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Global Perspective of Going Green; Lessons We Can Share

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Introduction

Al Gore's book "An Inconvenient Truth" awakened us to how our life styles and our business practices are impacting our world; accelerating pace of melting polar ice caps, rising seas, toxic chemicals in our water & food supplies, climate changes (floods & droughts), limited access to resources. We are now requiring a personal and professional environmental accountability for our actions. The process of manufacturing, distribution, and disposal of or recycling of products is going green, but green jobs are not necessarily safe jobs. These changes provide opportunities for the safety professional in the areas of: the health and safety, product safety, and environmental protection.

Sustainable Culture & Business

Sustainability is defined as: Economic development that takes full account of the environmental consequences of economic activity and is based on the use of resources that can be replaced or renewed and therefore are not depleted. Sustainability is often referred to as "Greening."

Greening means; (1) reduce the use of hazardous products and materials in housekeeping or maintenance (also reduces the amount of hazardous wastes needing to be disposed), (2) use more energy efficient equipment in heating, cooling, and lighting as well as construction materials, (3) recycle electronic goods, building materials from renovation projects (example rubble for future projects or unpainted wood turned into mulch) and share usable windows & plumbing supplies with the needy, (4) use reusable products, (5) use energy-efficient or alternative-fuel vehicles, (6) practice energy and environmental conservation (ride share programs & "work at home" programs to minimize travel/traffic), (7) water conservation, and (8) Participate in community environmental initiatives.

Scientists feel that the burning of carbon-based fuels to produce energy contributes heavily to increase of carbon dioxide and greenhouse gases in the atmosphere which are responsible for the

changes in our weather patterns, global warming, and a deterioration of our health. Many people (only 4% of US adults) do not realize that buildings were the largest contributor to greenhouse gas emissions. Companies understand their "Brand Value" is affected by society's perception of their stewardship for our natural resources. They see greening as an opportunity to maximize ROI and increase brand equity. Carbon Trust, an independent company, states "tackling climate change could create opportunities for a company to increase its value by up to 80% if they are well positioned and proactive". Companies are transforming their business models and are talking in terms of the "Triple Bottom-line"; profit, the planet, and people.

Government Initiatives

The Kyoto Protocol was adopted in December 1997. In 2007, the Securities and Exchange Commission was approached by leaders in 17 states requesting all publicly held companies be required to disclose their full environmental liabilities to all potential investors. In 2007, nine Midwestern governors signed the Midwestern Regional Greenhouse Gas Reduction Accord with significant reductions targeted in carbon dioxide. Beginning January 2008 California is tripling fines for diesel vehicle idling and will prevent registration of units with outstanding citations. 39 states, four Canadian provinces, one Mexican state, and three Indian tribes have joined The Climate Registry which is developing standards for measuring, reporting and verifying greenhouse gas emissions. This registry will be a standard repository for companies and organizations to file and update their greenhouse gas emissions. The states will rely on this information for their voluntary, regulatory or market based programs.

California law, AB 1103, effective in 2009 will allow commercial buildings to see how they stack up against their peers in terms of energy consumption—and so, too, are the buildings' prospective buyers, financiers and lessees. This information could push a lot of business to proactive owners as businesses look for energy efficient buildings that will help them meet their own sustainability goals. For owners who have not been proactive the list could prompt improvements or result in lower occupancies and lower lease rates. Under the law, electric and gas utilities are required to maintain records of the energy consumption data of all nonresidential buildings to which they provide service and, upon request of an owner, upload those records to a secure online interactive energy management tool maintained by the US Environmental Protection Agency (Portfolio Manager) that tracks and assesses energy and water consumption. One year from January, anyone looking to buy, finance or lease an entire building will be entitled to obtain the building's Energy Star Portfolio Manager benchmarking data and ratings. Buildings within the top quartile will be recognized as an EPA Energy Star Building.

President Barack Obama selected Steven Chu, the Nobel Prize-winning physicist, for energy secretary. Mr. Chu advocates for more research into alternative energy, arguing that a shift away from fossil fuels is essential to combat global warming. President Obama has also pledged to spend $150 billion over five years in green technology. Obama is calling for new buildings to be carbon neutral by 2030, and for improving new building efficiency by 50% and existing building efficiency by 25% over the next decade.

Addressing Toxic Products and Personal Sustainability Goals

A succession of stories about toxic products from China in 2008 brought new urgency to an already budding movement to reduce or eliminate hazardous materials in everything from toys to Toyotas. Target said it would eliminate or reduce polyvinyl chloride (PVC) from a range of products and packaging, including infant and children's products, shower curtains, and tableware. Sears, Wal-Mart, Microsoft, Johnson & Johnson, and Apple announced similar measures. Some measures were the result of shareholder actions, as with Hasbro. All told, 13 resolutions aimed at reducing toxics were introduced by investors of major U.S. corporations during 2007. Wal-Mart promotes green by encouraging its 1.3 million U.S. employees to develop "Personal Sustainability Projects, to improve their health and the health of the environment.

Toxic Toys, the Ecology Center, in Michigan tested 1,500 toys for toxic substances, 33% had significant levels of lead, mercury, cadmium or other chemicals. While much of the blame for deadly toys in recent years was placed on Chinese manufacturers, the Ecology Center points out that in 2008, in its second round of testing revealed it's not just China making unsafe toys. Twenty-one percent of toys from China had detectable levels of lead, but so did 16 percent of toys from all other countries. Of the 17 toys made in the United States that were tested, 35 percent had detectable levels of lead, with two exceeding the federal limit for recalls. Overall, lead was detected in 20 percent of toys, and 54 products exceeded the U.S.'s limit for lead paint recalls, and others exceed the new Consumer Product Safety Commission standards that will begin to go into effect in February 2009. (13)

An example of the financial impact a company faces from selling toxic toys is Mattel. They have settled a lawsuit brought by 39 states after some of their toys were found to contain dangerous levels of lead. Mattel will make the $12 million payment by January 30, 2009, that will be divided among all 39 states. The toy recall affected about 2 million toys between August 2 and October 25, 2007; the toys carried Mattel and Fisher-Price brand names and were manufactured by contractors in China. The toys showed levels of lead far in excess of the 600 parts-per-million laid out by the federal government: some toys contained lead as high at 50,000 ppm. The settlement also requires that Mattel follow more stringent standards for the use of lead in toys beginning November 30, 2008, as well as maintaining records for four years regarding any subcontractors that manufacture parts of any of its toys.(3)

Energy & Air Quality Impact in Buildings & Occupants

The United States Green Building Council (USGBC) developed the Leadership in Energy and Environmental Design (LEED) System to provide guidance and a rating system for Green buildings. Green buildings efficiently manage our natural resources such as energy and water. They use environmentally preferred materials, reduce waste, use less toxic materials, promote a healthy indoor environment, and endorse sustainable development. Property owners and developers see developing a green building as demonstrating their commitment not only to the quality of the building itself and the experience of people using the building, it also allows them to be viewed as a good environmental steward, a good corporate citizen in the community and they can realize financial gains from reduced building operating costs. The financial benefits on a multi-location operation can save millions of dollars which appeals to their stock holders and

investors. According to the EPA every $1 in energy savings is equivalent to increasing operating margins by $2 to $3. These companies also create a healthier environment that attracts and retains quality employees/tenants (in 2008 CoStar Group reported LEED certified buildings had a 3.8 percent higher occupancy rate than traditional buildings), encourages public trust, and lowers their healthcare costs. LEED certified buildings provide differentiation that allows companies to build Brand image.

Many experts discuss tangible business results from going green beyond the energy & utility cost savings. Charles Lockwood, in the June 2006 issue of *Harvard Business Review* stated" Employers have experienced significant workforce benefits in green buildings, including stronger employee attraction and retention, as well as fewer illnesses and lower absenteeism, which relates to lower health care costs." Similar comments have been echoed by Lacy Muszynski of Building Operating Management in her article "Tenant Satisfaction Guaranteed". She stated "Safeguarding the health of occupants is at the top of facility executives' priority lists. Green design — especially applied to interiors — shares the same tenet. And as the list of research studies and surveys linking occupant health and happiness to productivity grows, more and more companies are taking notice. "A company's business is based on humans," says Jack Davis, program manager with BetterBricks. "Once an organization realizes that green factors track against less employee sick days, that becomes a huge incentive to go green." Mr. Lockwood also reported in the *Harvard Business Review* that green buildings boosted employee productivity nearly 15%. Gregory Kats, Chair of the Energy and Atmosphere Technical Group for LEED said "A 1 percent increase in productivity – is equal to $600- $700 per employee per year. The relatively large impact of productivity and heath gains reflects the fact that direct and indirect cost of employees is far larger than the cost of construction and energy."

The Energy Policy Act of 2005 provides tax incentives to encourage more energy-efficient buildings. These tax incentives are linked to improving the energy efficiency of either the entire building or one of it's 3 sub-systems; lighting, HVAC, or the building envelope. To qualify for the deductions, energy use must be cut compared to the limits specified an ASHRAE 90.1-2001. This incentive tax plus ongoing energy savings are inducements to take action plus energy efficient equipment often has a longer life which will reduce replacement costs and labor costs.

LEED is applied to new construction, commercial building renovation, campuses of buildings, existing building operations and maintenance systems, homes, and schools. There are four levels of LEED certification a building can obtain: (1) LEED Certified, (2) LEED Silver, (3) LEED Gold, and (4) LEED Platinum. These levels achieved are based on points gained through: (A) Sustainable Sites, (B) Water Efficiency, (C) Energy & Atmosphere , (D) Materials & Resources , (E) Indoor Environmental Quality, and (F) Innovation and Design Process. To achieve certification you need to include items in the project manual that meet LEED credits such as low/no VOC paints, and use of materials with recycled content.

The use of plastics in building construction can provide outstanding energy performance (high R values), a complete air and moisture barrier, and can improve overall building strength. They are light weight, there is little waste and in the case of polyurethane in 1992 this foam insulation saved 3.4 trillion BTUs in manufacturing energy as compared to fiberglass insulation. Plastics, such as polyurethane, can easily ignite and when used in frame construction they need to be protected with a minimum 15 minute thermal barrier. Plastics do not need any additional protection when they are encased in steel core, pre-insulated panelized walls and roofs. The metal

guards against insect infestation, mildew, mold, and will not dry rot. Wall panels made with 20-gauge steel core encapsulated in 6-inch-thick expanded polyurethane insulation provide R-24.8 rating. This construction will lower your energy costs year round. (5)

It is important to have a completed building commissioned to verify the initial energy model met its goals. The commissioning agent will also verify that building systems failures are detected and control measures are implemented such as a generator coming on line after the electrical system goes down. Often the system failures are due to complex systems with multiple components that provided by several contractors operating independently. The National Institute of Building Sciences states commissioning a building will mean it will cost 8 to 20 percent less to operate than a non-commissioned building. The value of commissioning a building goes beyond energy savings. The property owner receives a functional test of all their equipment and a complete review of operations which includes maintenance manual review, verification of warrantees, and their staff are trained in maintenance & operational procedures.

Protect your LEED certified building with “Green” insurance. Insurance companies such as Fireman's Fund Insurance Company offer specialized coverage to owners of commercial buildings who have green-certified property. These companies will provide insurance for; (1) owners of buildings that are not certified, and may or may not include green features, who will be covered for the cost to make defined upgraded repairs. In case of a total loss to a green building, they will pay the cost to rebuild, top to bottom, as a green-certified structure, (2) for owners of Leadership in Energy and Environmental Design (LEED) or Green Globes-certified buildings to make repairs that meet green qualifications, and (3) they will pay for the cost to hire a commissioning engineer to oversee repairs to ensure that all of the building's systems are operating at peak performance and are in agreement with one another. Fireman’s Fund provides a customer website known as ***i***Customer with an online collection of articles, tools, and links to help clients understand the Green building movement and its many benefits. They will also provide their clients with onsite consulting on Sustainable Business Practices.

Energy Use in America

In 1909, Thomas Edison "I shall make electricity so cheap only the rich people will be able to afford candles." In 2008, unregulated electrical costs are up 40-60%. Energy costs were even more volatile in unregulated areas that charge by the spot price of oil & gas. In the United States we spend $1.5 to $2.0 trillion every year on energy, and at average productivity levels that are 30% to 40% lower than the EU average and most modern Asian production facilities. Good energy-management programs have at least four dimensions: improved procurement, low-cost/no-cost efficiency measures, investment-based efficiency measures, and investment in fundamentally new process technology. Enhanced energy productivity is a key competitive differentiator.

We need to make the right choices. According to Mark Z. Jacobson, professor of Engineering at Stanford some choices are awful such as ethanol-based biofuels which will actually cause more harm to human health, wildlife, water supply and land use than current fossil fuels. The raw energy sources that Jacobson found to be the most promising are, in order, wind, concentrated solar (the use of mirrors to heat a fluid), geothermal, tidal, solar photovoltaics (rooftop solar

panels), wave and hydroelectric. He recommends against nuclear, coal with carbon capture and sequestration, corn ethanol and cellulosic ethanol, which is made of prairie grass. In fact, he found cellulosic ethanol was worse than corn ethanol because it results in more air pollution, requires more land to produce and causes more damage to wildlife.

There is hope, according to "Electric Power Annual 2007" from the U.S. Energy Information Administration. For the first time, non-hydroelectric renewable energy, led by wind power, was the leading source of new electric generating capacity in the United States, The study found that in 2007, electric power generation increased 2.3 percent, from 4,065 million megawatt-hours (MWh) in 2006 to 4,157 MWh in 2007. Total net summer capacity increased 8,673 MW. Wind capacity accounted for 5,186 MW of this new capacity. Net generation produced by renewable energy sources, excluding hydroelectric generation, grew by 9.0 percent as compared to 10.5 percent growth in 2006. Renewable energy accounted for 2.5 percent or 105 million MWh of total net generation in 2007. This marks the fourth consecutive year in which renewables' share of total net generation has increased. (21)

The Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) recently proposed an updated version of the *National Action Plan Vision for 2025: A Framework for Change*, energy efficiency plan for state policymakers which, if implemented by all states, could lower nationwide energy demand by 50%, achieve more than $500 billion in net savings over the next 20 years, and reduce carbon emissions equivalent to taking 90 million cars off the road annually. Currently, states, utilities, and other organizations are spending around $2 billion per year on efficiency programs, saving customers nearly $6 billion annually. As an example: Southern California Edison announced in December 2008 the completion of the largest solar installation in the state— two square miles of panels on the roof of the Prologis distribution building in Fontana (600,000 square feet and 33,700 thin film solar panels. This installation will provide 250 million watts of peak capacity—enough power for 1,300 homes. According to Southern California Edison, this rooftop installation is the first of approximately 150. (12) The use of solar panels presents fire fighting challenges. Firefighters have to be concerned with the power in the cells (an energized DC power in the conduit from the panels to the inverter in the daytime). Therefore they must secure all utilities and stay away from the panels and the conduit in the daytime. They also do not want to break a panel with an axe or related forcible entry tools as each solar panel in the string could be carrying the Full Voltage of that string (120-400 VDC), not just one panel, so they need to vent elsewhere and kill the utilities at the main panel.

We can evaluate our energy use by doing a lighting audit; identify all illuminated areas and determine the number of lamps in each area and multiply the lamps by the wattage to get the total fixture watts. Then multiply that number by the hours of daily use to get the total wattage. Now you can rank your areas by results, this will give you a starting point to investigate change. You also need to optimize all your utility bills and create a database by paying electronically (electric, water, gas, waste). Also use sub meter for tracking purposes and use the Energy Star Portfolio Management System to benchmark you current performance.

Energy Solutions

Power Generation, Developers Diversified Realty has formed an income-producing solar energy program in partnership with SunEdison, North America's largest solar energy services provider. The program will enable them to incorporate solar photovoltaic (PV) systems through a multi-phase deployment at the company's shopping centers, starting with those in California, Colorado, New Jersey and Puerto Rico. As part of the long-term partnership, SunEdison has the option to develop solar energy systems at hundreds of Developers Diversified's shopping centers in the United States and Puerto Rico. Developers Diversified will be able to purchase energy for common area uses. In addition, shopping center tenants can benefit and realize energy savings by opting to purchase the power generated by the solar systems at rates less than retail energy rates. Developers Diversified will receive significant rental stream from the program by converting unused rooftop space into a revenue-generating asset. The impact that energy savings can have on the environment and for their tenants is significant. Solar energy is clean, cost-efficient and environmentally-friendly.

San Francisco will install the largest solar photovoltaic system in the state, and the largest municipal system in the country. They will install a 5 MW solar array on the roof over the Sunset Reservoir. The system is to be completed in 2010 and the city will have a 25-year contract to purchase the power for $1.6 million per year. By contracting the project to Recurrent Energy, they become eligible for tax credits not available to a municipality, and those tax savings will mean cheaper power for the city. The project will produce approximately 3 percent of the 210 MW SFPUC needs and will cost an estimated 23.5 cents per kilowatt-hour.

Lighting, we are striving to have energy efficient light that is comfortable, provides pleasure and is energy efficient (lighting metrics; a T8 lamp produces 2900 lumens while consuming 30 watts yielding 100 lumens per watt, a compact fluorescent lamp provides 70 lumens per watt and an incandescent lamp yields 20 lumens per watt). The amount of light required is dependant on the application including safety and security considerations. Lighting energy costs can exceed 20% or your electric bill. Reduce your electric use by lowering lighting, people prefer it, you are also lowering the heat build-up and cooling load in your property. Replace your incandescent light bulbs with compact fluorescent energy-efficient bulbs that use a fraction of the electricity (25% of the energy and saves you about $30+ in electric charges over the life of the bulb), last almost 10,000 hours longer, and reduce the carbon dioxide emissions. Check with your utility company, there may be financial incentives to replace old equipment with new energy-efficient products. Buildings can also save on power costs by utilizing LED exit signs or light emitting diodes use less than 20% of the energy of an incandescent bulb and last 10 years vs. 3 months, saving money, resources and providing a failsafe emergency signage at Exit ways. An additional action; install occupancy sensor controls that turn lights off in unoccupied areas and replace some electric lighting with daylight through photoelectric dimming.

Mechanical Systems, selecting the correct sized equipment will control costs and energy starts. An oversized chiller plant leads to diminished comfort with greater on-off cycles of fan systems (accelerating their aging process and higher energy costs). Operation and maintenance programs on existing systems targeting energy efficiency can save 5%-20% on energy bills with limited capital investment & cost. Tools that help increase efficiency and decrease energy consumption include: perform scheduled maintenance on equipment, regularly clean filters and air-conditioning coils to improve efficiency (you can also save energy and improve air quality by using a high-output ultraviolet-C (UVC) device in the air handling duct after the coils by the

condensate pan, the UVC can also possibly earn LEED Credit), and seal the duct work. A success story on a cooling retrofit, the Orlando World Center Marriott had a 23 year old chiller plant that was inefficient, deteriorating and undersized. They implemented a $1.9 million dollar renovation installing new stainless steel cooling towers (increased cooling capacity by 300 nominal tons) with induced draft which reduced the electrical load to the cooling tower fans by 400 hp. Variable speed drives were installed on each of the nine cooling tower fans and the two main 1200 ton chillers. The chiller impellers were upgraded to larger blades. The energy savings in the first quarter 2008, $225,000! (1)

Edible byproducts from food plants are being used as animal feed and for land applications (fertilizer). The water content in these byproducts leads to spoilage and drives up transportation costs. There is a new process of maceration, steam heat, cooking and centrifuge; these byproducts can be converted to a biodiesel fuel, solids and water. The cost of this process versus traditional rendering is said 80% less and produces the new revenue stream. (22)

Water Resources

The green Holy Grail of sustainability includes water which impacts capitol costs, consumer values, and environmental integrity. Two key factors are: 1) availability will change as a result of climate change, and 2) scarcity will become more widespread as world population continues to grow. Water prices rose 27% between 2001 and 2006 and are forecasted to continue to increase, according to the NUS Consulting Group. To compound these issues, some say that population growth will cause water quality to decline from increases in waste and non-point pollution. (7)

An example of water use, the California Integrated Waste Management Board states the average hotel guest uses 218 gallons of water daily. It is important for hotels to bring their guests into the conservation process by telling them what they are doing to protect the environment and ask them for their help. They are using waterless toilets in the public restrooms. Water leaks can create mold spore exposures and leaking toilets waste water. Locating water leaks is a challenge especially behind wall panels and under floors. Leak detection can be approached through a Preventative Maintenance Program that can include visual inspection, use of imaging technology, and the use of a pipeline borescope.

Water is a local and time-specific issue, and should be treated as such when a company develops a water management plan. Conserving one unit of water in a water-stressed region has a greater value than the same unit of water in a wet region (and usually a greater cost). Therefore, water conservation measures should be prioritized at facilities located in water-stressed regions such as the southeast and southwest United States.

A good water management plan should include: (1) Regular assessment & goal setting, (2) Process & product innovation focused on conservation and (3) Partnerships with state and local governments and utilities. Water has uses beyond personal consumption and corporate services & manufacturing, heating, ventilation and air conditioning units require water as well as fire safety systems.

Mechanical systems can save water, by monitoring boilers and cooling towers to insure optimal efficiency of the systems. Boilers and steam generators use large quantities of water to make up for amounts lost to leaks and "blow-down." The amounts used vary from system to system. The cost of water is not as significant as the cost of the energy used by these systems. Chemicals used to treat the water impact costs. Installing makeup and blow-down meters for your cooling tower could amount to significant savings for your building. In a cooling tower, water is lost through the evaporative cooling process. To replace lost water and maintain cooling function, makeup water must be added to the cooling tower system. The makeup meter tracks the amount of water that passes through the meter as it goes to the cooling tower. The blow-down meter tracks the amount of water leaving the cooling tower before it actually enters the city's wastewater system. These meters allow businesses to save money by allowing the customer to pay only for the wastewater that reaches your wastewater system. Some companies capture and reuse the condensate in their cooling systems. They collect the condensate at the coils and reuse it as makeup water in the cooling towers. During the cooling season in a large complex this could be thousands of gallons a day or week.

Health Concerns & Green Solutions

Recent outbreaks of Methicillin-Resistant Staphylococcus aureus (MRSA) in schools have ignited a rush for systems and products that will protect children from this "superbug" infection. School cleaning supply companies are flooded with orders for huge quantities of harsh disinfectants. Remember health is a priority, clean with basic hygiene & green cleaning practices to prevent the spread of MRSA and reduce the environmental impact. Extreme measures may actually backfire when you're addressing this type of infection. The good news is that schools can protect children with basic steps such as hand washing and a thorough, consistent cleaning program. Green cleaning procedures, such as those outlined in Healthy Schools Campaign *Quick & Easy Guide to Green Cleaning in Schools* and echoed in the Center for Disease Control and Prevention's guidelines for controlling MRSA in schools, suggest thorough cleaning of a school and disinfecting touch points such as doorknobs and light switches. Extra attention should be paid to locker rooms and athletic areas. For a disinfectant to be effective, it needs to be used on surfaces that have already been cleaned to remove surface soil that can harbor bacteria. This cleaning procedure prevents the spread of infection without exposing children to unnecessary levels of harsh chemicals that can reduce indoor air quality, burden the immune system and aggravate respiratory problems such as asthma. Excessive use of disinfectants is also suspected as a contributor to the development of resistant strains of bacteria similar to the way that overuse of antibiotics led to the development of MRSA. Green cleaning procedures for disinfection offer benefits for the environment and reduce expenses for schools by avoiding futile attempts to disinfect an entire school. Of course, they also protect the health of students and staff by focusing the disinfection on surfaces where cross contamination can occur.

Microfiber mopping is an effective mopping technique. Microfiber is a strong, lint free synthetic fiber. Each fiber is split during manufacturing, and this split structure makes microfiber effective for mopping. The microfibers have a positive charge that attracts dust, which has a negative charge. Dust and dirt particles are not only attracted to the microfiber, but are held tightly and not redistributed around the room. Microfiber mopping completely eliminates rinsing

and wringing a heavy loop mop. There is a smaller volume of cleaning solution. It leaves a light film of water on the floor that dries quickly resulting in less opportunity for slips and falls on a wet floor. The water-soaked microfiber mop is considerably lighter than a loop mop and has a lower potential for injury; it uses less water & chemicals, less weight to lift less potential from fatigue, back pain, neck strain. Microfiber mopping streamlines tasks and takes less time. The cleaning solution preparation is reduced considerably because of lower volumes used. The need to repeatedly transport, empty, and replenish large buckets of cleaning solution is eliminated. Replacing microfiber mop pads takes much less time than rinsing and wringing a loop mop.

Microfiber mopping can reduce your costs. Although initial purchase costs for microfiber mops are about twice that of loop mops, the useful life of a microfiber mop is about 10 times as long as a loop mop. Eliminating the need for large janitor sinks and closets simplifies plumbing and maintenance and reduces the storage area needed for supplies. Biological hazards are reduced. The used mop head is changed after every room and sent for laundering. Because soiled cloths are never returned to the cleaning solution, risk of cross contamination between rooms is eliminated. Laundering resources are reduced, they can be laundered in standard washing machines. They require less space in the washers and dryers than conventional mops, saving on water, detergent and energy.

Mercury exposures are encountered when we change out old thermostats and fluorescent lights which contain mercury. They are classified as “Universal Wastes” by the Environmental Protection Agency. The safety professional can ensure safe handling and disposal methods for these waste materials. A recycling plan and an emergency response plan to breakage are required. Many firms have partnered with a vendor that recycles used bulbs in supplied cardboard boxes or the bulbs can be crushed in an enclosed and filtered process that contains the glass, aluminum, and mercury vapors and packs the crushed bulbs in 55 gallon drums (these can hold 1,000 bulbs). Broken bulbs must be cleaned up safely in a way as not to spread mercury containing dust. The EPA has outlined such a method that includes adequate ventilation, personal protective equipment, and methods to pick up and package the waste for recycling. (14)

Cradle to Grave

Manufacturers are responsible for the safe disposal of their goods at the end of their functional life. As an example, a new e-waste recycling laws passed in Oregon and Washington effective 01-01-09, require electronics manufacturers to pay for the recycling of their electronics products (often toxic) electronic waste sold in each state, and is expected to collect as much as 12 million pounds of electronics in Oregon and about 25 million in Washington in the first year alone. The new laws are among the toughest in the country. Fifteen other states have passed e-waste laws.

There is a similar movement in Japan with a financial twist. Odate, a city of about 80,000 people, has begun diverting small electronics from landfills and using the town's mining history to salvage precious metals from the waste. By putting collection bins outside supermarkets and community centers, the city gathering about 17 tons of e-waste in 11 months, from April 2007 to February 2008. After 11 months of collection, the city has reduced its trash burden and found a source of income from waste that would have otherwise cost significant money to dispose. They expect to harvest as much as half a kilogram of tantalum, one kilogram of gold, and as much as 4

kilograms of silver and palladium. After the success of the pilot project, the Japanese Diet has allotted 75 million yen (US$ 832,000) to support other recycling projects throughout the country.

Corporate Solutions

The industrial sector accounts for 33% of the U.S. energy consumption and has a potential for significant energy savings. The easiest way to address energy use is through load shedding, i.e. only run systems when they are needed, and using variable frequency drives so delivery equals demand need. You can also use a soft start to your motors vs. a quick start that requires peak power demand, use motors that are right-sized vs. over-sized, and using energy via a common dc bus when at least two variable frequency drives are combined and coordinated (energy produced during deceleration can be reused and recycled back into the line but this application requires engineering and new controls. (20) The following sections will provide an insight on how companies have developed sustainable business solutions that increase their profitability, reduce their carbon footprint and their overall environmental impact. These companies are leading the way to a greener future for us all. As you read these sections look for safety and risk management opportunities where you can add value.

Coca Cola, has a corporate vision where Sustainability reflects the role that their business must play in society to be successful in the 21st century. This is expressed in their renewed focus on productivity and efficiency, the goals they have set as a system, and the ways in which they are engaging with stakeholders and communities on issues such as water stewardship; energy and climate protection; sustainable packaging; active, healthy living; workplace rights; and community development. They feel that their efforts across the sustainability spectrum are helping them attract and retain the best and brightest people throughout their system which according to their President & CEO this will make their company and their bottling partners stronger.

They are now defining their objective as “accelerating sustainable growth to operate in tomorrow’s world.” As a result, they **now include sustainability among the key criteria by which they evaluate their business plans and performance.** They assess how they are improving their earnings and their competitive position, as well as how they are strengthening the sustainability of our business practices. They **are building sustainability into the personal accountability and objectives of their associates** and are committed to communicating about their sustainability progress to their external audiences and partners. Their next step is to embed sustainability into our strategic planning process. As they evaluate business performance in their 2009–2011 planning cycle, they will assess their progress, determining whether they are meeting existing commitments, creating new shared value for their customers and partners, and engaging others through their leadership team.

Their key sustainability initiatives are water stewardship, sustainable packaging, energy management and climate protection. Water, their goal is to safely return to nature and to communities an amount of water equivalent to what they use in all their beverages and production; (A) Recycle, all the water they return to the environment from their manufacturing operations (typically called wastewater) is required to meet applicable laws and regulations. They also have an internal standard that their operations must ensure treatment of water so that it is

capable of supporting aquatic life before returning it to the environment. The goal is to have 100 percent of their facilities aligned with these stringent internal wastewater standards by the end of 2010, and (B) Replenish, they have set a goal to offset the liters of water used in their finished beverages (approximately 122 billion liters in 2007), through locally relevant projects that support communities and nature. They are currently involved in more than 120 Community Water Projects in more than 50 countries. They continue to consider water resources when planning new manufacturing sites, deciding on plant closings, making acquisitions or expanding production at existing plants.

Energy Management, through: (1) cold-drink equipment—Improving the efficiency of coolers, vending machines and fountain equipment, and reducing greenhouse gas emissions produced by this equipment, (2) facilities and bottling plants—Improving energy efficiency and productivity and reducing manufacturing emissions, (3) increased use of hybrid passenger cars for their sales force and diesel-electric hybrid delivery trucks to bring their products to market. In 2000, they made a commitment to improve the energy efficiency of their cooling equipment (drink machines) by 40 to 50 percent by 2010. We are well on our way to reaching that goal. They developed a proprietary energy management system (EMS) that delivers energy savings of up to 35 percent. They have placed 1 million of these units in markets around the world. These 1 million units are saving an estimated 1.1 billion kilowatt hours per year. In 2006, they completed the transition to insulation foam that is free of hydrofluorocarbons (HFCs) in all new refrigeration equipment. The new insulation avoids three-quarters of the direct greenhouse gas emissions from their old equipment. Refrigerant gases are a big challenge and an even bigger leadership opportunity. The same HFCs that we have taken out of our insulation foam also are the chemical backbone of most of the current generation of cooling equipment and an unusually potent greenhouse gas. Interestingly, their alternative is carbon dioxide (CO2), which is also a greenhouse gas itself. But when used in cooling systems, it is 1,300 times less potent than the HFC-134a they deploy in our conventional equipment.

Packaging Initiatives are focused on three goals: (A) Reduce, design consumer-preferred packages that use the least amount of resources, while maintaining product quality, (B) Recover, build packaging management systems to collect post-consumer packaging and (C) Reuse, use post-consumer packaging and packaging materials again to deliver sustainable value. They have successfully reduced the weight of our 8-ounce glass bottle by more than 50 percent, the 12-ounce aluminum can by more than 30 percent, and the 20-ounce PET bottle by 25 percent. For example, they do not reduce a primary package so much that it requires additional secondary or transport packaging to avoid breakage. Recovery, their system invests millions of dollars annually to support the collection and recovery of beverage packaging materials. There is currently no universal recovery model, so they work in partnership with local communities around the world to help develop economically and environmentally effective solutions tailored to meet their specific needs. Reuse, in 2007, they announced their investment of more than $40 million to help build the world’s largest plastic bottle-to-bottle recycling plant. Expected to be fully operational in 2009, the 30-acre facility located in the United States (Spartanburg, South Carolina) will produce approximately 100 million pounds (the equivalent of 2 billion 20-ounce PET bottles) of PET plastic for reuse each year. (11)

Duke Energy Corp helped a beer distributor in North Carolina deal with the requirement to keep the beer cold and reduce their need for emergency power. The solution includes efficiency lighting that only operates only when workers are in that area and as far as keeping the beer cold

they use the chilled beer as a thermal mass which eliminates the need to run the chiller around the clock. Chillers in the winter are shut down from 6 AM to 1PM. and in the summer the chillers are off from 1 PM to 9 PM allowing the beer to warm slowly but still maintaining an acceptable temperature. If the cartons get below 60oF in the summer, excess condensation on the trucks weakens the cartons so a somewhat higher temperature is desirable. The outcome, there was no need for emergency generators and they were able to cut their energy bill. (8)

Anheuser Busch Inc., in the past five years, their brewery water use ratio has declined more than 7 percent. Compared to 2003, in 2007, their efficiency efforts resulted in a savings of 4.3 billion liters of water. Although the breweries use a large volume of water in the brewing process to produce their product and meet high quality standards, they also treat and return large volumes to the local watersheds. In 2007, the breweries returned on average more than 70 percent of the total water used at the facility back to the local watershed. In 2007, due to a drought threat in the Atlanta area their plant reduced their water use to 4.3 hectoliters per hectoliter of packaged beer, a 12 percent reduction over 2006 results. These conservation methods are being transferred to their other breweries. Their recycling corporation recycles the equivalent of five aluminum cans for every four they package. The company also made 2 packaging changes that reduced material requirements. They reduced their 15-pack/24-ounce can tray and saved 2.3 million pounds of cardboard and changed the carton liner for the 24-pack/12 ounce package and saved another 2 million pounds of liner material. (10)

Patagonia Distribution Center Efficiency, they use a modular conveyor system (Dematic, 877-725-7500) that can handle greater dimensional and weight diversity than conventional systems, including user-selectable carton gapping controls for a broader level of flexibility. The conveyor system includes a run-on-demand capability that can reduce power consumption by as much as 30% over conventional roller conveyors, a concept that fit right into the distribution center's ideal “green” operating environment. Along with allowing them to operate more efficiently, the conveyor system senses when there is no activity and shuts down. The belts won't keep running and wasting electricity if there's a lull in the action. In addition to reducing power consumption, the system increased man-hour efficiency in the facility by 20%, making better use of all of Patagonia's resources.

Burt's Bees is turning garbage into gold, in 2007 they set a goal of zero waste to landfills by 2020. The company quickly made great strides at reaching that target and went from producing 40 tons of waste per month down to an impressive 10 tons per month by aggressively recycling and introducing composting at its Durham, N.C., corporate office and manufacturing plant. To emphasize recycling the company piled two weeks of garbage in their parking lot then asked their employees to wade through it looking for recycling opportunities. They cut the company's waste in half while generating $25,000 in estimated annual savings, turning their waste stream from a cost center into a profit center. After that experience, the company quickly jumped from 80 percent compliance in recycling to 98 percent. (2)

Maker's Mark is fueling their operations with bourbon waste, They have turned on a new treatment system at its distillery, turning waste into energy for the facility. An anaerobic digestion facility was installed by waste management provider Ecovation. It will process stillage—the water, grain and yeast waste leftover from making bourbon—and produce a methane and carbon dioxide biogas for use in the distillery's boilers. The stillage treatment, which was incorporated into the facility's existing wastewater treatment system, is expected to offset 15-30% of the

distillery's natural gas use. The $8 million system is estimated to produce 85 million BTUs a day, and will eventually produce up to 165 million BTUs a day as the distillery increases its production of bourbon from 840,000 cases to 2.2 million cases a year over the next 10 years. Anaerobic digestion is a process in which organic materials are broken down by microorganisms. Previous to using the system, Maker's Mark would dry and ship its stillage to farmers for use as cattle feed. (4)

Procter & Gamble set a GOAL to deliver an additional 10% reduction (per unit production) in CO2 emissions, energy consumption, water consumption and disposed waste from P&G plants, leading to a total reduction over the decade of at least 40%. PROGRESS (percent reduction per unit production) July 2007 - July 2002; (I) Energy Usage -6% -46%, (II) CO2 Emissions -8% -52%, (III) Waste Disposal -21% -50% and (IV) Water Usage -7% -51%

Their methodology: is based on (A) Products from Waste, (B) Product Sizing, (C) Energy Conservation and (D) Transportation. Examples of Products from Waste; (1) Perfume: the sweet smell of re-use at their manufacturing site for perfume in Avenel, New Jersey, they developed a new process for blending scrap material for reprocessing as an ingredient for potpourri. As a result, annual generation of scrap waste at the site has dropped from 50,000 kg to zero, (2) Paper: a by-product raises the roof. In some P&G tissue and towel plants, the paper "fines"— a wet by-product of the paper making process — are reclaimed for energy to run the plant. The fines are also used to manufacture housing and roofing tiles, (3) Soap: a second chance for suds Bubbly wastewater from our shampoo and liquid soap plants has found new life in a secondary market. Today, instead of becoming waste, the mixture is sold and repackaged for use in automatic car washes. Examples of Product Resizing; (1) Charmin MegaRoll was created. It features four times as many sheets per roll than a regular roll of Charmin. Along with meeting consumer needs, the product requires the use and disposal of fewer cardboard cores. In addition, the space-efficient product allows more tissue to fit on a truck, saving on fuel consumption and CO2 emissions associated with transportation. 1,000,000 consumers switching from a regular roll to Charmin MegaRoll can save: 321,000 Liters of Fuel Per Year, 140 Million Cores Per Year 226,000 Kg of Plastic Per Year, and (2) in 2007, they began to convert their North American liquid laundry detergent portfolio to a "2X" concentrated formulation. Through scientific innovation, they developed a new formula that delivers more active ingredients in every drop, allowing consumers to use less. Product Concentration One advance sparked many benefits such as reducing CO2 emissions by more than 100,000 metric tons a year, saving more than 500 million liters of water a year, requiring 15,000 metric tons a year less in packaging materials and these new size required 40,000 fewer truck loads a year. Energy Conservation has been accomplished through; (1) Heat Recovery, much of the heat energy in the form of steam and combustion gases used in drying paper lost. At their Mehoopany, Pennsylvania facility, a proprietary process was developed that enables the plant to recover this heat and save 422,000 GJ of energy and 13,600 metric tons of CO2 emissions per year and (2) Innovation in 2008, P&G operations pioneered breakthrough technologies to reduce energy consumption. Among the simple, low-cost steps such as using water spray instead of electric power to cool water, recovering waste heat from washout and sanitization water, and using high-efficiency long-life lighting. These changes helped to reduce mean output energy by 6 –10 percent for each site. Transportation savings have been realized when they joined the SmartWay Transport Partnership (collaboration with leading organizations and the U.S. Environmental Protection Agency (EPA)). They have implemented more efficient designs of distribution centers, increased the use of inter-modal and railroad transport , reduced inter-plant truck shipments, encouraged all existing carriers to join the SmartWay initiative,

developed and implemented a sourcing strategy that includes more efficient and environmentally friendlier transportation. By 2012, the SmartWay Transport Partnership expects to eliminate 33 to 66 million metric tons of CO2 emissions, along with up to 200,000 tons of NOx emissions. This represents savings of as much as 150 million barrels of fuel per year — equivalent to taking about 12 million cars off the road. (9)

Restaurants use five times more energy per square foot than other commercial buildings and five times more energy in the kitchen than in the rest of the building. An example of the energy use in a full service restaurant: Food Preparation 35%, HVAC 28%, Sanitation 18%, Lighting 13%, and Refrigeration 6%. Restaurants are constructed, remodeled or re-commissioned to meet LEED certification standards. These restaurants look to control their operating costs and possibly take advantage of federal tax deductions available for commercial buildings that can save at least 50% of the heating and cooling energy of their building. There are also partial deductions available for green measures affecting one of their three building systems: the building envelope, lighting or heating and cooling systems. Many restaurants are going beyond that threshold and becoming Energy Star partners (using Energy Star® appliances such as Energy Star® dishwashers use 25% less energy, refrigerators and freezers are 45% more efficient than non-Energy Star appliances) to optimize their energy performance. Energy can account for 30% of the restaurant's total cost and it is the largest and most controllable operating expense. EPA's research indicates buildings carrying the Energy Star label consume 40% less energy. The money you save on operating costs (through energy efficiency) adds to what you get to keep so saving 20% on energy operating costs can increase your profits by as much as 33%.

Yum Brands restaurants are challenged by: energy usage, waste management, packaging, sustainable building design. Over the past two years, their U.S. company-owned restaurants aggressively worked to reduce our energy consumption and have achieved total annualized savings of 60,000 metric tons of CO2, about 18 percent above the goal of 51,000 metric tons. The savings benefited shareholders as they saved $17 million in energy costs. They continue to focus on: equipment retrofits and energy efficient innovations, better energy management systems, behavioral changes related to use of energy, waste management in their restaurants including the spent grease from their fryers (recycling the grease as a bio-fuel), and water reduction, recycling paper and other restaurant packaging, and material selection and use in our building design and retrofits.

Dell plans to eliminate 20 million pounds of packaging for its desktop and laptop computers around the world within the next four years, a move expected to save $8.1 million. The company will cut out about 10 percent of its computer packaging as well as make the remaining packaging greener. Dell wants to make at least 75 percent of its packaging curbside recyclable by 2012 and increase the renewable and recycled content of cushioning and corrugate by 40 percent. The computer giant will utilize air-filled cushion technology, molded pulp cushions and recycled HDPE (High-Density Polyethylene) thermal-formed cushions to replace current foam cushioning. The plastic HDPE cushions will contain 100 percent recycled content, and the amount Dell plans to use in 2009 will be equivalent to about 33 million milk jugs. Dell is already using recycled HDPE to package its Studio Hybrid PCs, and estimates it will use the equivalent of 2 million milk jugs to protect them next year. For 2007, Dell aimed to reduce outbound packaging by 10 million pounds, and ended up exceeding that goal by about 10 percent. (6)

The Department of Energy to meet the energy and environmental goals outlined in Executive Order 13423, the Energy Policy Act of 2005, and the Energy Independence and Security Act of 2007 has awarded a contract to Honeywell to implement up to $5 billion of energy-efficiency, renewable-energy and water-conservation projects at federally owned buildings and facilities, nationally and internationally, over the next 10 years. Examples of these projects include, (A) replacing a 1950s vintage coal-powered steam plant at Savannah River Site in South Carolina with a clean, renewable plant powered by waste-wood biomass (expected to save about $1.5 million per year) and (B) installing a 375- kilowatt solar installation Luke Air Force Base in Glendale, AZ (produces enough energy to power about 100 homes per year saving an estimated $21.8 million in energy and operational costs). (19)

Lodging Technology's & Siemens GEM System can be interfaced directly to the existing SIEMENS Apogee Building Automation System to enhance energy savings in a hotel. It's an infrared sensor-based guestroom energy management system that reduces room energy costs 35 to 45 percent. The SIEMENS Apogee system allows the hotel to maintain setback temperature levels in un-rented rooms, but they had no way to control temperature in rented-but-unoccupied rooms. Now, with the addition of GEM System, the SIEMENS Apogee system can maintain setback temperatures anytime a room is unoccupied, in both rented and un-rented rooms, which will dramatically impact the hotel's energy savings.

Hewlett Packard, in 2007 they released the industry's first line of business PCs that meet the ENERGY STAR 4.0 hardware requirements. These machines, when properly configured, can save as much as 52% of power use over traditional machines. HP was also the first company to enable all business PCs with S3 power management to automatically switch machines to standby during times of inactivity. HP was the recipient of an Innovative Products and Services Award at the 5th Annual Flex Your Power Awards. Recycling, by 2008 HP has recycled 1 billion pounds of electronics and HP print cartridges. HP is internally applying a global duplex (two sided printing) standard to all their locations. They expect to save 800 tons of paper annually. HP managed print services with 3M cut their costs in the US by $3 million in two years (printer devices were reduced 47%, printer settings defaulted to duplex, per page costs were reduced 90%, use of standardized energy efficient high speed equipment, centralized control on printing and consistent recycling to return goods to a supplier or reclaim product or components at the end of their useful life. (16)

NetApp was awarded the $1.4 million rebate from California's Pacific Gas and Electric Company (PG&E), whose Non-Residential New Construction Program gives rebates to PG&E's customers to use energy-efficient building design and construction. NetApp received the check for the work it did when designing and building its new Sunnyvale engineering data center. NetApp stressed power efficiency and reduced cooling needs through techniques such as environmentally friendly flywheel uninterruptible power supply (UPS) systems, energy-efficient transformers, outside air economizers, and a variable primary chiller plant. (15)

Marriott Corporation's green initiative, ECHO encourages all their hotels to promote the program and actively participate. The program provides guidance to their properties in five key areas; (1) Water and energy conservation (Marriott was named an ENERGY STAR Partner of the Year by the US Environmental Protection Agency in 2005-2007 plus guests are encouraged to re-use bath towels and linens vs. receiving new every day), (2) Clean air initiatives (Marriott is

targeting to reduce it's greenhouse gas emissions by one fifth by 2010, approaching 1 million tons of climate warming gases, also all hotels in U.S. & Canada are 100% smoke free, paints and stains water based no hazardous vapors), (3) Waste management (recycle materials are used in construction and energy recovery units installed), (4) Wildlife preservation (use of environmentally friendly building materials (wood is certified as coming from a renewable source), and (5) Clean-up campaigns. An example of Energy Star® products is in the laundry: full-sized Energy Star® qualified washers use 18-25 gallons of water per load, compared to the 40 gallons used by a standard machine. They do this by extracting more water from clothes during the spin cycle. This reduces the drying time and saves energy and wear and tear on linens. Top-loading models look like conventional machines from the outside, but these Energy Star® qualified washers use different types of washing action to get clothes clean with less water and energy. Many have sensors to monitor incoming water temperature closely. They also rinse clothes with repeated high-pressure spraying instead of soaking them in a full tub of water. Dryers, use clothes dryer with moisture sensors to reduce energy use and wear and tear on the materials being dried. Front-loading models use a horizontal or tumble-axis basket to lift and drop clothing into the water instead of rubbing clothes around a central agitator. Both top-loading and front-loading use faster spin speeds to extract more water from clothes, reducing drying time and energy use.

Conclusion

The solutions presented here and those you develop present new safety challenges; biogases, heat recovery & transfer, water treatment, hybrid vehicles, changes in manufacturing/ packaging/ material handling systems, modifying logistics, and product reuse & recycling, etc. Going Green requires the full engagement of staff, vendors, suppliers and customers and is engrained in the corporate culture, it’s everyone’s job. (17)

A Greener World Media survey* of 65 large and multinational organizations showed that 59% of them set environmental objectives at the board and senior management level. "Live Green or Die” is how a recent Business Week cover story describes General Motors Corp.’s current challenge: A Chief Responsibility Officer magazine survey indicated that 25 percent of Fortune 500 companies expected to appoint Chief Sustainability Officers (CSOs) as of January 1, 2009 Companies are getting beyond environmental compliance and looking to profit from sustainability.

Some companies are embracing ISO 14000 which is an International Standard that encourages them to develop, maintain and continue to management their environmental programs with ongoing improvements. It also gets Associates involved by creating a cross functional team that brings a variety of views and experiences to help the organization focus on reducing is environmental footprint.

Join and support your company’s sustainable business objectives. If they are not as yet addressing sustainability; take a leadership role and suggest they move forward to differentiate themselves now and not wait until they are required to take action. Change is inevitable, be a leader, improve: the environment, the quality of the work environment, your brand, and your profitability. Create a vision for sustainability, start small focus on the actions that create ROI. It’s not easy “being green,” lamented Kermit the Frog. In fact, it is a big leap from that quiet lily pad to the more complicated world of energy efficiency and the systems that support it.

Footnotes

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(21) Environmental Protection, February 2009, “Renewable Energy Accounts for Capacity Increase”
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