

Elizabethtown College, Elizabethtown, PA
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Institutional Water Conservation

Water Conservation Workshop
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Pennsylvania State University

THE COLLEGE

The Elizabethtown College is an independent residence college with over one hundred years of service to its students and to the community of Lancaster County, Pennsylvania. There are 1,748 full-time students currently attending the college. The college provides 40 undergraduate majors in traditional programs such as art, history, political science, and philosophy, and pre-professional fields such as accounting, business, communications, engineering, music therapy, occupational therapy, and social work. The campus covers over one hundred acres with over one million square feet of residential and instructional space.

“Educate for Service”, the motto for the Elizabethtown College, is demonstrated beyond academic subjects which includes student personal growth and service to the community. Elizabethtown College believes in using the values of its past to embrace and challenge the future.

PROJECT BACKGROUND

Drought plagued South Central Pennsylvania from 1999 until this spring as the Lancaster County region experienced severe lack of rainfall.

Isolated areas of the state saw water reserves dwindle or dry-up, and some communities were forced to purchase water. A desire to participate in the reduction of water use, the need to make the most efficient use of financial resources, and a concern for our environment prompted Elizabethtown College to embark on an action plan to use water more efficiently.

The goals of this program included saving money, preserving this valuable resource, and being good stewards of our environment. For the plan to be successful it had to provide ways for the entire campus community to participate in water conservation and developing and sharing ideas for additional areas of conservation. Initial targeted areas for reduction in water use were:

- Replacing antiquated plumbing with state of the art equipment

- Changing from top load to front-load laundry washers
- Effective lawn and athletic fields' irrigation
- Encouraging campus community water conservation by participation, education and reminders.

ACTION PLAN

Once the goals were established Elizabethtown College implemented the following water conservation plan:

- During the summer of 2001 the Elizabethtown College changed all the antiquated toilets, urinals, and associated flush valves to low-flow or 1.6 gallon/flush fixtures. Every building on campus and off-campus houses were retrofitted. This project replaced four hundred forty-four (444) toilets and seventy (70) urinals. The total cost of this "change over" was \$108,000. The new fixtures have yielded 30% savings in water usage per year or 6.6 million gallons. Projected annual savings in water and sewer costs is anticipated at approximately \$40,000, yielding a 2.7 year straight line payback.
- Monitoring the use of water on a monthly basis allowed the college to identify excessive water use on a "real time" basis so corrective action could be undertaken. Please see the handouts that are circulating. During this process we identified the toilet "flapper" as the main source of wasted water and replacement of these "flappers" with siphon valves significantly reduced wasted water.
- Another area of potential water waste is laboratories where faculty leave water running in processes 24/7. Some of these water uses may be necessary to cool sensitive pieces of laboratory equipment or processes, but working with faculty and researchers to use the minimum amount of water needed to provide proper cooling can result in significant reduction in water use.
- Another project began in the summer of 2001 to replace top-load clothes washers with front load washers. The average front load washer uses about one-half the water of conventional top load washers. Top load washers use an average of 37 gallons for a 14-pound wash load while the high-efficient front loaders use approximately 21.5 gallons for the same amount of laundry. That is a savings of 15.5 gallons per wash load. The 32 new front load washers, assuming two loads per day, will result in daily savings of almost 1,000 gallons of water. Additionally, front load washers are able to extract significantly more water from a load of wash reducing our electric consumption resulting in reduction in electrical costs. As we have a long term contract with a washer/dryer vendor we were able to make the change at no cost by negotiating with the vendor.

- The small-town atmosphere of open lawns, lush green athletic fields, flowerbeds, and shade trees of the Elizabethtown College campus add to the overall appearance and appeal for residents and visitors. Maintaining such conditions requires an important ingredient—water. The drought had stressed the lawns, trees and the athletic fields. Student sporting events, games, and special events cause damage to the turf covering making the fields unsightly and potentially dangerous to the players. Water is the great “healer” and is usually applied naturally through 38 inches of rainfall annually in Lancaster County, PA. When rainfall is in short supply, alternative sources of water must be obtained to maintain the integrity of the athletic fields.
- To celebrate the 100th year of the Elizabethtown College a special garden was constructed in the center of campus. A variety of shrubs, perennials, and annual flowers are maintained providing a colorful and welcoming corner of the campus. Again, water is a key element in maintaining the freshness and beauty.
- A “metered irrigation system” was installed rather than “timer irrigation” for efficient benefit of the water used to irrigate the athletic fields and Centennial garden. This system provides state-of-the-art features such as accurate, economical flow sensing, and cycle and soak programming at a “push of a button”. The irrigation controller features the ability to select cycle-and-soak programming or conventional programming on an individual program basis. There is automatic minimization of water use by intelligently scheduling zone operation starts if and when other stations are satisfying. This system was designed to conserve water and provide playing fields. Watering of the athletic fields was coordinated with the Elizabethtown Borough Water Company and approved by The Bureau of Watershed Management, Office of the Commonwealth Drought Coordinator.
- The Elizabethtown College campus contains a 2-acre lake supplied by storm run-off and rain. During drought conditions water from the lake is used for irrigation of the athletic fields. Over many years the depth of the water decreased due to silt build-up and lake bank erosion. In 2001 the lake was drained and dredged to increase the depth, modify the banks, and repair the spillway for overflow. A grant of \$90,000 from DEP through the “Growing Greener” program provided the funds to plant a variety of grasses to maintain the integrity of the lake banks and the surrounding wetland areas and filter storm water flowing into the lake. As the final phase of the lake project informational signage is being installed so members of the college community and guests can be made aware of the best practices in storm water management incorporated into the lake design.
- Understanding the need to involve the college community in conservation efforts students living in the six dormitories were encouraged to actively participate in a friendly competition called “Water Wars”. Water usage in the residence halls was measured over a two-week period in March. Students tried to keep water use to a minimum through: shorter showers, not letting water run while brushing their

teeth and shaving, and washing a full load of clothing rather than just one or two articles. Students were encouraged to be aware of their use of water and look for ways to decrease waste by reporting leaking water faucets or showerheads to the maintenance department.

- The students of Royer Hall decreased their water usage by 12 gallons per student per week winning the competition. The residents of Royer Hall, along with Royer Resident Director, Drew Lesicko, program founder and Resident Assistant (RA) of the Environmental Floor senior Susan Tomchak and Plant Operations were recognized and honored with the first ever Pennsylvania Department of Environmental Protection "Golden Faucet Award." An added incentive for the students was a prize to the winning dormitory to purchase recreational equipment.
- A variety of posters were displayed in restrooms within the academic and administrative buildings on campus to remind staff and faculty they also needed to participate in the water conservation effort. Simple, but effective wording on colorful recycled paper, resulted in timely calls about a leaking faucet or running toilet. While employees and students were alert about water use at school and work, the hope was that this behavior would continue at home.

SUMMARY

- In this "high-tech" computer age, a "low-tech" approach can yield very positive results. High efficiency toilets and urinals have improved our ability to conserve water.
- Simple posters remind even drought aware individuals to continue with conservation efforts on and off the job.
- The Elizabethtown College students found a fun way through their "Water Wars" to participate in water savings. Monthly readings of building water meters and charting amounts can locate problems quickly or identify areas where education may be needed to reduce water waste.
- The irrigation system installed to maintain the athletic fields is the most advanced irrigation controller available. The soil and grass types are identified and then irrigation is programmed to the plants required or water consumption. Watering is scheduled to match the evaporation rate of the root zones. This permits exact need irrigation of the turf and prevents waste from over watering.
- The Water Wars program received extensive media coverage in local outlets including the Lancaster New Era, News 8 (WGAL), ABC27 (WHTM), Fox-43 (WPMT), and WHP580 AM. The WAVE, November 2001 issue of the newsletter featured a cover story about the plumbing renovations and the

reduction in water use. This successful action plan also won the Governor's Award for Environmental Excellence in September 2002.

- Through creative programs such as this, Elizabethtown College, can contribute to water conservation by direct action and example. It also demonstrates the surrounding communities that the College is committed to actively participating in conserving a valued resource as water. The primary benefits from these programs are insuring there is sufficient water for everyone to use and cost reduction.

FINANCIAL SUMMARY

Costs

- Plumbing project \$108,000
- Front load laundry washers no cost
- Irrigation for athletic fields \$30,000

Savings

- Plumbing project 6,600,000—gallons \$40,000 annually
- Front load washers 200,000—gallons \$21,000 annually
- Irrigation It is difficult to project the direct savings in gallons and dollars for the irrigation system, as rainfall determines the amount of use.

Future Conservation Plans

Elizabethtown College is conscious of our responsibility to be good stewards of the environment and to provide educational opportunities in the most economical way possible. As a major regional consumer of electricity, natural gas, water and a producer of sanitary waste we have the opportunity to further improve the efficiency of our consumption of these resources and our generation of sanitary waste. Several years ago we completed a major energy conservation effort with the installation of high efficiency T-12 lights, high efficiency boilers and air conditioners all of which are common techniques used in many institutions to improve efficiency and to reduce costs.

However, we are exploring several recent technologies, which have the possibility of significant improvements in our operating efficiency and further reduction in costs.

The first of these is micro turbine technology, which is a derivative of the aviation turbine engine technology. This system uses very small turbines to generate electricity using the exhaust gasses to produce hot water for heating or domestic water use during heating

season. During cooling season the same turbine continues to produce electricity, but the hot gasses are routed through an absorption chiller to produce chilled water for cooling.

Needless to say this cogeneration technology has the potential to significantly reduce our cost of heating and cooling while reducing our purchased electrical power. We are working on a plan to incorporate this technology into small district heating and cooling systems to better balance our generation of electricity, cooling water and heat with our building loads.

Those of you who live in or have visited Lancaster County have certainly noticed the odiferous by product of the conversion of plant material to milk via the bovine digestive process.

To deal with the considerable amount of manure produced by the milking herd farmers are moving to anaerobic methane digesters which turn the manure into soil augmentation material, methane and waste water. The waste water is spread on fields and the methane is disposed of by burning it to produce electricity, via micro turbines or internal combustion engines driving generators. Since the farmers don't have a use for all of the generated electricity they try to sell it to the local electrical supplier. However, the electrical suppliers do not want to purchase electricity at anywhere near the cost of generation, making methane digester projects uneconomical. As we use electricity for a lot of our heating we are in a position to consume a lot of electricity. Since we are now paying 6.1 cents per KWH, the dairy farmer and we could benefit from our purchase of the methane produced electricity as he could get a higher price and we could get a lower cost. The bovine digestive process has the potential to make a lot of methane! For example, a farm in New York milking 850 head and using a methane digester for disposal of the manure produces 500,000 KWH per year.

There is at least one other possible cost savings for us in the methane digester process in that food waste has a high production of methane, as it hasn't already been digested. We now pay to have our food waste hauled off campus and if we were to dispose of it in the digester considerable savings could be achieved

At this time the methane/electricity process is in the initial stages of discussion, but I am very excited about the possibility of making good use of what is now an unwanted waste material.

As you can see, Elizabethtown College takes its environmental stewardship responsibility very seriously and continues to do what we can to operate with a minimum of disruption on our environment