UgMO as a Sole Source Solution

UgMO, manufactured by Green Badge Technologies, is unique and differentiated in the market.

UgMO is the only wireless, belowground, microclimate sensor that measures soil moisture, temperature and salinity, on a zone-by-zone basis. Protecting UgMO's unique place in the market, are its 24 approved patents and several additional patents pending.

Green Badge Technologies maintains cradle to grave control of every aspect of the solution experience through controlling the product's research and development, design, manufacturing, software, management, labor, installation, sales, maintenance, warranty and customer service.

Further, Green Badge Technologies is a US based company, with its headquarters and manufacturing located in Pennsylvania.

The wireless sensors measure soil moisture, temperature and salinity levels at the root level of the plant in real-time, up to six times an hour, 24 hours a day. This wireless sensor data is transmitted to the UgMO Irrigation Controller, which utilizes its patented, watering algorithms to deliver only the correct amount of water the landscaping needs, zone-by-zone.

The UG1000 system breaks the traditional watering schedule paradigm. There are no cycle times to set and no complex site variables to enter. Just tell the system when it is allowed to water and using the sensor data, UgMO does the rest. The controller is also fully software upgradeable to incorporate future features. The UG1000 can be combined with the advanced UgMO Knows web-based software platform for sophisticated agronomic analytics, environmental monitoring, leak detection and remote configuration and control.

Overview of the UgMO Wireless Soil Moisture Systems

UgMO™ Technologies has developed an innovative wireless belowground soil moisture sensing and communication system that can both monitor and control residential and commercial irrigation systems. The underlying network architecture, called SenLink™, consists of low cost, small (approximately 10cm x 3cm x 4cm) battery powered sensors with built-in radio modules. These sensors are installed completely below ground and are capable of radio communication to above ground repeaters and control units that may act on the data, or data bridges that port the data onto the Internet. The UgMO system has been optimized for improving the efficiency and performance of residential and commercial irrigation systems spanning areas from less than an acre to large facilities such as golf courses, retail outlets, schools, colleges, athletic fields, parks and large office complexes.

In a traditional irrigation system, a simple timer is used to run each irrigation zone for a fixed amount time usually set to accommodate hot, dry conditions. In general, this is a very inefficient use of water. Soil conditions tend to be much wetter than needed due to overwatering, which in turn causes disease and pests initiating a cycle of excessive fertilizer and pesticide applications, which often become pollutants due to run-off. In addition, plant health and aesthetics are compromised as a result.

With UgMO sensors buried in each irrigation zone, soil moisture conditions are monitored and water is applied, zone-by-zone, according to the needs of the plant. In order to keep soil moisture at the optimum level, the required run times for each zone can vary greatly depending on numerous factors, including the following: plant type, such as turf, shrubs or trees; soil types (sandy soil is quick draining whereas heavy clay is slow draining); exposure (south facing, shaded by trees or buildings, open to prevailing winds); and the rate of water application in a zone, which depends upon water pressure, hardware type and coverage of irrigation heads. In essence, UgMO operates like a thermostat that maintains temperature levels, but UgMO maintains optimal soil moisture levels to ensure plant health. Because the typical irrigation timer over-waters, maintaining the optimal moisture level means using 30-60% less water. Most importantly, this "thermostat" is set zone-by-zone to reflect the irrigation system, soil types, plant types, and microclimate.

A key feature of UgMO is while the system applies water, it also monitors changes in soil moisture as a result of irrigation. Thus, the UgMO data acts as a full "soil laboratory" where the controller learns autonomously and without human setting, all the required parameters for efficient irrigation management. At the same time, the system determines, zone by zone, how long each zone's irrigation system must run to effect a given change in soil moisture. This allows UgMO to operate easily in systems with very different irrigation hardware types and coverage densities. These adaptive learning processes avoid human error and estimation as to the key parameters of soil type and irrigation application rate that even trained agronomists will struggle to estimate.

The combination of these unique features produces effective "as needed" irrigation management that yields excellent water savings with little need for human monitoring or adjustment. In addition, because soil temperature is monitored, the system automatically suspends irrigation when soil temperatures fall to levels where plants go dormant. Also, by creating an Internet enabled local network, the system performance can be monitored, adjusted/configured, and updated remotely.

UgMO Wireless Sensors

The UgMO wireless sensors currently measure soil moisture, temperature and salinity once approximately every ten minutes and transmit this information at 433 MHz to an above ground receiver. With two AA lithium batteries, sensors will operate for 5 - 7 years without battery replacement or other maintenance. The sensor is fully waterproof and corrosion resistant. Its installed completely below ground in the active root zone of the plant and the wireless range of the signal is typically 600ft to the above ground receiver.

Below ground to above ground communication is a very challenging problem and UgMO has developed extensive intellectual property and expertise in making this feasible. Varying soil conditions (principally moisture content), sensor depth, and antenna design complicate below to above ground radio communication. UgMO is unique in its ability to achieve reliable and effective communication range.

UgMO Repeaters

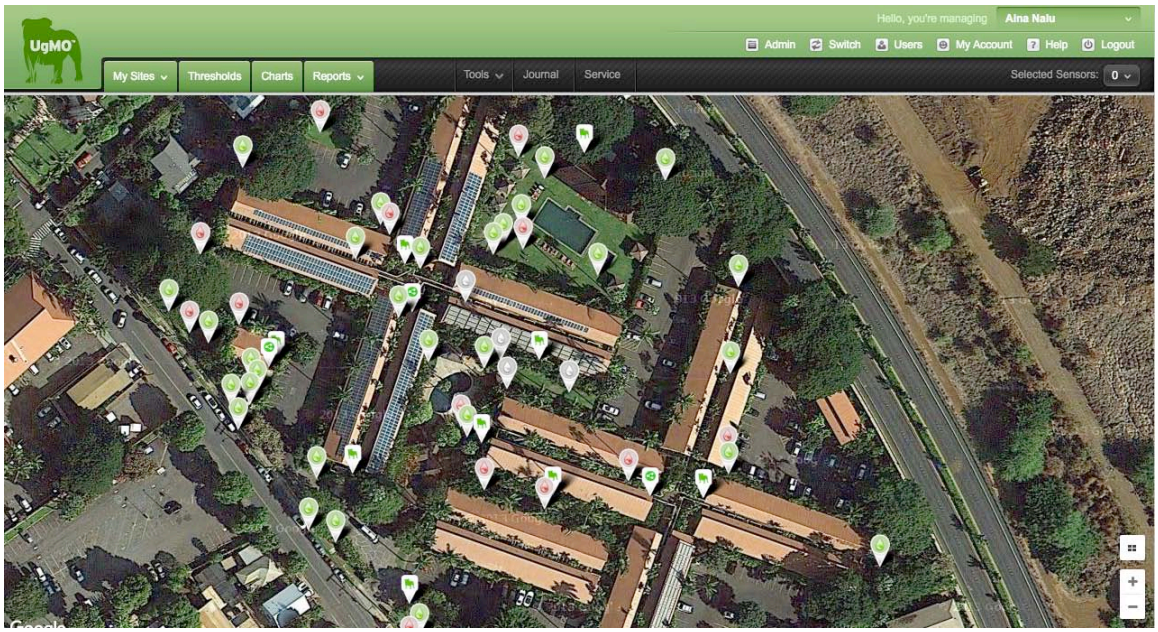
Repeaters receive sensor communication from the below ground sensors at 433 MHz and forward them over a frequency hopping link that operates in the US ISM band between 902-928 MHz. Currently the system is configured for a minimum of 2000 ft. range above ground with direct line of site at 5 ft. antenna heights with an integrated internal antenna. Other ranges are possible with different antenna and transmit power level configurations. Repeaters are powered by a 110V power source or with a solar setup. By using a number of repeaters, effective sensor transmission can be extended to several miles.

UgMO Irrigation Controller

Controllers receive sensor data, either directly from the sensor or through the repeater network, and act upon the information. Currently, incoming soil moisture and temperature data is used to efficiently apply irrigation water to meet the plant needs while avoiding wasteful water usage by directly controlling irrigation valves. The controller can implement sophisticated adaptive learning protocols and can act, if desired, autonomously. Remotely upgradeable, new features and functions can be added after installation. The data received by the sensors and all controller activity is then sent to the cloud through GSM cell modem.

UgMO Knows Web Application

UgMO Knows is a web based data visualization server accessible from any device with Internet access and a web browser. It is password protected and offers various levels of user accounts from full privileges to modify and configure the system to view only accounts. UgMO Knows allows for data charting and alarms to be generated (emails, phone messages, etc.) when sensor data exceeds user set limits. In addition, the platform supports advanced analytics and "data mining".



Dual Radio

The dual radio architecture is designed to optimize the radio link for the two distinct propagation media, namely the underground to above ground channel, and the above ground channel. The 433 MHz radio link is optimized for operating under ground with a combination of antenna form factor, sensor enclosure design, and antenna tuning and matching. The above ground link on the other hand is designed to take advantage of higher allowed transmit power levels on the civilian 902-928 MHz ISM band.

Flow Sensing and Leak Detection

With the addition of a flow sensor attached to the irrigation pipes, the UG1000 can monitor water flow isolated to the irrigation system and provide leak detection and system flow irregularities data to the Internet. When combined with actual irrigation event data, the system can send system alerts to responsible parties by e-mail or SMS text.

Weather Data

UgMO also has the capability to incorporate weather data into its smart irrigation program. When certain weather precipitation is forecasted the system can decide to suspend watering for the current watering window. This data will be used in conjunction with real time soil moisture measurements to take the all ready intelligent watering algorithm to the next level added another layer of water savings.

The UgMO system does not attempt to estimate soil moisture levels - it measures them directly and hence consistently outperforms any competitive system using weather data alone.

Conclusion

There is no other irrigation system or product on the market today, which provides the functionality, specification, water conservation or savings results to the level of UgMO. These results are proven through independent studies conducted by SWAT, SFWMD, SWFWMD, SJWRMD, not to mention our long list of clients.

UgMO's major differentiators include:

- Sub-surface, wireless Sensors – This means the product is invisible to the eye, it requires no trenching or wiring, leading to an easy non-disruptive installation. Very few companies sell wireless soil sensors, but for those that do, their products sit above ground which means they are visibly disruptive to the landscape and subject to damage, theft, and vandalism. Other companies also deploy only one or two sensors to manage an entire property. UgMO sensors are buried in each zone of irrigation, so the system does not rely on an outside, single, or shared data source to manage the needs of each individual zone.
- Easy to operate and maintain –UgMO operates based on direct measurement of the soil so it leaves nothing to chance. The system is fully automated, which means you save water and money while cutting back on labor resources.
- End-to-end solution –Our core belief is that we are not an irrigation company – we are a technology solution company. UgMO creates custom user interfaces that deliver an end-to-end solution for the customer – starting with soil moisture data, collecting and aggregating that data, delivering significant water savings, and presenting that information back to the customer in a way that is relevant, interesting, and actionable.
- No Capital Outlay – In most cases UgMO installs, warranties and maintains the system with no capital outlay. Clients enter into a ongoing service agreement or a Saving Share agreement where UgMO shares in the water savings.
- Substantially greater savings – Studies have shown that UgMO soil sensor technology delivers greater savings relative to other water conservation devices.