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# CORRECTIONS FORUM

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# Going the Green Mile

From use of biomass boilers to lower heating bills to collecting AC condensation to conserve water, here are some sustainable steps employed by forward-thinking corrections agencies.



Biomass boiler used by Indiana's Putnamville DOC facility that burns bio-products such as switch grass, bark, sawdust and wood chips.

**T**he cost of operations, a continuously growing prison population, aging infrastructure and a seemingly endless down economy have impacted corrections in numerous ways. A correctional facility is essentially a town, and towns never shut down. Certain utilities, such as water, must be constantly running. Darkness, a breeding ground for misbehavior, requires that a facility be lit 24/7/365 and heating a town in the dead of

winter is an expensive endeavor.

On top of that, points out Mark Hardcastle, who is chief of California Department of Corrections and Rehabilitation's Energy, Sustainability and Infrastructure (ESI) Section, "This type of operation requires that equipment and materials are used that can withstand the additional operating hours/usage vs. a business that operates eight to sixteen hours a day." These factors have correctional facilities searching for ways to maximize efficiency.

Some prisons, such as Coyote

Ridge in Connell, Washington, were specifically designed with LEED certification in mind, notes David Jensen, DOC Director of Capital Programs. (LEED or Leading Energy and Environmental Design is a designation created by the U.S. Green Building Council.) Some are adhering to executive orders, others have obtained funds from the American Reinvestment and Recovery Act (ARRA) and some are simply trying to cut costs. Regardless if the motives are environmental or economic, cor-



“HVAC condensation is a guaranteed water source.... Millions and millions of gallons of water may be saved and, in some cases, reutilized again with very little pumping energy at all.”

—Scott McMillan

rectional facilities are thinking green.

In June 2011, the National Symposium on Sustainable Corrections met in Indianapolis. The workshops included, among other things, the Greening of the Indiana DOC and discussions of conservation, including rainwater harvesting and integrating green technology into older facilities.

The Indiana DOC has taken a leading role in maximizing efficiency, and its facility at Putnamville has realized impressive results, especially in regards to heating, traditionally one of the most expensive utilities. Putnamville is a medium-security facility that houses approximately 2,500 offenders. A few years ago the facility partnered with Kamps, a local manufacturer of pallets, also known as skids. The skids are trucked in and the inmates tear them down, build new ones and return them. Mike Callahan, physical plant director, explains. “There’s a lot of scrap generated by that process. We capitalized on their waste-stream. We in turn purchased a grinder that grinds that scrap into wood chips, and then the wood chips are used in the biomass boiler that produces about 80 percent of the heat for the facility.” A biomass boiler is a carbon-neutral

type of boiler that burns bio-products such as switch grass, bark, sawdust and wood chips.

The system simply requires natural gas subsidization during the end of December and through January and February, Callahan notes. The project began in November 2008 and was fully operational by July 2009, and the results have been dramatic. In FY 2010-2011 the facility saved a whopping \$850,000 on natural gas costs, but, says Callahan, in that time period the facility had to purchase supplemented wood chips. “This year we will be producing 100% of our own, so we’re expecting even more savings.”

According to the Federal Energy Management Program, biomass such as that being used in Putnamville is now the nation’s leading source of renewable energy. Scott McMillan, P.E. and senior mechanical engineer at HDR Architecture, Inc. is involved in most of the global firm’s justice/correctional work in the U.S. While HDR has not specifically incorporated such alternative heating methods (yet), this technology is something they see on the horizon and whose use is something they are anticipating. “Fuel alternatives appear to be accepted based

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on regional alternatives. We believe that [its use] is just around the corner.”

Heating is not the only operational expenditure in which the facility has realized maximum efficiency. As Callahan notes, the prison replaced or upgraded “some 26,000” light fixtures as well as overhauled the plumbing fixtures and water use. They put in conservation showerheads, which flow at two gallons per minute, as well as timed water shut-off devices. The savings have been impressive, but the precise dollar savings are not yet specifically measureable. What is known is that the changes have saved a quarter of a million gallons of water *a day* and the electrical savings have been in the mid-30% range. When contract negotiations with the water company come up again, Callahan notes, the savings “will give us some leverage when we start talking dollars.”

As Callahan explains it, it was not a matter of simply switching out light bulbs or adopting a new technology. The facility has developed a culture of conservation from the top down. On one side he credits Bruce Lemmon, who was the superintendent at the time. (He is now the commissioner of the Indiana DOC and also gave the keynote address at the symposium.)

“He was a major supporter,” says Callahan. “It takes a top to keep the momentum, and he provided that.” He also notes that the staff’s ability to “think outside the box” has been instrumental. For example, the wood they grind for the biomass boiler is full of nails. An employee in the facility pointed out that if they install magnets along the conveyor the nails could be removed. Those nails now bring in \$300 a week in salvage sales. “We’ve got some outstanding staff who are constantly thinking,” says Callahan, who added, “Ideas come from inmates, too.”

Facilities that have been successful in realizing maximum efficiency in operations often cater to their strengths. The biomass boiler at Putnamville is labor intensive, but, as Callahan points out, they have an enormous labor pool.

## Solar Power

California, on that note, has a virtually unlimited supply of sunshine. On April 12, 2011, Governor Brown signed SBX 12, which requires that, by 2020, one-third of the state’s energy come from renewable sources. CDCR is already ahead of the curve. They have entered into an agreement with SunEdison to add nearly 23-megawatts of solar-generated power to



**Aquawing laundry system works best in cold water, so the need for hot water for laundry is eliminated. The shorter wash and dry times mean more loads per hour, the reduction of harsh chemicals enhances the life of the linen and the savings of hot water and gas is reduced significantly—up to 85%.**



five correctional facilities. SunEdison currently operates two solar-power fields in state prisons: Ironwood State Prison and Chuckawalla Valley State Prison, and has plans for expansion. Once that expansion is complete, the cumulative output for the two facilities is expected to be about 11 megawatts. By the end of 2011, CDCR will be on track to save 1.5 million therms (one therm is 100 cubic feet) of natural gas and 41 kilowatt hours per year. These projects are also expected to save the taxpayers \$4.8 million a year in reduced utility payments. Over the life of the contracts, according to the department's website, the savings to taxpayers is expected to be over \$55 million.

Other, smaller scale projects being undertaken by CDCR, says Hardcastle, include updating fixtures, such as light bulbs that use less energy and last longer, replacing motors with those that are more efficient and operate less, incorporating higher efficiency boilers that can be smaller due to the added efficiency and including flush-restricting valves in inmates' housing.

Taking a global view, on Halloween Day 2011, the planet was introduced to its 7 billionth resident. That's a lot of water requirements. Aside from maximizing efficiency through low-flow facilities, flush-restricting valves and automatic shut-off devices, one of the possibilities to maximize water savings and recycling is rainwater harvesting.

Cedar Creek Corrections Center in Washington, the first prison campus (in contrast to a single building) in the country to receive LEED Gold certification is one institution that has adopted the use of rainwater catchment to water gardens and to flush some of the facility's toilets. In 2009 the center captured about 23,500 gallons of water.

Bob Boulware, P.E., is the president of Design Aire Engineering as well as director and president

of the American Rainwater Catchment Association, a non-profit organization founded to promote rainwater harvesting in the United States. Boulware spoke at the National Symposium on Sustainable Corrections about rainwater catchment as an alternative source in areas with limited resources, such as facilities in California and the Southwest. "Rainwater is moving forward," says Boulware. "It is definitely an emerging technology."

Of the applications for the water, he notes, "The common no-brainer to use rainwater for is flushing toilets." Laundry is also among the best uses. The water is soft, which would save soap, and the gray water recycling could be used to flush toilets. Some facilities, such as the Miami Correctional Facility in Bunker Hill, Ind., harvest rainwater for various uses, such as sprayed herbicide, watering flowers and for use in the greenhouse.

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The barrels, says Ann Hubbard, Miami Correctional Facility's public information officer, were constructed by the maintenance department onsite from materials on hand at a cost of \$7.54. Golden Grove Prison, on the U.S. Virgin Islands of St. Croix, which is a dry island, has a special membrane sprayed on the roof that is designed to harvest rainwater. The water is then treated and used as the facility's primary water source. One point Boulware acknowledges, though, is that rainwater harvesting might not always be a simple undertaking. "There's always politics, but they are not consistent politics." However, he adds, "There is no technical reason not to have rainwater as part of your system."

McMillan of HDR notes, "Water savings appears to be the most critical aspect of much of my project work right now, especially in recent years in the Southeastern United States and certainly drought-ravaged Texas

currently." He furthers that the organization has also recently taken on another "guaranteed" water source—the collection of HVAC condensation. "Dehumidification and the air conditioning process generate 'free water' in the form of condensate. This water is distilled, cool, and requires no filtering—only a means of capture for reuse. For years and years, this water has been directed to the nearest floor or roof drain and on for treatment at the local utility district. Our study at Wake County [in Raleigh, N.C.] has proven that millions of gallons of water may be saved and, in some cases, reutilized again with very little pumping energy at all.

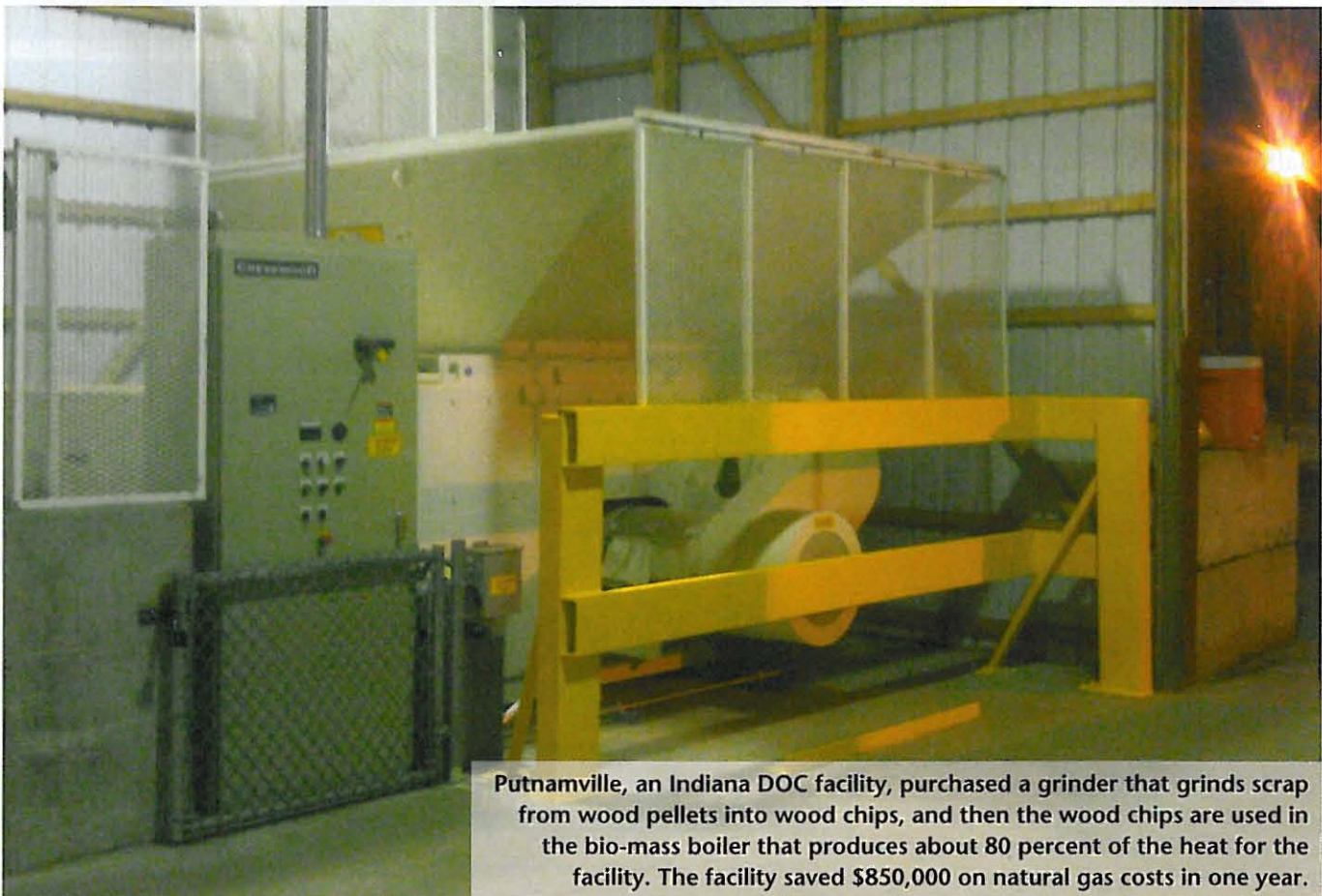
In another example at Hays County Government Center in San Marcos, Texas, HDR is utilizing the cast-off condensate for irrigation of the entire site landscaping system and all of the water is conveyed to an underground tank by gravity and

pumped with the irrigation system. The periods of the year when the demand for cooling is greatest (summer) coincide perfectly with the demand for watering of the landscaping."

## Cold Water Wash

Running laundry facilities in correctional facilities is an expensive and energy demanding endeavor. A technology that has been growing in popularity is the use of ozone in the laundry cycle. Brett Daniels, vice-president of Aquawing Ozone Injection Systems (AWOIS) LLC, in Auburn, N.H., notes, "When properly applied, ozone has the ability to streamline and 'green' any laundry facility." Ozone (O<sub>3</sub>) is created by adding a third oxygen atom. That third atom breaks down organic material in a wash cycle, which can then easily be removed from the fabric.

The technology works best in cold water, so the need for hot



Putnamville, an Indiana DOC facility, purchased a grinder that grinds scrap from wood pellets into wood chips, and then the wood chips are used in the bio-mass boiler that produces about 80 percent of the heat for the facility. The facility saved \$850,000 on natural gas costs in one year.



# Of the applications for rainwater, the common no-brainer is for flushing toilets. Laundry is also among the best uses.

water for laundry is eliminated, but the shorter wash and dry times mean more loads per hour, the reduction of harsh chemicals enhances the life of the linen and the savings of hot water and gas is reduced significantly (80% and 85% respectively). Missouri prisons adopted the use of ozone systems in 2007 in 12 facilities at a savings of \$1.2 million per year.

The savings might not only be found in regards to energy efficiency. "The important note to any correctional facility considering an ozone system is its ability to disinfect," states Daniels. "Aquawing is the only system clinically validated by two separate microbiologists to kill super bugs such as MRSA and C.diff," a tactic that could presumably realize further savings in medical expenses and suffering. On November 7, AWOIS announced in a press release that the company had installed an Ozone Injection System in its 125th correctional facility.

Plumbing has long been an operational concern in correctional facilities. Not only can the facilities be used to hide contraband, communicate with other inmates and deliberately flood cells as a distraction, the amount of water required to service a facility is massive. Vacuum plumbing can have an advantage over the standard gravity toilets in correctional facilities. According to manufacturer AcornVac, vacuum toilets use only one half gallon per flush, as opposed to the 1.6 gallons used in a traditional gravity toilet, thus providing significant savings

in water and sewage costs. Ron Mims, national sales manager for AcornVac notes, "The water savings is obvious but as importantly is the wastewater savings."

Facilities can also save money by reducing material costs because they use smaller diameter piping and do not require vent stacks. They can be installed vertically or horizontally and therefore offer flexibility in designing or renovating facilities. The Salinas Valley State Prison (SVSP)



Reharvesting rainwater can be used to flush toilets, do laundry or water gardens.

has incorporated the use of an Acorn Vacuum Plumbing System. The facility, a 64-bed housing/treatment facility in Soledad, Calif., houses male patients who require mental health treatment at level IV security. The incorporation of the system has contributed to the facility's Silver LEED certification.

Newer facilities are being built with LEED certification in mind, but that is not an option available to older facilities. Nevertheless, steps can be taken,

as has been witnessed by Putnamville, a correctional facility established in 1914. Some of these steps, notes Hardcastle, could include "utilizing benchmark data, and identifying water and energy efficiency measures with a short payback and utilities savings to fund construction and/or purchase equipment." He also suggests that facilities seeking utility savings "survey or conduct an in-depth investigation of the facility's plumbing, landscaping, and general water management practices to assess water conservation efforts."

Furthermore, there also might be money out there, after all. CDCR was able to accomplish seven projects as a result of ARRA (which in turn generates \$1.87 million in utility savings a year). Hardcastle recommends researching various grant opportunities through state and federal energy organizations and making an effort to identify opportunities for renewable energy projects (solar, wind) through Requests for Information (RFI) and also developing a partnership with investor-owned utilities to take advantage of their expertise and financing options. It is those partnerships that seem to be a recurring theme in the greening of corrections. The conservation process at Putnamville began when the facility entered into a performance contract with Johnson Controls, a private company, which guaranteed the savings. "It's panned out," says Callahan. "It's been a very good experience." ❁