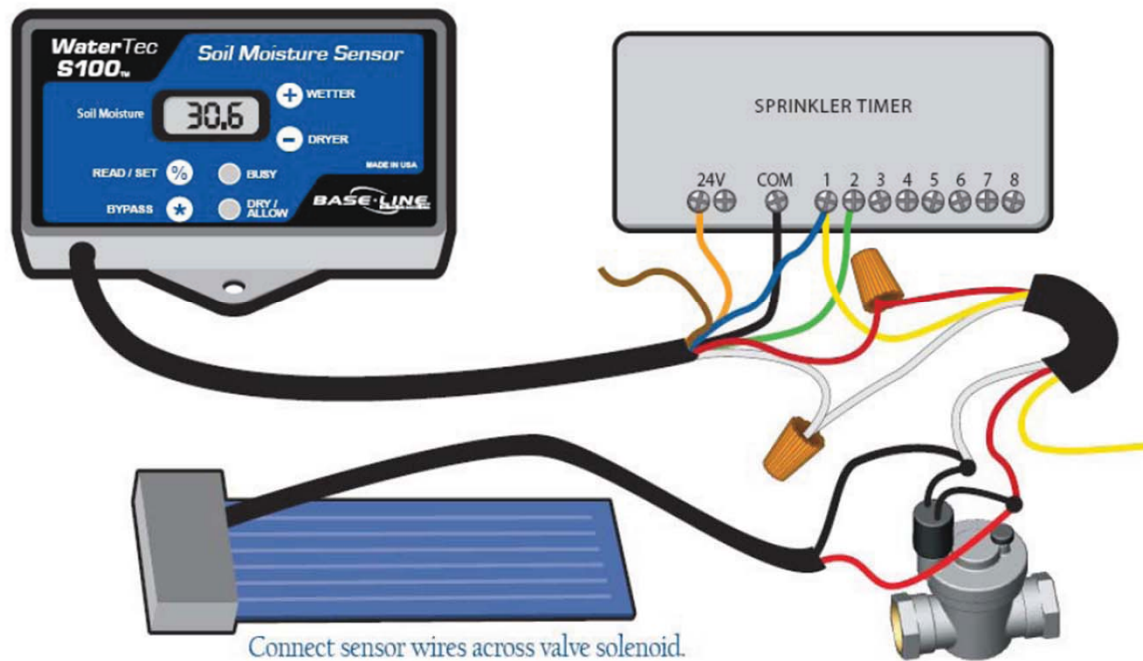
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About the technology

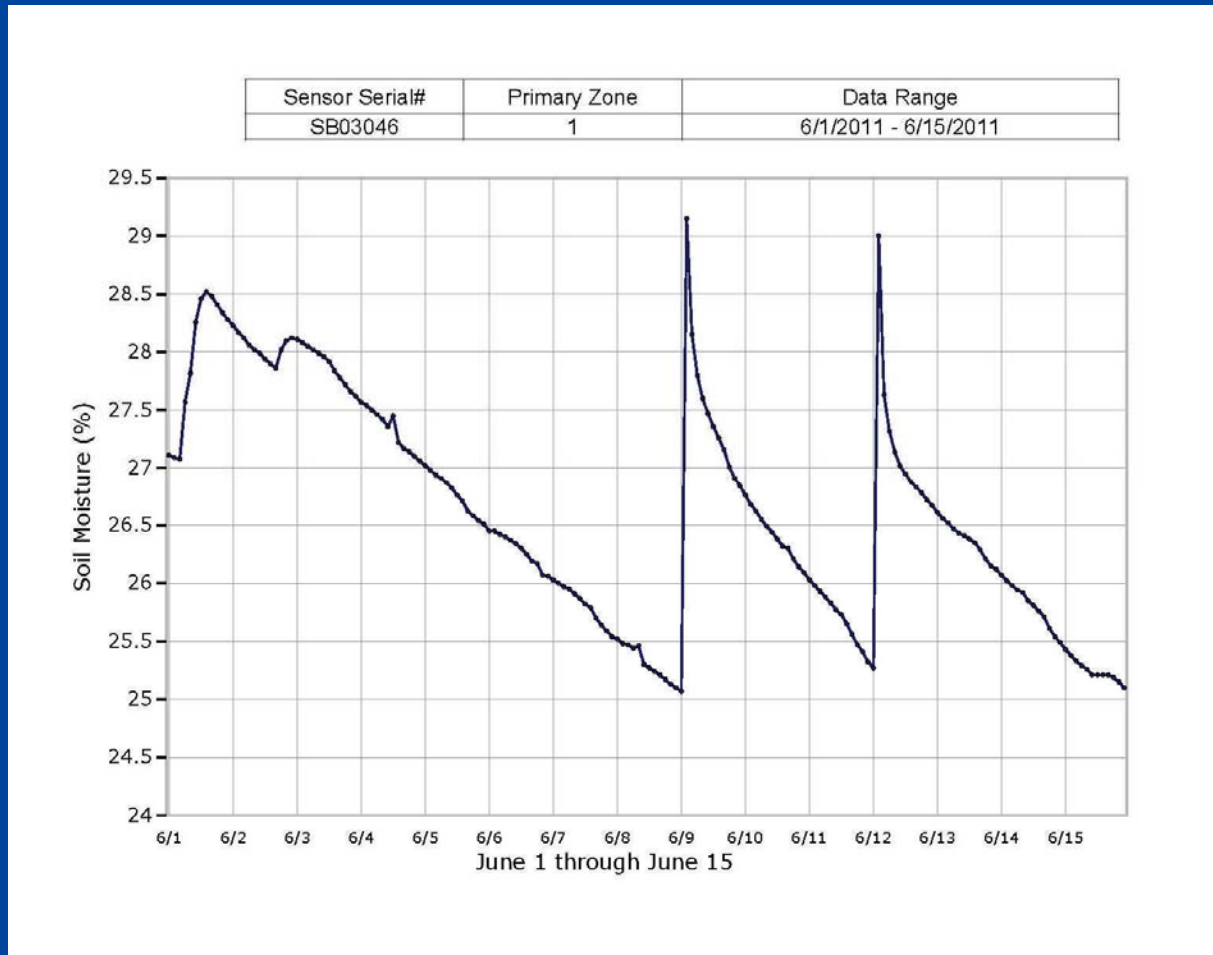
- WaterTec S100 add-on works similarly.
- Bi-sensor lets S100 know to tell controller to water or not.
- More for smaller, residential use.

WaterTec S100 Set-up

Water Tec S100 Typical Layout:



Visual from Ability to View Remotely



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Evaluation Methodology

- Consumption histories, before and after, for each participant.
- Consultant developed 10-year average weather data and applied to test years.
- Payback periods calculated with cost of equipment, current rates and 5% increase in rates (based on history) and a discount rate of 3%.

Results

- Average savings for all seven sites was 315,119 gallons, or 17.2%.
 - Savings from 2.3% to 82.3%
 - One participant – increase in use.
- Average payback for all sites = 4.21 years.

Port of Portland



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Results

- Error - originally tracked consumption of wrong meter and didn't find out until after project completed.
- Port decided to water large ivy bed that hadn't been watered before.
- No savings based on 2005-2009 use of 216,322 gallons per season.
 - 2010 = 322,510 gallons (+49%)
 - 2011 = 290,405 gallons (+34%)

Essex Park



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Results

- Parks decided to water the berm that hadn't been watered in the past – an additional 29% more turf area.
- 2005-09 average = 695,320 gallons
 - 2010 = 1,050,833 (+51%)
 - 2011 = 679,196 (-2.3%)
- Using small savings in second year, average payback 23.67 years.

Results

- Essex Park
 - Accounting for 29% more turf area, average savings for 2 years = 31,969 gallons
 - Payback period = 13.29 years for equipment only; 22.4 years for ethernet, cell modem, etc.

PacWest Center

- Only participated one year – 2011
- Had some different plantings
 - Roof-top Garden – 25th floor and 3rd floor
 - Street-level Planters



Results

- 2005-09 use = 1,995,250 gallons
- 2011 use = 1,653,341 gallons
(-17.1%)
- Payback based on one year = 2 years
 - Some savings also due to system improvements.

OMSI



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Oregon Museum of Science and Industry (OMSI)

- Leak in one of the areas discovered first year; fixed second year.
- Mainline break in second year; contractor turned off water and kept it off for almost a month – soil moisture sensors showed dangerously low moisture levels – 9.5%

Results

- 2005-09 use = 2,096,712 gallons
 - 2010 use = 2,145,413 gallons (+2.3%)
 - 2011 use = 1,303,833 gallons (-37.8%)
- Payback, assuming only 2/3 of savings since system shut down for 1 month – a little over 6 years.

Rose Quarter

Mostly sandy loam soil – moisture levels set higher here than at other sites.



Results

- 2005-09 use = 1,327,251 gallons
 - 2010 use = 899,044 gallons (-32.3%)
 - 2011 use = 938,548 gallons (-29.3%)
- Payback based on one year = 1.81 years.

Metro Center

- Two zones – eco-turf and shrubs; planters in a courtyard.



Results

- 2005-09 use = 257,269 gallons
 - 2010 use = 143,224 gallons (-44.3%)
 - 2011 use = 196,334 gallons (-23.7%)
- Payback based on one year = 12.23 years
 - Some savings based on system improvements.

McDonalds

- Very bad distribution uniformity – 43%.
 - Improvements –pressure regulator and multi-stream rotors – DU up to 65%



McDonalds

- Improvements cost \$1796.60



Results

- 2005-09 use = 402,492 gallons
 - 2010 use = 136,819 gallons (-66.3%)
 - 2011 use = 71,405 gallons (-82.3%)
- Payback based on one year = .09 year
 - Some savings based on system improvements.
 - Including cost of repairs = 1.56 years

What went well...

- Site managers open to learn about new technology.
- Web-based management made it easy to review moisture levels and change thresholds and schedules remotely.
- No need for third-party data provider.

Challenges...

- Identifying correct meter to monitor for consumption, e.g., Port.
- Difficulty in placing sensors in some places where they'd be most effective.
- Undetected leaks and other unexplained uses made it difficult to accurately calculate savings.
- Some sites decided to water more areas making it difficult to determine savings.
- Study timeframe during 2 of the wettest summers in years.

Overall benefits of soil moisture sensors

- Automatic change in irrigation frequency in response to weather changes/rainfall.
- Measure soil moisture at the roots where water is most needed.
- Improve plant appearance by keeping moisture levels within optimum ranges for plant health.

Customer Comments

- Two years after the completion of the pilot project, customers were asked to respond to questions about their satisfaction and continued use of the soil moisture sensor technology.

Customer Comments

- Four of the seven customers responded.

Customer Comments

- Metro
 - Satisfied?
 - “.installation and performance of the units seems to be top quality. Great products.”
 - Still using?
 - Yes, but not with remote control. Seems like program should have had training on how to manage controllers.
 - Made other upgrades?
 - No.

Customer Comments

- OMSI
 - Satisfied?
 - “Received very extensive and helpful support during installation.” Project coordinators worked closely with contractor to ensure system was “sufficiently operational and everything fully integrated.”
 - Still Using?
 - Yes, but difficult to determine effectiveness as have experienced some difficulty in at least one area but may be general system malfunction.
 - Made other upgrade?
 - No, just ongoing repairs.

Customer Comments

- Portland Parks
 - Satisfied?
 - Yes, but software is lacking.
 - Definitely do like ability to monitor soil moisture conditions remotely during irrigation season.
 - Still Using?
 - Yes.
 - Willing to continue since software enhancements are forthcoming.
 - Made other upgrade?
 - No.

Customer Comments

- Portland Parks – more on software
 - If field controller in “off”, completely unable to contact. If want to view/edit schedules, can't.
 - Speed of communication is slow.
 - Would not work with series of parks.
 - Data resident in controller, not on server.
 - Seems like software is an addition to a stand-alone controller platform vs. developed as integral component, e.g., Maxicom.

Customer Comments

- Port of Portland
 - Satisfied?
 - Sensor worked well but controller not user friendly.
 - Still Using?
 - No, controller malfunction.
 - Made other upgrade?
 - Replaced with Rainbird LX Modular controller with ET Manager.
 - Using WeatherTrak smart controllers at other sites, programmed and activated via computer or smart phone.

QUESTIONS?

Thank you!

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