Green Manufacturing in New Hampshire

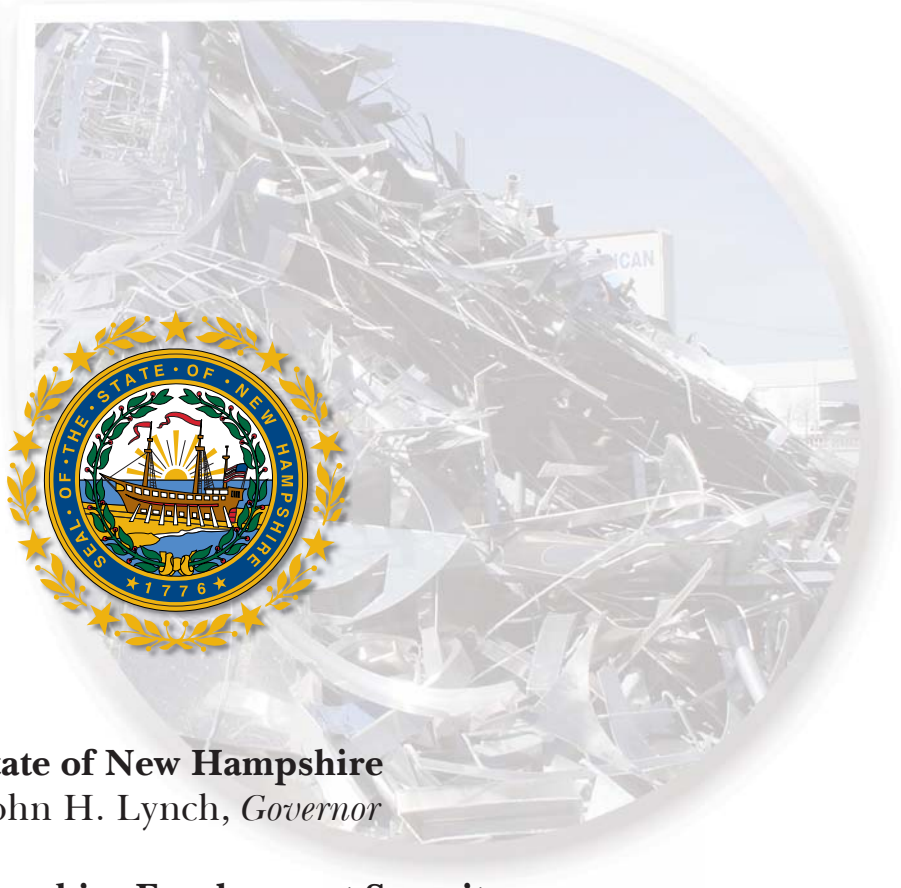

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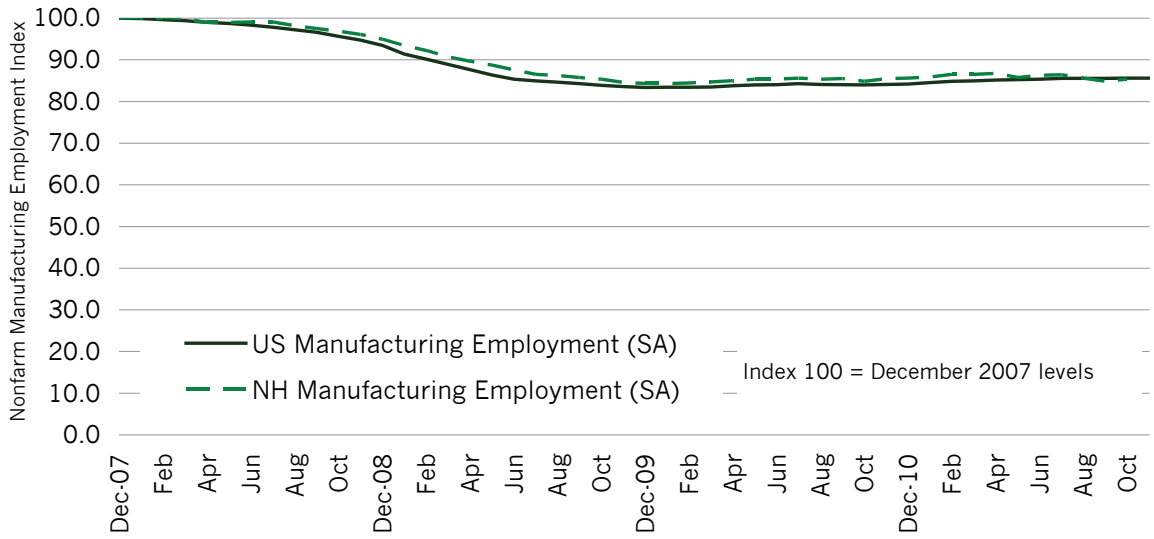
Table of Contents

Introduction

While the Great Recession caused a steep downturn in manufacturing employment, both nationwide and in New Hampshire, *Manufacturing* remains New Hampshire's third largest sector. accounting for 12.8 percent of total private employment in 2010. In October 2011, there were 66,100 nonfarm *Manufacturing* jobs in New Hampshire. The manufacturing sector is a large consumer of energy and tends to produce substantial volumes of waste, so focusing on the ways to become more energy efficient and reduce waste can be essential for success. For some businesses, energy efficiency and waste reduction are the result of an altruistic green philosophy on the part of owners or executives. But most have found that increasing prices for energy and materials mean that reducing energy use and reusing production inputs contribute measurably to cost cutting.

Nonfarm Manufacturing Employment, Indexed to December 2007 Levels



Green Manufacturing

The Manufacturing sector consists of establishments that produce goods usually sold on the wholesale market instead of directly to domestic consumers. The North American Industrial Classification System (NAICS) classifies manufacturing into 21 subsectors, depending on output.

The US Bureau of Labor Statistics (BLS) has identified green industry groups in 14 of the 21 manufacturing subsectors. Some of the *Manufacturing* industry groups considered green are:

- *Petroleum and coal products manufacturing*, which includes the production of asphalt shingles and coating materials, manufacturers that produce LEED™ eligible roofing asphalt, a sustainable building product;
- *Machinery manufacturing*, which includes the production of alternative energy products such as wind turbines and electric lawnmowers;
- *Computer and electronic product manufacturing*, which includes the production of Energy Star® products and solar cells.[1]

Yet simply identifying a manufacturer as green because it is engaged in a green manufacturing industry does not tell the whole story. Green manufacturing might occur in any manufacturing establishment because green manufacturing includes both the production of green products and the use of energy-efficient or environmentally responsible production processes. Establishments engaged in green manufacturing processes are those that continue to produce the same product, which may or may not be green, but have integrated energy efficient and resource conservation practices into the production process.

One example of a business using a green process is Velcro USA. This company produces hook and loop products, which by themselves are not considered green. However, the company decided to adopt more lean production processes, thus making it a green business. The company also chose to reduce energy use by self-generating all electrical and thermal power at its New Hampshire headquarters, and then recapturing excess heat left over from the electricity generation process.[2]

1. Green Goods and Services Industries by NAICS Code. 24 Aug 2010. Bureau of Labor Statistics. 4 Jan 2010. <www.bls.gov/green/industry_by_naics.pdf>.
2. Sustainability. Velcro USA. 3 Jan 2010. <www.velcro.com/index.php?page=sustainability>.

Guidelines for Greening the Manufacturing Process

The incentive for private business to embrace green manufacturing processes usually comes down to the bottom line — it reduces business operation expenses. Businesses have also discovered that customers approve of, and in some cases demand, resource conservation and environmental stewardship. Certifications have been developed that identify manufacturing businesses as having incorporated renewable energy, energy efficiency, and environmentally responsible practices. Strategies, guidelines and certifications for green manufacturing processes have been developed by private business as well as state and federal government agencies.

Below are some of the ***green certifications and trainings*** that have been attained by New Hampshire companies and their employees.

- ***Lean Manufacturing*** systematically decreases waste from all aspects of the manufacturing process by eliminating processes where resources used do not result in value added to the product.[3] Since the streamlining process reduces waste it can also, but not always, minimize pollution and environmental impacts, correlating lean with green.[4] Lean production can reduce the marginal cost of implementing an Environmental Management System, and thereby improve a company's environmental performance.
- ***Six Sigma*** is a quality improvement method for manufacturing processes.[5] Practitioners are ranked using a martial arts-style hierarchy to indicate roles and responsibilities.[6] Green Belt status usually requires ten days of training; Black Belt status requires 18 days of training. Participants must complete project work and pass an exam to achieve Six Sigma certification.[7] Six Sigma statistical methods analyze a manufacturer's processes to improve control and reduce process variation, scrap, and rejects. Six Sigma is considered a green manufacturing process because by removing process variations there are fewer defects, less waste, less inputs needed, and less energy is consumed.[8]

3. "Environmental Benefits and Shortcomings." Lean & Environmental Performance. United States Environmental Protection Agency. 24 Nov 2010. <www.epa.gov/lean/performance/>.
4. King, Andrew A. and Michael J. Lenox. "Empirical examination of the relationship between lean production and environmental performance." Production and Operations Management. Fall 2001; 10, 3: pg 244.
5. Originally developed at Motorola in 1986 with the specific goal of reducing production defects.
6. "Six Sigma: A Brief History." Six Sigma. 24 Nov 2010. <www.sixsigmaonline.org/six-sigma-training-certification-information/articles/six-sigma-a-brief-history.html>.
7. "Six Sigma." Performance Based Training. New Hampshire Manufacturing Extension Program. 24 Nov 2010. <www.nhmep.org/performance_based_training.html#six_sigma>.
8. "Lean Thinking and Methods." Lean Manufacturing and the Environment. United States Environmental Protection Agency. 24 Nov 2010. <www.epa.gov/lean/thinking/sixsigma.htm#implications>.

- An ***Environmental Management System*** (EMS) is a voluntary way for an organization to develop and maintain environmental policies. Beyond being green, there are multiple reasons for an organization to adopt an EMS: reduced liability, increased competitive advantage, improved compliance, reduced costs, fewer accidents, and the ability to meet customer requirements.[9] For many customers, environmental responsibility signifies that a business is reputable and reliable.
- ***ISO 14001*** certifications require meeting a set of environmental management standards established by the International Organization for Standardization. These standards contain the requirements and guidelines for an EMS and set standards for all environmental aspects of labeling, performance evaluation, auditing, life cycle analysis, and communication.[10] Businesses obtain ISO 14001 Certification through a third party auditing process. Once complete, certification is valid for three years. The cost of the process varies, but benefits include greater efficiency, reduced materials and lower operating costs.[11]

The following ***certifications and trainings*** apply to a company and their products:

- ***Forest Stewardship Council***® (FSC) Certification can apply to a company or to the manufactured products themselves. Forest Stewardship Council (FSC) Chain of Custody certifies that a wood or paper product can be tracked from the forest through each stage of manufacturing to its final distribution.[12] There are three FSC product labels:
  - ***FSC Pure label*** identifies a 100 percent FSC certified product group.
  - ***FSC mixed label*** includes FSC products mixed with controlled wood. This label started in response to supply shortages of FSC products.
  - ***FSC recycled*** means the product is sourced from 100 percent recycled content.

9. "Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations." 2nd edition. 2001. United States Environmental Protection Agency. 24 Nov 2010. <www.epa.gov/owm/iso14001/ems2001final.pdf>.
10. "ISO 14000 Essentials." ISO 14000 – Environmental management. International Organization for Standardization. 24 Nov 2010. <www.iso.org/iso/iso_catalogue/management_and_leadership_standards/environmental_management/iso_14000_essentials.htm>.
11. Paramasevam, Gunalan. "Cost Benefit Analysis for Implementation of Environmental Management Systems." International Symposium on Environmentally Conscious Design and Inverse Manufacturing (EcoDesign'01), 2001.
12. Forest Certification Matrix. 11 Oct 2010. Forest Certification Resource Center. 28 Jan2011. <www.thepaperlifecycle.org/forests/in_depth/forest-certification-matrix>.

In all three cases, a company manufacturing FSC products must be FSC certified, create an extensive documentation system and train workers to track all FSC products. At the start of 2011, there were 57 organizations in New Hampshire that had received third party accreditation as FSC certified.[13] The program is globally recognized, but is not without critics. Organizations such as FSC-Watch, and the Swedish Society for Nature Conservation question the program's effectiveness.

- ***USDA Organic Certified*** foods are included in many definitions of green products because organic farming methods contribute to environmental sustainability. The United States Department of Agriculture (USDA) certifies animal and crop food products as organic. In order to obtain or maintain a USDA organic certification, farms growing crops such as vegetables, fruits, and grains may not spray with insecticides or pesticides, ensuring that land and food sources remain chemical free. Farms raising animals must feed organics and have restrictions on antibiotic use. Because of that restriction, sanitation and cleanliness standards must be kept at a high level to prevent illness.

13. FSC Certification Database. Forest Stewardship Council. 28 Jan 2011. <info.fsc.org>.

Green Certifications & Training

Certification	Type	Training Organization	Resources
Lean Manufacturing	Company & individual training	NH MEP	www.nhmep.org
Lean Green & Energy	Company	NH MEP in collaboration with DES, GDS, EPA	www.nhmep.org
Lean Enterprise Certificate Program	Individual	NH MEP with Community Colleges: Great Bay, Manchester, River Valley, and Nashua.	www.nhmep.org
Six Sigma	Individual	NH MEP Great Bay Community College	www.nhmep.org www.greatbay.edu/pdf/btc/Lean.pdf
EMS	Company & individual training	NH MEP	www.nhmep.org
ISO	Company & individual training	NH MEP	www.nhmep.org
FSC FSC Chain of Custody	Company & Product	KPMG PricewaterhouseCoopers LLP (PWC) QMI-SAI Global Assurance Services Scientific Certification Systems	www.kpmg.ca www.pwc.com/fpp www.qmi.com www.scscertified.com
Organic	Company & Product	NH Dept of AG Markets & Food Producers or handelers USDA, National Organic Program	www.nh.gov/agric/divisions/markets/documents/organic-producer-directory.pdf www.usda.gov/wps/portal/usda/usdahome?navid=ORGANIC_CERTIFICATIO

Note: This listing does not constitute an endorsement or advertisement.

New Hampshire Business Outreach Programs with Focus on Efficiency

The State of New Hampshire has developed business outreach programs that encourage businesses to improve energy efficiency and streamline manufacturing processes.

- The *NH Business Resource Center* provides information on Energy Efficiency Programs including free assistance, low interest loans, rebates, and energy audits that aim to increase energy efficiency and the use of renewable energy for New Hampshire companies.[14] One notable program is the Pay for Performance Program (P4P) funded by the Greenhouse Gas Emissions Reduction Fund (GHGERF), which addresses energy efficiency needs of the commercial and industrial sectors.
- The *New Hampshire Manufacturing Extension Partnership* (NH MEP) leverages public and private resources with the goal of strengthening global competiveness of United States manufacturers. NH MEP offers training, programs, events, and resources for local manufacturers.[15] Recently, NH MEP began offering Lean, Green, and Energy, a partnership program with New Hampshire Department of Resources and Economic Development, and GDS Associates. The program helps manufactures achieve energy savings by incorporating Lean production processes. This unique program has shown great success so far.[16]
- The *New Hampshire Department of Environmental Services* (DES) offers an Environmental Management Systems (EMS) Program. This program educates companies about the role and benefits of creating an EMS and ISO certifications.[17]
- The *New Hampshire Job Training Fund* grants funds to eligible New Hampshire manufacturers for employee training.[18] To date, a large share of training made possible by the fund has been related to Lean manufacturing.[19] Other common training courses include Six Sigma, Leadership, and ISO training, all of which are related to efficient manufacturing processes.

14. Energy Efficiency Programs. New Hampshire Business Resource Center. 8 Feb 2011. <www.nheconomy.com/business-services/energy-efficiency-programs.aspx>.
15. New Hampshire Manufacturing Extension Partnership. 8 Feb 2011. <www.nhmep.org>.
16. Personal communication. Zenagui Brahim, Executive Director, New Hampshire Manufacturing Extension Partnership (MEP). 20 Dec 2011.
17. Overview. Environmental Management Systems Program. New Hampshire Department of Environmental Services. 8 Feb 2011. <des.nh.gov/organization/commissioner/p2au/pis/emsp/categories/overview.htm>.
18. New Hampshire Job Training Fund. 24 Nov 2010. <www.nhjobtrainingfund.org>.
19. "Report of Activities (Cumulative, October 2007 – May 2010)." New Hampshire Job Training Fund. 8 Feb 2011. <www.nhjobtrainingfund.org/new%20hampshire%20job%20training%20fund%202010.pdf>.

Federal Initiatives to Promote Good Environmental Practices

The US Environmental Protection Agency (EPA) has launched several environmental programs, which are aimed at reducing an organization's environmental impacts while offering benefits such as reducing operating costs and increased marketing opportunities. The programs are voluntary and can be utilized by businesses, non-profits, and government organizations.

- The ***SmartWay*** program offers several ways for the freight transportation industry to reduce emissions and fuel costs, such as lowering fuel consumption by reducing speed, reducing idling or using more direct routes. In addition EPA-designated SmartWay tractors and trailers are outfitted with fuel reducing technologies prior to purchase.[20]
- The ***WasteWise*** Program aims to eliminate municipal solid waste and select industrial wastes. Benefits of joining the program include technical assistance, access to web-based tracking tools, educational materials, and more.[21]
- The ***Green Power Partner*** program supports organizational procurement of green power with expert advice, technical support, tools and other resources. Green power is electricity produced from renewable resources such as wind, solar, geothermal, biomass, and low-impact hydro.[22]

20. SmartWay. United States Environmental Protection Agency. 30 Jan 2011. <www.epa.gov/smartway/>.
21. Wastes - Partnerships - WasteWise Program. United States Environmental Protection Agency. 8 Feb 2011. <www.epa.gov/epawaste/partnerships/wastewise/>.
22. Green Power Partnership. United States Environmental Protection Agency. 8 Feb 2011. <www.epa.gov/greenpower/>.

New Hampshire's Green Businesses

What efforts are New Hampshire manufacturers making to implement green processes in their companies and what impact does implementation have on their workers? Some of New Hampshire's manufacturers were examined more closely to find out.

Certified Green Processes

Some New Hampshire manufacturers are certified as International Organization for Standardization (ISO) 14001. The ISO 14001 certification includes compliance with all relevant legislation, permits, and licenses. After passing the extensive third-party inspection process to become certified, the company must then pass internal audits including the management process, training systems, emergency plans, and the functionality of the company's Environmental Management System (EMS). The following three profiles illustrate what these companies gain from creating an EMS and obtaining ISO 14001 certification.

Approximately 1,000 potentially green firms were identified by the New Hampshire's Employment Security's Economic and Labor Market Information Bureau (ELMI). These firms were stratified throughout New Hampshire and included many different industries. ELMI researchers contacted thirty businesses in the manufacturing industry and discussed each firm's green processes, practices and products. The following profiles highlight some of the green practices in New Hampshire but are not all-inclusive.

For more information about the methodology of the green firms list, see New Hampshire Green Jobs Survey, Appendix 1 pg 20. <www.nh.gov/nhes/elmi/pdfzip/specialpub/green/green-survey.pdf>.

Windfield Alloy Inc., Atkinson, NH

Windfield Alloy is a single source recycling facility. The industry is extremely competitive, but Windfield Alloy maintains a Zero Landfill goal while providing "One Stop" recycling for small or large businesses. The company can de-manufacture and recycle almost any material. The company's ability to adapt to constant changes within the scrap industry was featured in *Recycling Today* magazine.[23]

Windfield Alloy's ISO certified Environmental Management System (EMS) supports the company's growth and customer needs. The company's ISO 14001 certification provides a globally recognized level of environmental commitment and accountability.

According to Wendell Iby, Windfield Alloy's Director of Human Resources, Environmental Health and Safety, maintaining the ISO 14001 certification at their New Hampshire facility has generated greater communication between the company's management and division leaders, leading to enhanced safety and the company's ability to achieve larger goals. As the management team developed new environmental policies and procedures, a process was formed to disseminate information to all laborers, creating environmental training protocols for existing and new workers. Now, workers receive training in environmental policy and awareness, air emission responsibilities, storm water pollution prevention, waste identification, and the handling, storing, and shipping/receiving of hazardous waste. Workers are also aware of record keeping and safety and emergency procedures.

The EMS promoted changes in the infrastructure of the company's facility as well. Windfield Alloy reduced energy use by replacing lighting and heating elements. The facility reduced overall water consumption by reusing biodegradable water in their fire safety systems. Recently, the company reduced fossil fuel consumption by reusing oil from their manufacturing machinery as heating oil and by purchasing more efficient smelting equipment.[24]

23. "The Sum of its Parts" Features- Scrap Industry News. Recycling Today Magazine. March 3 2008. http://www.recyclingtoday.com/Article.aspx?article_id=20968 Accessed December 2011.

24. Iby, Wendell. Windfield Alloy. Personal interview. 8 Dec 2010.

EMD Millipore Corporation, Jaffrey, NH

EMD Millipore Corporation is a biomanufacturing and life science research firm that implemented an EMS and received ISO 14001 certification approximately 10 years ago. In order to gain ISO 14001 certification, EMD Millipore Corporation developed processes that continuously identified opportunities to reduce environmental impacts and implemented tools to track sustainability progress. As the EMS evolved, the workers' tasks also changed. For example, procedures for handling wastes, recycling, and conserving natural resources were integrated into operating procedures. Now workers need to understand the key components of EMD Millipore Corporation's Environment, Health and Safety Policy and demonstrate an understanding of how their work impacts the environment. Orientations for new hires include an overview of the company's EMS, and EMS General Awareness training is given to workers on an annual basis.[25] The company also uses Lean manufacturing and Six Sigma tools to streamline their manufacturing processes, which in turn drives process improvements that reduce environmental impacts and improves worker safety.

There have been structural and system changes at EMD Millipore Corporation as well. Over the last decade, EMD Millipore Corporation attained significant savings in water consumption by creating water management systems. The company reduced their energy consumption by changing lighting, heating, and cooling elements. To reduce carbon emissions, the company made an effort to convert their transportation fleet to hybrid vehicles. In 2006, 30 percent of the company's United States transportation fleet consisted of hybrid vehicles. Recently, the company increased opportunities for product recycling. The company has also started to incorporate LEED green building practices into their manufacturing spaces.[26]

25. Healey, Cait and Ryan Cameron. EMD Millipore Corporation. Personal communication. 15 Dec 2010.

26. Sustainability - a Responsibility and an Opportunity. EMD Millipore Corporation. 22 Dec 2010. <www.millipore.com/sustainability/flx/sustainabilityhome/>.

Monadnock Paper Mills, Inc., Bennington, NH

Monadnock Paper Mills has a long-standing tradition of environmental stewardship. The mill is the oldest continuously operating paper mill in America. Throughout the years, the company expanded into three different markets: technical and specialty papers, non-woven media, and premium graphic arts and packaging papers. In 2006, Monadnock Paper Mills became the only premium uncoated text and cover paper mill to achieve ISO 14001:2004 certification.[27] The ISO certification requires the company to maintain an ambitious Environmental Management System (EMS). The EMS involves all levels of the organization, and teaches workers to understand how their job duties may potentially impact the environment. Monadnock Paper Mills uses a team-based approach to help identify those impacts and set goals for impact reductions. Employees work closely together to reach those goals.[28] Results of previous EMS sustainability programs include reducing operating expenses by $500,000 over a two year period.[29]

Situated on the banks of the Contoocook River since 1819, being green is not new to Monadnock Paper Mills. In 1974, the company began operating a wastewater treatment facility, improving water quality in the Contoocook River. By 2001, the company was able to reprocess and recycle 100 percent of the wastewater treatment facility's solid waste, creating agricultural compost and animal bedding for local farmers. Over the last decade, the company has introduced two lines of premium recycled paper, upgraded lighting systems to significantly reduce energy usage, reduced emissions and oil usage, and increased their internal recycling by 75 percent. The company received Forest Stewardship Council® (FSC) certification in 2004.[30] Now, all printing and packaging paper lines are FSC certified, meaning the wood pulp with which the paper is made is harvested and processed responsibly as documented throughout the supply chain from forest to pulp producer to paper mill. Employees are educated about the supply chain of custody for all incoming raw materials.[31] Graphics and packaging papers are manufactured carbon-neutral and made with 100% renewable electrical energy.[32]

27. Monadnock Paper Mills. 17 Dec 2010. <www.mpm.com>.
28. Verney, Geoff. Personal Interview. 7 Feb 2011.
29. NH Businesses for Social Responsibility, Spring Conference 2008. Monadnock Paper Mills. 8 Feb 2011. <www.nhbsr.org/uploads/triple-bottom-line/triple-bottom-line-monadnock-paper.pdf>.
30. About Us: History. Monadnock Paper Mills. 8 Feb 2011. <www.mpm.com/graphicarts/about_us/history/>.
31. Verney, Geoff. Personal Interview. 7 Feb 2011.
32. "Monadnock Joins EPA Climate Leaders." Techinical Papers. 2 Jun 2008. Monadnock Paper Mills. 10 Oct 2011. <www.mpm.com/technical/news/technical_news/epa_climate_leaders/>.

Green Processes in Food and Beverage Production

The manufacture of food and beverages presents a different array of challenges in green production. Many food and beverage production facilities use high amounts of energy and produce large amounts of waste. Whether raising animals or growing crops, farms and production facilities can contribute to soil erosion, or use large amounts of chemicals and pesticides that contaminate groundwater. One of the following profiles looks at organic manufacturing as part of the solution; while the other profile looks at streamlining production processes to reduce resource consumption and environmental impacts.

Pete and Gerry's® Organic Eggs, Monroe, NH

Pete and Gerry's® is an egg production farm that houses about 120,000 chickens. The farm has adopted many automated processes to expedite collection, washing, and packaging of eggs, allowing workers to be more productive. As a certified organic farm, eggs must come from chickens raised without hormones, antibiotics or pesticides. USDA Certified Organic Farms raising animals must feed organics and have restrictions on antibiotic use. Because of that restriction, sanitation and cleanliness standards must be kept at a high level to prevent illness. Maintaining both cage free and healthy hens, while keeping the large number of hens required for daily egg production, depends heavily on either physical labor or mechanization. Pete and Gerry's® chose to embrace mechanization as a way to both house more chickens under organic conditions while increasing egg production. Chickens are fed and watered mechanically through an automated and mechanized computer system. Nesting boxes, used for egg laying, are tilted back slightly to allow the egg to roll onto a conveyor belt system which aids in egg collection and packaging. Prior to adoption of mechanization, conveyor belts were controlled by hand, limiting and slowing the efficiency and speed of the workers. With a computer system controlling egg flow, multiple barns can be processed simultaneously versus only one barn at a time by hand. Where automation has replaced tasks, workers have moved into other responsibilities. Egg production, collection, and packaging are all centrally located on one farm, often allowing eggs to be on store shelves the next day. Through automation and increased efficiency, this business had seen a 25 percent growth rate up to 2009 and maintains a daily output of 80,000 to 90,000 eggs with a staff of 20 people.[33] Pete and Gerry's® holds several certifications, including New Hampshire and USDA Organic certifications as well as Certified Humane approval. Organic products are free from antibiotics and artificial growth hormones, as well as genetically modified organisms

33. Happy Cluckers. May 2010. Pg. 1. American Agriculturist. 29 Nov 2010. <magissues.farmprogress.com/AMA/AM05May10/ama001.pdf>.

(GMOs). Consumer demand for organic, sustainable or free range meats and farm products is growing. The demand for organic products is providing incentive for food producers to modify practices to become more sustainable.

Anheuser-Busch, Merrimack, NH

Anheuser-Busch, a beer manufacturer, with a facility in Merrimack, New Hampshire has fostered environmentally responsible practices since its inception in 1860. Large scale beer manufacturing requires extensive amounts of energy and water. Anheuser-Busch employs a Bio-Energy Recovery System (BERS) which "turns the nutrients in wastewater from the brewing process into renewable biogas."[34] This system reduces and avoids greenhouse gas emissions by reducing the amount of fossil fuels that would otherwise be needed. In 2007, the company joined the U.S. Environmental Protection Agency's Climate Leaders program, promising to reduce their greenhouse gas emissions by five percent between 2005 and 2010. Through employee dedication and use of alternative fuels, Anheuser-Busch met the goal in 2009 — one year ahead of schedule — and further plans on reducing emissions to 15 percent below 2008 levels by 2013.[35] Anheuser-Busch aims to reduce energy use by 10 percent per hectoliter of product by 2012 and strongly supports the use of alternative forms of energy. This includes the use of biogas from area landfills at its Houston brewery, which, combined with the site's BERS system, should provide 70 percent of fuel needs, as well as installation of renewable energy in two separate production facilities in Fairfield, CA and Newark, NJ. When combining the two solar arrays Anheuser-Busch is one of the largest users of solar power in the U.S. brewing industry.[36]

Beverage manufacturing is a water-intensive industry, and beer manufacturing is no exception. Between 2004 and 2009, Anheuser-Busch reduced water use by 32 percent, saving 23 billion liters of water.[37] The company aims to reduce the amount of water used to produce their product to 3.5 hectoliters per hectoliter of product.[38] Anheuser-Busch has stated a commitment

34. Energy Conservation. Environment. Anheuser-Busch. <www.anheuser-busch.com/s/index.php/our-responsibility/environment-our-earth-our-natural-resources/energy/>.
35. Ibid.
36. Ibid.
37. Global Citizen Report 2008-2009. Page 94. Anheuser-Busch. 21 Dec 2010. <www.anheuser-busch.com/pdf/US_Section_of_the_Citizenship_Report.pdf>.
38. Global Citizen Report 2008-2009. Page 93. Anheuser-Busch. <www.anheuser-busch.com/pdf/US_Section_of_the_Citizenship_Report.pdf>.

to reducing water usage and encouraging employees to "actively [look] for opportunities to reduce water use throughout the brewing and packaging processes."[39] This company has been an environmental leader since its inception and takes environmental activism seriously. Recycling of aluminum cans began over thirty years ago, and today over 99 percent of all solid waste is recycled. The corporate culture of this company is one that encourages and expects sustainable practices as a way to improve both the bottom line and be environmentally responsible.

Green Processes in Wood Product Manufacturing

Wood products manufacturing businesses contend with intense global competition. To distinguish their products, many New Hampshire manufacturers offer extensive customer service, product customization, and products that use environmentally sustainable harvesting methods.[40] The following organizations are working toward these goals:

The ***Regional Wood Products Consortium***, a collaboration between wood products manufacturers and Sustainable Forests Futures (SFF), is an organization promoting a sustainable and competitive forest economy in Maine, Vermont, New Hampshire and northern New York. The consortium offers workshops and training opportunities, with the goals of fostering economic competitiveness, generating innovative opportunities, improving efficiency, utilizing technology effectively, and strengthening access to markets.[41, 42]

The ***Wood Education and Resource Center (WERC)***, created by the US Forest Service, promotes opportunities for improved efficiency, biomass for energy, and value-added products. WERC's recent projects include creating National Skills Standards for woodworkers administered through the Woodwork Career Alliance.[43] These credentials create measurable standards; designed to train and retrain workers in operational procedures, including the latest woodworking machinery and techniques. Completion of the educational program awards woodworkers with a "Woodwork Passport," a permanent record of competency in tool and machine operations.[44] Since there is a lack of uniform training standards in the industry, the passport is designed to help skilled workers distinguish themselves in the work force.

39. Water Conservation. Environment. Anheuser-Busch. 21 Dec 2010. <www.anheuser-busch.com/Environment/water.html>.
40. Woodward, Collin. Sustainable Forest Futures. Phone interview. November 2010.
41. Regional Wood Products Consortium. Sustainable Forest Futures. 21 Dec 2010. <www.foresteconomy.org>.
42. Miller, Collin, Director of Wood Products Initiative. Sustainable Forest Futures. Personal Communication 6 Dec 2010.
43. Wood Education and Resource Center. U.S Forest Service. Northeastern Area. 11 Oct 2011. <www.na.fs.fed.us/werc/>.
44. Woodwork Career Alliance of North America. 28 Jan 2011. <www.woodworkcareer.org/>.

The following profiles highlight New Hampshire wood manufacturers using two different types of sustainable harvesting methods.

New England Forest Products, Inc., Greenfield, NH

In 1993, New England Forest Products opened a lumber supply business. The owner, Dave Buxton, is a licensed professional forester who utilizes good forest management practices. Consequently, his company has always promoted and used sustainable forest practices, while continually increasing manufacturing efficiency.

New England Forest Products (NEFP) originally shipped lumber out of state for additional processing, but in 1997, the company decided to invest in equipment upgrades to increase the effectiveness and productivity of the mill. Unfortunately, that same year the upgrades and the mill were destroyed by a tornado, but with the help of a local builder and steel company, the mill was up and running again in six weeks.[45] The new renovations enabled in-house processing, eliminating transportation costs and reducing the wood products' carbon footprint. The company has purchased kilns to dry lumber on site, eliminating the need to transport wood to another location. Now, NEFP is involved in the entire production process from start to finish, beginning with the harvested tree, through the de-barking process, to lumber drying, then building value-added products such as flooring, sheds, paneling, and stair treads. Another benefit of retaining control of the entire manufacturing process is the ability to turn waste products into a commodity. At NEFP, sawdust waste is sold to a local company for wood pellet production, and residuals from the debarking process is sold as bark mulch for landscaping, an organic, dye-free, and pesticide-free product. The company sells directly from the mill to buyers and added a retail showroom to their business model in 2008. Because the wood comes from local sustainably managed wood lots, NEFP wood products have been used for LEED® certified building projects.[46]

45. About Us. New England Forest Products. Jan 2011. <www.neforestproducts.com>.

46. Buxton, Deb. Phone Interview. 21 Dec 2010.

Young Furniture Manufacturing, Inc., Bow, NH

Young Furniture was founded in 1980 in Manchester. By 1986, the company had quickly outgrown its original location and moved to a larger, more efficient facility in Bow. Young Furniture expanded several times over the next two decades, offering new products and expanding their wood species selection. The company was active in choosing responsible suppliers and used locally sourced wood when possible. By April 2008, the company became Forest Stewardship Council (FSC) certified and began offering a line of products built from FSC wood. The FSC line provides customers with the option to purchase cabinetry constructed from wood grown using minimal impacts on the world's remaining forests and qualify for LEED building projects.[47] As of yet, consumer demand and awareness for FSC wood is not where the company had hoped it would be, but receiving the certification has given the company opportunities that it would not have had otherwise.[48]

In addition to using sustainable inputs, Young Furniture improved operational and work efficiency by sending key personal to classes on manufacturing techniques and reduced waste by remanufacturing wood scraps into smaller components. Now, even non-reusable scraps are used to heat the facility with wood-fired boilers. Plywood is made with formaldehyde-free adhesive so it is safe to burn. Paul Oppold, the Director of Marketing, stated that "it makes good business sense to not handle material more than necessary or create more waste than necessary."

47. Our Company History. Young Furniture. 7 Feb 2011. <www.youngfurnituremfg.com/company/company-history.html>.
48. Oppold, Paul. Young Furniture. Personal communication 22 Dec 2010.

Conclusion

A description of various green manufacturing processes was developed through profiles of seven companies located in New Hampshire. These companies fell into different areas of manufacturing. Several of these companies were considered green due to the products they were manufacturing, while the rest were not producing green products. However, since all of the companies continuously evaluated their production processes making them leaner and greener, all can be considered green companies. In addition to looking for ways to become more efficient in manufacturing processes, some of these companies evaluated their business practices and started using greener practices in addition to using green processes. Examples of green practices are use of waste products from the manufacturing process to heat a building or to generate electricity. For New Hampshire manufacturers, containing costs while producing high quality products often makes a company competitive and sustainable at the same time.

There are various types of incentives, resources, and industry-specific organizations available to help manufacturing companies that want to achieve greater energy efficiency or resource conservation. Many manufacturing firms in this study reported that incorporating sustainable practices into their business had a positive impact throughout the business. One way these businesses improved their sustainability was sending workers to training programs aimed at streamlining production processes.

To date, "green" is still a somewhat amorphous concept. And to measure the full extent of green manufacturing remains a difficult task because there is no over-arching green stamp for manufacturers. This is due in part to the fact that manufacturers can produce all types of goods and to define green for all possible products would be an endless list. To illustrate the point, products can be certified green based on how they are sourced, inputs used, handling methodologies and tracking; or for the product's increased efficiency, for life cycle sustainability, or for other reasons.

Most people agree that environmental responsibility, reducing waste, and energy conservation are positive goals. But achieving these goals are not limited to specific industries or occupations. Businesses are not excluded from being green by the goods they produce or the services they provide, and for most, embracing some form of energy efficiency or waste management is beneficial to their bottom line. Individuals can engage in energy conservation and waste reduction practices, both in their daily lives and in their workplaces. And as long as the benefits of being green outweigh the cost, the adoption of green practices will continue to grow.