

Shaping A Sustainable Future



sus·tain'·abil·i·ty: meeting the needs of current generations without compromising the needs of future generations.

As a company spanning five generations of family ownership, we're passionate about sustaining the needs of future generations.

Long before the World Commission on Environment and Development (WCED) defined sustainability in 1987, the responsibility to protect and preserve the environment has been at the cornerstone of our business strategy. While definitions of sustainability abound, our approach to this concept is rooted in four core principles:

Environment Less energy consumed means less waste, fewer emissions and a healthier environment.

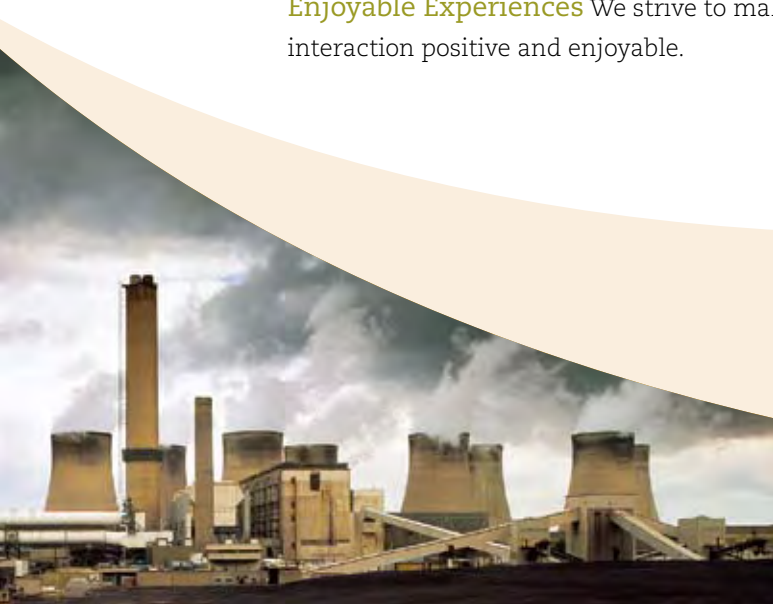
Energy Auditing existing systems, eliminating waste and managing utility solutions is good for the bottom line and the environment.

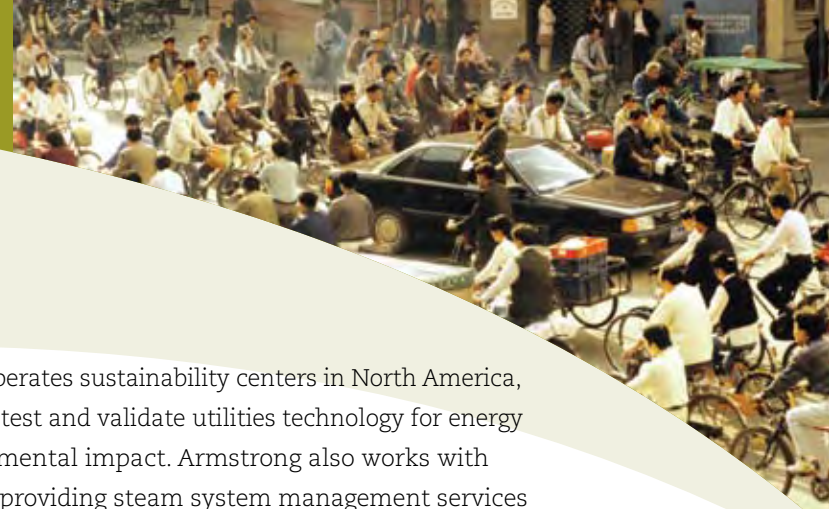
Education Sharing information and ideas can improve communication and strengthen bonds with business partners. It's also why we say *Knowledge not shared is energy wasted.*[®]

Enjoyable Experiences We strive to make every business interaction positive and enjoyable.

For us, *sustainability* is a goal in which all resources used by an operation – whether they are natural, human or monetary – are utilized to create a zero-use system in which every resource is fully replenished.

Our commitment is to help customers around the world conserve energy and operate more efficiently through a broad range of product and service solutions. By applying a formula approved by the United Nations Climate Change Committee, Armstrong customers are reducing their CO₂ emissions by one ton every 13 seconds, saving one ton of fuel every 40 seconds and saving 10 tons of water every three seconds.





Turning Carbon Into A Valuable Commodity

Reducing carbon emissions and turning a corporation's liability into an asset is a key benefit of partnering with Armstrong.

The Kyoto Protocol made emissions credit trading possible. In 2004, Armstrong introduced the first energy-efficiency methodology approved by the United Nations Framework Convention on Climate Change to reduce carbon emissions. This methodology took shape during the 1990s when Armstrong engineered, constructed and financed a \$2.5 million steam system optimization project at a refinery in northeast China. The result was a positive cash flow from the steam energy savings and a reduction of 40,000 tons of CO₂ emissions annually.

Following our methodology, companies can reduce their CO₂ emissions and capture valuable credits for international trading.

Practicing Sustainonomics

Going green doesn't mean you have to go into the red. Sustainable development must be economically viable – not just environmentally friendly or socially responsible. Carbon credit trading is just one way Armstrong helps customers capture a return on their sustainability investment.

Armstrong owns and operates sustainability centers in North America, Europe and Asia which test and validate utilities technology for energy efficiency and environmental impact. Armstrong also works with customers like Nestlé, providing steam system management services and support to achieve improved energy efficiencies and benchmark environmentally friendly best practices at plants around the world. Armstrong maintains the largest database of food industry utility performance metrics in the world.

New technology innovations from Armstrong such as wireless diagnostic tools and Web based measurement platforms also enable customers to continuously monitor components of production systems in order to prevent energy losses and reduce labor costs.

Shaping a Sustainable Society

Equity is central to sustainable development. As the world's population continues to grow at a staggering pace against a finite landmass, we must become more conscious of our own impact on the environment. For example, while North America represents only 5 percent of the world's population, we consume roughly 40 percent of the world's resources.

Armstrong recognizes that sustainable development means dealing fairly and honestly with customers, suppliers, employees and communities to enhance the quality of life for all.



Strategies for Sustainable Food Production

Agriculture is the dominant user of natural resources and a predominant source of greenhouse gas emissions (GHG). While the food sector consumes only 5 percent of the total energy used by all other industries, it accounts for 82 percent of the total water used and 18 percent of total GHG emissions. Armstrong partners with leading food processors to address these two key sustainability issues enabling food processors to meet the growing consumer demand for green product choices.

Wise Water Use & Wastewater Discharge Reduction

H.J. Heinz L.P., one of the world's leading marketers of branded foods to retail and food service channels, has made a strong commitment to reduce its environmental footprint and protect natural resources for future generations.

Armstrong partners with processors like Heinz to reduce overall water use and wastewater discharge by owning, operating and maintaining the utility assets of plants in Iowa, Ohio and Pennsylvania. Through a team of on-site employees, Armstrong has helped Heinz conserve water and optimize wastewater treatment processes that save hundreds of thousands of dollars in annual operating expenses and help Heinz avoid millions in capital upgrade expenditures. Additionally, Heinz and Armstrong have received environmental awards for their efforts in achieving compliance with municipal wastewater discharge regulations.

GHG Emission Reduction

Climate Leaders, the EPA industry-government partnership that provides guidance and recognition to companies developing long-term strategies to reduce GHG emissions, now has more than 150 member companies. Armstrong is proud to partner with many of these to support their efforts to reduce GHG emissions at facilities around the world.

Armstrong works with leading beverage manufacturers such as Coca-Cola, and meat and poultry processors like Wayne Farms, to replace out dated "energy hog" steam boilers with closed-loop Complete Thermal Exchange (CTE) hot water generation systems that deliver higher than 99 percent efficiency with very low emissions of nitrous oxide and carbon dioxide for a more environmentally friendly effect. Armstrong has also received certification from the National Sanitation Foundation (NSF) for use of CTE hot water technology in burning methane gas from anaerobic digesters. Helping customers capture energy from alternative and renewable sources such as biomass and biogas is a growing area of investment for Armstrong.

Armstrong has also responded to growing concerns among food processors faced with EPA elimination of chemical treatments such as methyl bromide for insect control. Armstrong delivers safe and effective options such as steam heat to control pests in an environmentally friendly way.

Strategies for Sustainable Pharmaceutical Manufacturing

Pharmaceutical manufacturers strive to save, sustain and improve quality of life. To help them achieve this higher purpose, Armstrong partners with these companies to integrate and follow sustainable manufacturing processes in the development of their life-saving compounds.

Energy Auditing, Benchmarking and Best Practices

In the U.S. alone, pharmaceutical manufacturing plants spend more than \$1 billion each year for fuel and electricity to operate their facilities. This expense can increase dramatically when fuel supplies tighten and oil prices rise, translating to higher costs for raw materials and reduced profit margins.

Auditing to pinpoint energy losses and adopting new technology to improve energy efficiency is not only essential – it's a strategic imperative for any plant manager or operations supervisor. Not only can energy efficiency reduce overall manufacturing costs and add to the bottom line, it also reduces environmental emissions, establishing a strong foundation for a corporate GHG management program.

Carbon Footprint Reduction

Armstrong has partnered with the world's largest research-based pharmaceutical company, Pfizer Inc., for more than a decade. As the company committed to *Working Together for a Healthier World*,™ Pfizer turned to Armstrong to help minimize the cost and operational restrictions arising from a carbon-constrained manufacturing environment.

At Pfizer's largest worldwide manufacturing headquarters, Armstrong began by implementing steam trap management software, products, training and human resources to analyze and upgrade Pfizer's steam distribution system – a major source of energy losses at many pharmaceutical and industrial manufacturing operations. Within the first year, the partnership yielded \$479,000 in savings and a reduction of 95 million pounds of steam – energy that would have otherwise gone up the smoke stack in the form of carbon dioxide.

Armstrong's ongoing relationship with Pfizer has evolved to on-site management and 24/7 troubleshooting of Pfizer's steam system by Armstrong employees. As a result, Pfizer has been able to conserve and use energy more efficiently, leading to a reduction in its carbon footprint and an improved bottom line.





Strategies for Sustainable Petroleum Refining

Rising energy prices drive costs up and decrease the added value of all products – including petroleum and petroleum based products. Petroleum refining accounts for more than \$8 billion in annual energy purchases in the U.S. alone, and is one of the largest energy consuming industries in the world.

Changing Demand Fuels Back-to-Basics Approach

Increased air quality and climate change demands, along with new developments in automotive technology and bio-technology, are posing new challenges to refineries. Producing lighter products and low-sulfur automotive fuels requires more energy to convert. This demand for a lighter product mix compounds the pressure on refineries to meet tougher environmental, safety and quality standards. While the vast majority of GHG emissions in the petroleum life cycle occur with the final consumer, energy use among refineries is a major source of environmental emissions. Making basic energy efficiency improvements is a relatively low-cost way refineries can reduce emissions and cut operating costs.

Meeting the Climate Action Challenge

Industry benchmarking data suggests that most petroleum refineries can economically improve energy efficiency by as much as 20 percent, resulting in millions of dollars in savings and far reaching environmental benefits. The American Petroleum Institute has issued the Climate Action Challenge, an industry commitment to improve energy efficiency by 10 percent between 2002 and 2012.

Marathon Oil Corporation, the fifth largest refinery in the U.S., partners with Armstrong to identify and capture energy savings and reduce emissions of harmful gasses including carbon dioxide and nitrous oxide. At Marathon's Robinson, Illinois site, Armstrong analyzed the condition of more than 7,000 steam traps replacing more than 1,200 leaking or failed traps. Additional improvements such as recovery of condensate were also made. Marathon realized more than \$1 million in energy savings at the Robinson refinery with additional year-over-year savings.

Marathon estimates its refineries achieved a 4.5 percent improvement in energy efficiency from 2002 through 2006 by installing new energy-efficient equipment and upgrading existing equipment. PetroChina based in Fushun, China, has also partnered with Armstrong to dramatically reduce emissions and capture energy savings worth hundreds of thousands of dollars annually.

Improving energy efficiency by adopting new technologies and sound management practices helps refineries like Marathon and PetroChina meet the challenge of maintaining the output of a high quality product while reducing production costs and working toward a sustainable future.

Creating Sustainable Institutional Environments

In Mexico, Canada and the United States, buildings are responsible for as much as 40 percent of total energy used and 38 percent of all carbon dioxide emissions. Each year, these buildings generate more than 2.2 million metric tons of CO₂ released into the atmosphere – roughly 35 percent of the continent's total.

The benefits of green building are well documented. Green buildings are estimated to reduce energy by 30 percent, lower carbon emissions by 35 percent and curb water use by up to 50 percent. Throughout the world, green building designers, engineers and builders are creating new environments and renovating old structures to significantly lower energy consumption, minimize waste and provide healthier, more productive environments to live and work in.

Increasing Square Footage While Reducing Energy Costs

Squeezing more out of existing structures while turning them greener is a challenge that requires a balance of good energy management practices along with appropriate investments in new technology solutions.

Universities and colleges compete to attract the best and brightest. Like many higher education institutions, Western Michigan University (WMU) strives to keep a lid on operational costs to minimize tuition fee hikes while maintaining functional, attractive, learning intensive facilities. WMU turned to Armstrong to assist in benchmarking critical energy components and soon realized inefficiencies that were costing the university hundreds of thousands of dollars annually.

Working with Armstrong, WMU began a decade-long program combining manual inspections of key utility systems that evolved into applying wireless technology for 24/7 monitoring. The combined strategy has resulted in reduced energy consumption and emissions, better deployment of limited human resources, and ultimately an expanded physical campus that consumes nearly half the energy it did previously.

Improving Productivity, Enjoyment & Quality of Life

While energy conservation is enough motivation for some businesses to undertake green building development, for others, energy represents only a small cost when compared to employee salaries, benefits and productivity losses.

Poor indoor air quality, archaic water system design, dim lighting and toxic emissions from building materials contribute to conditions such as asthma, allergies and the spread of influenza – the leading cause of sick building syndrome and a major contributor to deadly Legionnaires' disease. According to researchers, green building in the U.S. alone has the potential to generate an additional \$200 billion annually in worker productivity.

Armstrong partners with leading healthcare institutions to design and implement hot water system solutions that help reduce the risks of water-borne bacteria such as Legionella. We also work with these institutions to improve indoor air quality by supplying precise levels of humidification.



Armstrong Promise

Armstrong provides intelligent system solutions that improve utility performance, lower energy consumption, and reduce environmental emissions while providing an enjoyable experience.



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