

## Water Efficiency Case Study: D. S. Cole Growers, Loudon



D. S. Cole Growers, a 150,000 square foot commercial greenhouse complex located in Loudon, offers annual plants wholesale to the nursery trade. Approximately one-third of all sales are fully-grown, nursery-ready plants distributed throughout New England. The bulk of Cole's production consists of young plants shipped to other growers nationwide. Most of Cole's annual plants are grown from cuttings, including several varieties developed by company president, Doug Cole.

Nearly 100 percent of all water used at D. S. Cole Growers comes from onsite drilled wells. A small pond on the property provides water for summertime irrigation of a limited amount of outdoor nursery stock, but groundwater serves the large year-round greenhouse complex. Cole reports an average water use of 40,400 gallons a month to DES's Water Use Registration Program. In light of the recent expansion of the facility, this amount is apt to increase. However, the new computerized system should make that water use much more efficient.

From the beginning, owner Doug Cole realized that the size of his original 80,000 square foot Dutch greenhouse complex dictated an automated irrigation system. He installed a computerized ebb and flow irrigation system to meet this need. Originally developed for hydroponics (a system for growing plants in water only), an ebb and flow system pumps water to plants sitting in shallow bench trays (see the photo above). A closed loop irrigation method, Cole's ebb and flow system stores water in tanks connected by piping to the greenhouse growing benches. Clear water and fertilizer is mixed in large storage tanks to create an irrigation solution. This solution is pumped from storage to the bench trays, remains there for a prescribed period of time, drains to a trough under the benches, and returns to the storage tanks (see Photo 2).



Photo 2. Drain troughs

The incoming fertilized water sprays into the trays at a faster rate than the outgoing water drains from them (see Photo 3). The computerized system regulates the volume of flow so the residence time of the irrigation solution meets the plants' needs.



Photo 3. Spray Nozzles

A significant drawback to this system is that the growers have to turn on the irrigation solution to a whole row of benches at once. Different plant types have differing water and nutrient needs, so great care must be taken to group plants of similar needs in the same row of benches, or supplemental hand watering is required.

Another problem with an ebb and flow system is that salts can precipitate out of the fertilizer solution, form a crust inside pots, and eventually harm the plants growing there. Most commercial growers flush potted plants periodically with clear water to reduce the salt build-up. This isn't possible with an ebb and flow system. The growers at D. S. Cole must routinely use meters to check the potting soil for nutrient content and adjust their fertilizer/water mixture accordingly. Both of the above drawbacks are labor-intensive.

When Mr. Cole decided to add another 70,000 square feet of greenhouse complex, he looked for a water-efficient system that addressed both of the drawbacks of the ebb and flow system. He chose a state-of-the-art Priva Integro environmental computerized system from Holland (see Photo 4). The old computerized irrigation system merely regulated the residence time of fertilized water in the growing trays. The new Priva system monitors chemical content of the irrigation water, adding fresh water or nutrients as needed; senses water pressure in the distribution system, altering pump speed to compensate for pressure drops and rises; and filters debris from the returning irrigation water.



Photo 4. Computerized pumping system with storage tanks and filter

The computerized pumping system draws fertilized water into a sensor that analyzes the concentration of nutrients in the water. Either clear water or fertilizer solution is added if necessary and the irrigation solution is analyzed again before being pumped to the benches. Just as with the old system, residence time is regulated. The water is pumped back to the irrigation solution storage tank after passing through the Reko filter shown in Photo 5. Filtered debris falls into a large receptacle located below the filter and is later transferred to the composting area. The horizontal pump shown in Photo 4 is connected to the irrigation solution recycling system. The three vertical pumps control the distribution of hand irrigation water to various sections of the greenhouse complex.



Photo 5. Filtration unit

Mr. Cole stated that, since he started with an ebb and flow system, it is impossible for him to tell what his water savings might have been if he had initially used conventional irrigation methods. His new Priva system was brought online in December 2001, and he has no figures at this time to compare savings. However, despite the very high cost of installing the new system, he anticipates significant savings in labor, electricity and fertilizer costs. Mr. Cole states, "I'm installing this system to save money. Without it I'd have to hire more growers. The environmental part is a great side benefit."