



AGRICULTURAL UTILIZATION RESEARCH INSTITUTE  
PHASE I & II RESEARCH: TALENT DEVELOPMENT ISSUES & OPPORTUNITIES IN THE BIOFUELS INDUSTRY

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# EXECUTIVE SUMMARY

Workforce recruitment and training have been identified as two of the most pressing challenges in the biofuels industry today. In order to provide a better understanding of the needs and priorities in talent development, a two-phase research study was undertaken with key industry stakeholders and plant management at ethanol and biodiesel plants. The findings of the study, highlighted below, offer valuable insights regarding the obstacles, opportunities and priorities in hiring, training and developing productive talent.

## **CHALLENGES AND PRIORITIES IN THE BIOFUELS INDUSTRY**

- Talent availability and development represent two of the most significant challenges within the ethanol and biodiesel industries, ranking higher in priority than technology or public policy.
- Employee turnover is an issue, particularly within upper management; experienced plant managers and general managers are at a premium.
- Increased, and more accelerated, training for production/operations staff would be most beneficial in helping plants improve and grow.
- Industry leaders and plant managers recognize the challenge and importance of increasing interest and awareness of career opportunities within biofuels.

## **AVAILABILITY OF QUALIFIED TALENT**

- Production employees are much less likely than management staff to have a two-year college or technical degree and are very unlikely to have a four-year degree.
- The majority of management employees hold a four-year college degree and hold the most hard-to-fill positions within biofuels.
- While major ethanol and biodiesel plant development/management companies have developed their own recruitment and training programs out of necessity, smaller plants struggle the most to recruit and develop qualified employees.

### **CURRENT TRAINING SITUATION**

- On-the-job training is the primary way in which most plants provide education to their own, and other, plant employees.
- Plants currently face a number of obstacles in providing training on the job, including having a lack of qualified training resources and limited time to provide such.
- The biofuels education programs that currently exist widely differ in their approach, ranging from short-term intensive training to customized curricula at individual plants or all-online programs.

### **HIRING AND RECRUITMENT PREFERENCES AND LIMITATIONS**

- Currently, academic degrees are required for laboratory and engineering positions but are not considered a prerequisite for production/operations staff.
- Biofuels companies are looking for employees who have a basic understanding of the production process, science, mechanics and instrumentation.
- Concerned about retaining already hard-to-find employees, some plants prefer hiring local individuals, even if they lack qualifications.
- Plants prefer to hire new employees who possess multi-disciplinary skills, including leadership, experience in equipment operation and understanding of the manufacturing process/technology.
- Educational programs for operations staff could help compress the productivity timeline.

### **PREFERRED TRAINING METHODS AND SUBJECT AREAS**

- Training delivery methods that accommodate long-distance education are acceptable and deemed effective by the industry, particularly in combination with some hands-on experience. Online coursework is most preferred as an alternative to on-the-job training.
- Hands-on experience is a crucial component to employee training, with a number of plants willing to provide internships and in-plant experiences for students.
- Industry stakeholders place high importance on having courses taught by someone who has industry experience and stays in touch with the biofuels industry.
- Plants do not have a strong preference as to what season or time of day employee training is offered.
- Management is willing to actively encourage and, for the most part, financially support their employees' additional training through a college or university if such training does not interfere with employees' work schedule and earns them a degree or technical certification.
- Industry representatives say they are interested in working with colleges and universities on a consulting basis, as well as in talent development.

- Management staff are felt to be a group who could benefit from additional training in leadership skills, environmental and compliance issues, and safety training.

#### **LONG-TERM HIRING NEEDS**

- As the industry develops in the next five years, ethanol and biodiesel employees will need new or additional skills in environmental and compliance issues, safety, cellulosic ethanol, and fractionation training.
- Ethanol and biodiesel plants anticipate hiring more staff in both management and production in the next two years.



# PROJECT GOALS

The Agricultural Utilization Research Institute (AURI) is a unique and innovative nonprofit corporation working to enhance Minnesota's economy through the development of new uses and markets for the state's agricultural products. By providing feasibility analysis, product development assistance and technical support, AURI is helping Minnesota companies move value-added products into the marketplace. The biodiesel and ethanol industries – which produce fuels made from renewable resources – are among the entities the Institute serves.

AURI has identified that biodiesel and ethanol plants appear to have significant needs – such as workforce training and technology – that are impeding development. To help address these concerns and others, AURI has begun discussions with state educational institutions to explore how meaningful resources and solutions can be provided to the biodiesel and ethanol industries. While these educational organizations have strong interest in providing such, at the same time, they must gain an understanding of specifically what the existing needs are and what measurable interest there would be in continuing education opportunities.

To help provide a greater understanding of the issues and their scope, AURI identified the need to undertake research designed to accomplish the following objectives:

**DETERMINE WHAT ETHANOL AND BIODIESEL PLANTS SEEK IN INCOMING MANAGEMENT STAFF PREPAREDNESS** and what demand for hiring lies ahead.

**UNDERSTAND WHAT TRAINING NEEDS EXIST AMONG CURRENT PLANT EMPLOYEES** and project likelihood that employers would underwrite continuing education.

**GAUGE WHAT OTHER ISSUES – SUCH AS TECHNOLOGY, ETC. – ARE IMPEDING PLANT PROGRESS** and how such compares in priority to education/training.

**HELP VISION WHERE THE INDUSTRY IS HEADED IN THE FUTURE** in terms of growth, manpower development and production.

**DETERMINE THE MOST BENEFICIAL MEANS OF EDUCATION DELIVERY** (classroom, online, etc.).

# METHODOLOGY

To best accomplish the project goals, a two-phase research approach was undertaken: qualitative interviews with industry experts, followed by quantitative research with individual plant management.

## **PHASE I: ONE-ON-ONE INTERVIEWS**

Telephone interviews with key leaders were conducted in the biofuels industry to determine the outlook for industry growth, current talent development issues, and the best methods of educating and training the workforce for this dynamic and rapidly growing industry. A questionnaire was developed by Russell Herder with input from the Agricultural Utilization Research Institute. Actual interviews were conducted by David & Associates, a Nebraska-based firm with extensive biofuels background, under the direction of Russell Herder. In addition, Russell Herder conducted videotaped on-site interviews with management at FUMPA Biodiesel Plant in Redwood Falls, Minn., CVEC Ethanol Plant in Benson, Minn., and with a biofuels industry recruiter in Minneapolis, Minn. The purpose of the qualitative discussions was to provide critical insight for development of a subsequent quantitative survey with biofuels plant management.

Specifically, the one-on-one interviews with industry experts were designed to...

- Identify emerging trends and challenges in renewable fuels production that are related to workforce development and technical production issues.
- Define the current situation as it relates to the workforce in the renewable fuels industry and get an indication of the level and type of need over the next several years.
- Define characteristics of the renewable fuels industry that differentiate its employees' skills and management requirements from other manufacturing facilities.
- Identify technical challenges that are impeding efficiency and profitability in renewable fuels manufacturing including, but not limited to, consistency of distiller's grains, variances in the quality of biodiesel, use of water within a manufacturing facility, efficiency of extracting fuel from feedstock sources, production challenges and logistics involved in obtaining fuel from cellulosic sources, etc.
- Identify existing training/education programs that may exist or are under development.
- Identify challenges and opportunities that exist in delivering education/training to employees within the renewable fuels industry.

- Identify related industries that may also be affected by the growth of the renewable fuels industry such as transportation, animal agriculture, etc.
- Identify key areas of responsibility within a renewable fuels production facility.

Interviews were conducted with the following:

- Geoff Cooper, Director of Ethanol & Business Development, National Corn Growers Association, Chesterfield, Mo.
- Brian Jennings, Executive Director, American Coalition for Ethanol, Sioux Falls, S.D.
- Bob Dinneen, Executive Director, Renewable Fuels Association, Washington, D.C.
- Doug Durante, Executive Director, Clean Fuels Development Coalition, Bethesda, Md.
- David Hallber, Chairman & CEO, Prime BioSolutions, Omaha, Neb.
- Tom Verry, Director of Outreach & Development, National Biodiesel Board, Jefferson City, Mo.
- Bill Paulsen, Vice President of Production, Heartland Grain Fuels/Advanced BioEnergy, Aberdeen, S.D.
- Duane Kristensen, General Manager, Chief Ethanol Fuels, Hastings, Neb.
- Todd Sneller, Administrator, Nebraska Ethanol Board, Lincoln, Neb.
- Joe Ferguson, Director of Business, Industry & Economic Development, Northeast Community College, Norfolk, Neb.
- Bob Abbott, Human Resources Manager, VeraSun Energy, Brookings, S.D.
- Diane Fagen, Director of Human Resources, Fagen, Inc., Granite Falls, Minn.
- Angie Konda, Director of Human Resources, ICM, Colwich, Kan.
- Mike Cartney, Vice President, Lake Area Technical Institute, Watertown, S.D.
- Duane Carrow, Program Director: Renewable Energy Technology, Minnesota West Community & Technical College, Granite Falls, Minn.
- Dan Schmidt, Program Manager, Energy Technology, Bismarck State College, Bismarck, N.D.
- Myron Danzer, Vice President for Customer & Technical Service, Renewable Energy Group, Inc., Ralston, Iowa
- Dr. Jon Van Gerpen, Department Head, Biological & Agricultural Engineering, University of Idaho, Moscow, Idaho
- Kelly Davis, Quality Manager, CVEC Ethanol Plant, Benson, Minn.
- William Lee, General Manager, CVEC Ethanol Plant, Benson, Minn.
- Chuck Neece, Director of Operations, FUMPA Biofuels Plant, Redwood Falls, Minn.
- Dick Johnson, Senior Recruiter, BBI International Biofuels Recruiting, Bloomington, Minn.

## **PHASE II: QUANTITATIVE RESEARCH**

To help provide a greater understanding of the issues and their scope, quantitative research was undertaken to accomplish the following objectives:

- Determine what ethanol and biodiesel plants seek in incoming management staff preparedness and what demand for hiring lies ahead.
- Understand what training needs exist among current plant employees and project likelihood that employers would underwrite continuing education.
- Gauge what other issues -- such as technology -- are impeding plant progress and what type of solutions would be most beneficial.
- Help vision where the industry is headed in the future in terms of growth, manpower development and production.
- Determine the most beneficial means of education delivery (classroom, online, etc.).
- Gauge industry-specific challenges to introducing continuing education options now and moving forward.

The Southwest Marketing Advisory Center (SMAC) and Marketing and Research Solutions (MARS) were commissioned by the Agricultural Utilization Research Institute, through Russell Herder, to collect field data.

The in-depth interviews with key industry experts were conducted, in part, to gain information needed to design the survey questionnaire. Questions were developed by Russell Herder with input from SMAC and MARS as well as AURI and other planning committee members. During this process, the decision was made to subsequently offer research subjects the option of completing the questionnaire by telephone or mail.

Contact names were obtained from the Renewable Fuels Association for purposes of data collection. Also, the sample was expanded through inquiry calls to identified companies. A total of 198 individuals composed the final field list. Forty percent, or a total of 79 individuals, completed the survey (73 via phone and six through the mail). This resulted in a statistical reliability of +/-11 percent at the 95 percent confidence level. All completed surveys were entered into SPSS, a statistical analysis program that enables effective analysis of large amounts of data. Once the data was tabulated, both frequencies and cross-tabs were completed to help assess results.

## **LIMITATIONS**

After several interviews were completed at POET locations, corporate management decided to discontinue participation in the research effort. (The reason for this remains unknown.) It should also be noted that, despite the respectable response rate, the overall sample size is statistically limited. For this reason, decisions based solely upon these results should be done with this understanding.

# PHASE I: FINDINGS

## **THE FUTURE OF THE BIOFUELS INDUSTRY**

Since the oil embargo in the mid-1970s, when gas prices rose to a then-staggering 55 cents per gallon, America's "addiction" to imported oil has been a matter of concern. For the past 30 years, however, the United States has not demonstrated the will or commitment to do something about it -- until recently. The passage of the 2005 Energy Bill -- led to a great degree by biofuels -- was a major step forward in improving America's energy security and establishing benchmarks, incentives and investments designed to encourage the development of a domestic, renewable energy industry.

The energy bill currently being debated in Congress clearly underscores the nation's commitment to energy independence -- and biofuels will continue to be a key component in America's energy security and energy strategy. The Renewable Fuels Standard (RFS) included in the Energy Policy Act of 2005 called for 7.5 billion gallons of renewable fuel in the nation's fuel supply by 2012. The ethanol industry alone will surpass that figure much sooner than that. The current RFS being considered by Congress is in the neighborhood of 36 billion gallons, with renewable sources -- including ethanol (both grain and cellulose-based) and biodiesel -- being included.

While most within the biofuels industry are optimistic about the future, especially in the short term, everyone recognizes that the industry is driven to a great degree by public policy. And public policy is driven by many influences outside the control of biofuels interests, including those who do not necessarily support the expansion of biofuels.

"Policy drives the entire energy industry -- and renewable fuels are part of the energy industry, just as oil, natural gas and electricity are part of the energy picture," said Bob Dinneen, executive director of the Renewable Fuels Association (RFA). "Policy will dictate the pace and size of the biofuels industry, but the focus on climate change and energy security bode well for the future."

According to the National Corn Growers Association, there are 119 ethanol plants in operation in the United States, with another 80 under construction. Within the next 18 months, there will be 12 billion gallons of annual ethanol production capacity in the nation. Most projections indicate that the 80 plants under construction should be complete by the end of 2009.

The recent decision by the State of California to move to 10 percent ethanol blends by 2010 creates new demand on a large scale. Likewise, other markets such as the Southeast and Northeast continue to grow.

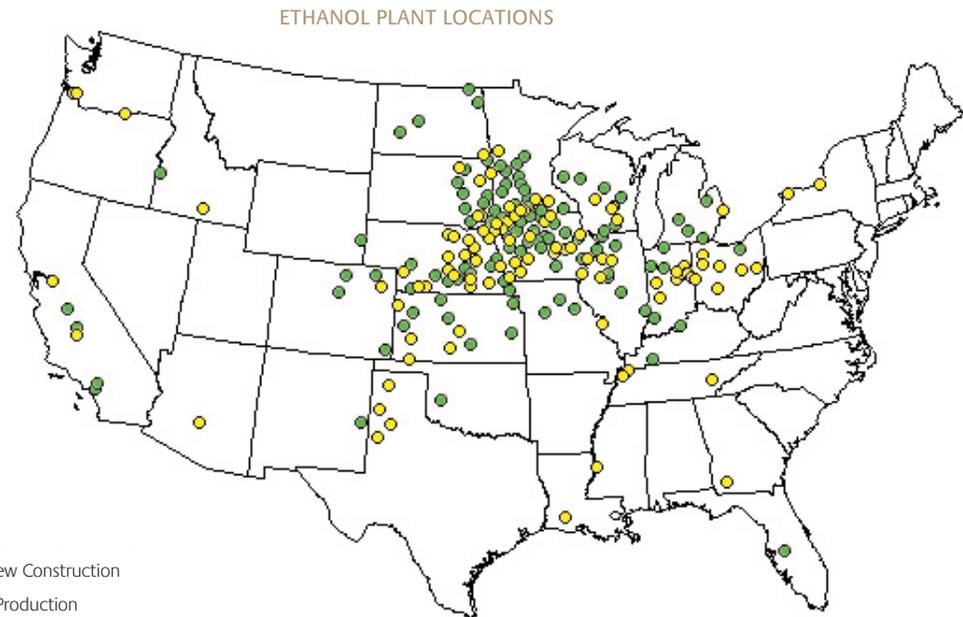
Geoff Cooper, director of ethanol and business development for the National Corn Growers Association, sees steady growth in ethanol until the industry hits what he calls the “blend wall” -- the point at which ethanol, blended at the standard 10 percent level with ordinary gasoline, reaches its market saturation point. That point is around 13.5 billion gallons annually, just 1.5 billion gallons more than anticipated capacity in the next year or so. Public policy allowing higher blends and developing a broader infrastructure

**“The biggest near-term challenge is building demand.”**

- Geoff Cooper, National Corn Growers Association

for E85 (85% ethanol) will be necessary to help the industry break through that wall. “The biggest near-term challenge is building demand,” Cooper said.

According to Cooper, corn ethanol plants are well positioned to adapt to new cellulosic feedstock sources -- using “bolt on” processing technologies added to the input side of the plant to prepare the new feedstock source for standard processing into ethanol. This holds promise for the continued viability of existing ethanol production facilities and the long-term outlook for employees in those plants - even as the feedstock source changes in the future. “Changes in feedstock will be more *evolutionary* than *revolutionary*,” he added.



Source: Iowa State University Research, 2007

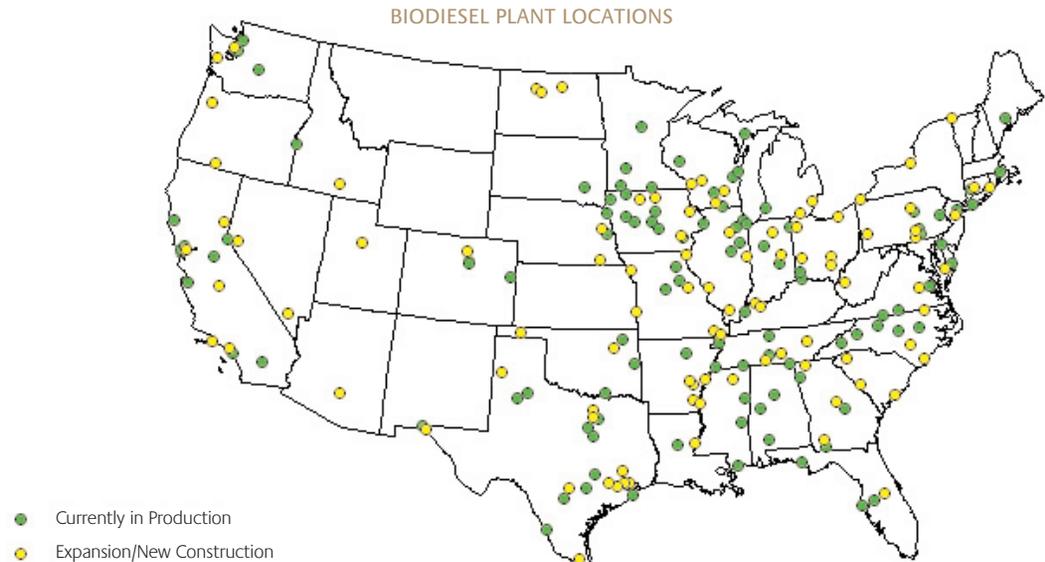
Brian Jennings with the American Coalition on Ethanol agrees. “The first cellulose-based production will likely involve incorporating the fiber stream within an existing ethanol plant -- essentially coupling ethanol processing with new front-end technology required to handle the new feedstock.”

Characterizing the past few months as a “quick and violent ride,” Doug Durante, executive director of the Clean Fuels Development Coalition, says that even if corn-based ethanol hits a wall, there will still be a biofuels industry. Durante says the industry must be ready to change, however. “While the process of making ethanol will not vary significantly, there will be a different skill set required in terms of handling and processing new feedstocks,” he said.

Duane Carrow, program director for renewable energy technology at Minnesota West Technical College in Granite Falls, Minn., says that both grain and cellulosic feedstocks for ethanol production are based on a “sugar” platform, so the processing is similar even though the front-end preparation may be different. “If and when we move to a chemical platform, everything will change,” he added.

Bob Dinneen notes that grain-to-ethanol facilities will be in a good position to augment production with cellulosic sources. “I think that both grain and cellulosic ethanol will be able to coexist and will serve to make each more competitive,” he added.

Tom Verry, director of outreach and development for the National Biodiesel Board, says that there are 148 biodiesel plants currently in production with a capacity of 1.3 billion gallons. Another 98 plants are under construction, adding another 1.8 billion gallons of capacity. While there are biodiesel plants in the Upper Midwest (MN, WI, IA), most tend to be clustered in the Mid-South, Middle Atlantic, West Coast and Midwest (IL, IN, OH, MO).



Source: Iowa State University Research, 2007

A caveat: There is a dramatic difference between production *capacity* and actual *production/sales* in the biodiesel industry. A document from the National Biodiesel Board indicates that sales at the pump rose from 25 million gallons in 2004 to 75 million in 2005 and were expected to double or triple again in 2006. Even at 250 *million* gallons per year, biodiesel sales lag far behind those of ethanol and are well under potential for biodiesel production capacity, which is in the *billions* of gallons.

Verry noted that the long-term outlook for biodiesel is positive with a proposed 36 billion gallon RFS. The combination of policy initiatives and technical challenges in the biodiesel industry, however, will have a significant effect on growth and viability. If petroleum prices continue to rise, the viability of biodiesel will improve even further.

“Ethanol is ethanol no matter how you make it or what you make it from,” said one interview subject. “While about 80 percent of biodiesel is derived from soybeans, it’s also being made from animal fat, kitchen grease and other sources, which has created problems with consistency and quality. Until the biodiesel industry figures this out, it will be tough to gain a strong foothold in the marketplace.”

**“Ethanol is ethanol no matter how you make it or what you make it from.”**  
- Interviewee

David Hallberg, chairman and CEO of Prime BioSolutions and founder of the Renewable Fuels Association, echoed the sentiments of several interviewees when he said the biodiesel industry is, in many ways, at a point at which the ethanol industry was 15 to 20 years ago in terms of both public policy and technology.

Hallberg believes that we will not see expansion in the renewable fuels industry (ethanol) as we have seen in the past 18 months. In fact, he anticipates some downsizing and consolidation as corn ethanol capacity nears its peak and market conditions adjust to the volume of ethanol in the marketplace. On the other hand, a widespread public interest in energy and climate change could well spark policy initiatives that call for 20 to 30 percent blends of ethanol in standard fuel formulations.

Fuel cells may be the next step in engine technology -- and ethanol will likely play an important role here as well. As a hydrogen-rich liquid, ethanol offers a practical and efficient solution as a hydrogen source for new fuel-cell applications. New demand driven by new technology of this nature should continue to create opportunity for the growth and sustainability of the ethanol industry.

Generally, industry leaders see a positive outlook for biofuels with a deceleration in terms of new plant development due to the abundance of capacity under construction, the rising cost of feedstock (both corn and soybeans) and the difficulty of finding financing now that the exuberance during last year's growth spurt in biofuels production has worn off. Since both ethanol and biodiesel are currently derived primarily from grain feedstocks (and will be for the near future), it is likely that the growth and sustainability of the biofuels industry will continue to be located in areas where grain is abundant.

In 2006, the biodiesel industry in Minnesota was estimated to create 5,668 direct and indirect jobs. As the industry continues to grow and more plants are built, this employment impact is expected to increase<sup>1</sup>. Between 2006 and 2015, biodiesel plants are predicted to support the creation of as many as 27,400 direct and indirect jobs in all sectors of the economy nationwide<sup>2</sup>. Ethanol production and new plant construction supported the creation of 163,034 jobs in all sectors of the economy nationwide in 2006, including more than 20,000 jobs in the manufacturing/production sector<sup>3</sup>. In 2006, the ethanol industry in Minnesota supported the creation of 10,321 new direct and indirect jobs, and is projected to create 11,444 jobs in 2007 and 18,461 in 2008<sup>4</sup>. With over 40 new ethanol plants expected to be built in two years, the industry is estimated to create approximately 2,400 new direct jobs in ethanol production (based upon an average of 50 employees per plant)<sup>5</sup>.

## **WORKFORCE ISSUES WITHIN THE BIOFUELS INDUSTRY**

Every person interviewed said that the availability of a qualified workforce is, and will continue to be, a significant issue in the biofuels industry -- particularly since most of the plants are located in sparsely populated, rural areas of the nation.

A typical ethanol plant employs 35 to 50 people depending on capacity and processing technology. With 119 plants in operation and another 80 under construction, that creates a demand for 7,000 to 10,000 direct jobs in ethanol production alone.

A typical biodiesel plant employs 30 to 40 people. Using the numbers provided by the National Biodiesel Board, that equates to another 7,300 to 9,800 direct jobs.

**“Many of these jobs are in rural areas where they are needed most -- and the job demand is immediate.”**

*- Todd Sneller, Nebraska Ethanol Board*

These direct job figures do not take into account the additional indirect jobs needed in areas that have biofuels plants -- truck drivers, rail workers, etc.

Todd Sneller, administrator of the Nebraska Ethanol Board, says: “This is a job sector that has expanded rapidly since 2005. Many of these jobs are in rural areas where they are needed most -- and the job demand is immediate.”

In June 2007, Rep. Bruce Hawley, D-Iowa, chairman of a House subcommittee on contracting and technology, held a hearing to highlight the high training costs confronting the renewable fuels industry. Braley has introduced a bill that would create competitive grants to support training programs at institutions such as community colleges.

During the hearing, Bruce Rastetter, CEO of Hawkeye Renewables, said his company received more than 800 applications for 45 jobs as it prepared to open a plant in Fairbank, Iowa. “But not more than 10 of those applicants had any experience working with biofuels,” he said. Rastetter added that cellulosic ethanol production would likely be more labor-intensive because greater quantities of material will be involved.

**“Alternative energy is no longer alternative.”**

- Kevin Doyle, Author

According to Kevin Doyle, author of *The Complete Guide to Environmental Careers* in the 21st Century, renewable energy is a bright spot in terms of career opportunities. “In 2006, we’ve made a switch: Alternative energy is no longer alternative,” he writes. Doyle adds that the advent of subsidiaries of fossil fuel companies, such as BP Solar and GE Wind Energy, mean the favorable federal and state tax treatment of related technologies will not go away.

**“There is a real need to create more awareness and interest in biofuels careers.”**

- Brian Jennings, American Coalition for Ethanol

The lack of education and training in biofuels production and technology has led many companies to develop their own approach out of necessity.

Brian Jennings, executive director of the American Coalition for Ethanol, says, “*workforce needs are extraordinary* and some plants are having difficulty keeping up” in terms of finding and retaining quality employees. Jennings notes that integrated companies such as VeraSun and POET (formerly Broin) are better at recruitment, training and retention, but the farmer-owned plants tend to face a greater challenge in this regard. “If you grew up in a town with a biofuels plant, you’d probably be more aware of the career opportunities,” he said. “But there is a real need to create more awareness and interest in biofuels careers.”

**“How can any plant afford the six- to 12-month acclimation period most employees require?”**

- Dave Vander Griend, ICM

In a presentation to the 2006 International Fuel Ethanol Workshop & Expo, ICM President Dave Vander Griend said resolving *recruitment* issues does not necessarily resolve the *workforce bottleneck* that is the result of lack of experience; it takes about six months to a year before an

employee is truly comfortable working in a plant. “With pressure to ramp up production above nameplate capacity as quickly as possible and maintain utmost efficiency, how can any plant afford the six- to 12-month acclimation period most employees require?” he asked.

Fagen Industries of Granite Falls, Minn., is a recognized leader in the design and construction of ethanol production facilities. According to Diane Fagen, director of human resources, the company does not take on the responsibility of hiring or training employees to operate the plants it builds. Fagen employees are primarily degreed engineers -- environmental, construction, mechanical, electrical, etc. Fagen also has its own construction crews which move from site to site. Hourly employees may be hired locally to assist and many times end up joining the traveling Fagen construction crews if they prove themselves.

Diane Fagen noted that employees with experience in grain milling, food-grade processes and the brewing industry have skills that are directly transferable to the biofuels industry -- particularly process professionals and engineers.

Fagen typically partners with ICM of Colwich, Kan., in developing ethanol production facilities. Fagen handles engineering and construction, and ICM is responsible for the technology used in the plants. ICM has a start-up manager who works with plants that use their technology. Angie Konda, director of human resources, says, “We don’t leave the site until the plant is operating at a process rate and quality level that meets our standards.” Staff hiring decisions are left to the owner of the plant, but ICM goes on site after the construction phase to train new owners and operators.

Duane Carrow of Minnesota West Technical College said that the typical “crash course” offered by an ethanol development/technology company involves one week of training specific to a process, one week of shadowing another employee and one week of training provided by vendors such as pump manufacturers, etc.

In terms of ICM’s workforce, which is focused primarily on engineering, Konda says the company typically does not get candidates with direct experience in the ethanol industry since the industry is so young. “We find engineering and management professionals with pulp and paper experience, or oil and gas backgrounds, to have skills that are similar to what we need,” she added.

Bob Abbott, human resources manager for VeraSun of Brookings, S.D., notes that 60 percent of the jobs in an ethanol plant involve skills that can be acquired in a two-year associate degree program.

VeraSun, which owns and manages ethanol production facilities in South Dakota, Minnesota, Iowa and Indiana, relies on its own in-house training program for its employees -- and does not expect that situation to change in the near future. Employees are hired well in advance of a plant startup, and new employees spend considerable time in other VeraSun plants shadowing their counterparts and obtaining hands-on training under real ethanol production conditions.

Renewable Energy Group in Ralston, Iowa, is a full-spectrum biodiesel company operating its own plants, building and managing plants for others, and even providing product marketing and feedstock acquisition services. Myron Danzer, vice president of customer and technical service, said his company provides its own training programs to its customers. "Ours is a six- to eight-week program that combines classroom instruction with in-plant hands-on training," he said. "The emphasis is on production processes and safety."

Danzer added that his company has relied on Des Moines Area Community College to provide training in controls and logic for operator-level personnel but intends to handle the bulk of its workforce development in-house. "Biodiesel is such a rapidly changing industry that we work to identify people who are flexible and can handle having their "to-do" list change at a moment's notice," he said.

Dr. Jon Van Gerpen with the University of Idaho noted that biofuels companies tend to keep their technologies closely held, even though most of the processes are relatively simple. "We've had a difficult time getting permission to get into plants as part of the biodiesel workshops that we sponsor," he said. "They just don't want to run the risk of having something they feel is proprietary get into the hands of competitors."

**"Ideally, you need employees with a blend of experience and the ability to learn quickly."**

*- Bill Paulsen, Heartland Grain Fuels*

Bill Paulsen, vice president of production for Heartland Grain Fuels in Aberdeen, S.D., says that, once a plant is up and running, it can typically keep up through on-the-job training. "New start-ups are the real challenge," he said. "Ideally, you need employees with a blend of experience and the ability to learn quickly."

Paulsen said it's helpful if prospective employees have some energy background, but experience is weighted against the value of hiring locally -- an issue noted by all interviewees, since hiring locally improves retention rates and helps ensure that the investment plants make in training and education is not lost to a competitor.

**"Hiring people with homes and history in the area makes them less likely to job-hop to another plant in another place."**

*- Bill Paulsen, Heartland Grain Fuels*

"Hiring people with homes and history in the area makes them less likely to job-hop to another plant in another place," one manager said. As more plants pop

up within a reasonable driving distance of each other, however, there will be more options for “hometown” folks who can easily justify driving 30 to 60 miles to another nearby plant for a significant pay raise.

Paulsen believes “anyone with general mechanical/maintenance background in an industrial setting can easily make the leap into the biofuels industry in an operator position.” On the other hand, an industrial process person may not make the transition to management or operations as easily, given the specific and unique nature of biofuels production -- though there are exceptions. “Working in a refinery is similar to working in a biofuels plant,” he said. “And working in the brewing industry is virtually identical to working in the ethanol industry.”

Paulsen added that the eventual move from grain to cellulosic feedstocks shouldn’t change the processes dramatically but may require some continuing education. Fractionation, a new grain preparation technology, is basically a simple milling process but will likely require some process-specific upgrade training.

Rail safety is key -- and is an area in which many new employees have never been involved. Community colleges could work in concert with railroad companies to train/certify students, Paulsen said.

Another training need is for “load out” personnel -- employees who have been trained in Department of Transportation (DOT) guidelines, rail safety, HAZMAT, etc., and can operate heavy equipment.

Duane Kristensen, general manager of Chief Ethanol Fuels in Hastings, Neb., had an interesting insight in terms of basic skill levels -- particularly as it relates to the need for training on basic equipment such as forklifts and front-end loaders. “We aren’t getting the farm kids anymore who feel comfortable jumping on a piece of equipment to get work done -- unloading pallets from a truck or loading a semi with distillers grains,” he said.

“As plants get older, there will be a greater need for mechanical engineers on staff to manage maintenance, plan and coordinate upgrades and expansions, etc.,” Kristensen added.

And it’s not just a dearth of graduates coming out of colleges that is of concern. Given the relative youth of the renewable fuels industry, there is also a question about the quality and experience of the faculty teaching the programs. “It is absolutely imperative that faculty be in touch with industry on a regular basis to stay current with what we need in terms of qualified graduates,” said one plant manager.

## CAREER OPPORTUNITIES IN BIOFUELS

While each company has its unique structure, there are some general consistencies in terms of job duties and classifications within a biofuels facility. One source offered this list of typical job titles within a biofuels production facility:

**GENERAL MANAGER:** Responsible for overall management of the plant. Typically requires a four-year degree and direct experience in the renewable fuels industry. Salary range: \$125K to \$200K.

**PLANT MANAGER/PRODUCTION SUPERVISOR:** Usually has a business degree or comes out of the engineering side of the business -- usually a chemical engineer. Salary range: \$90K to \$120K.

**MAINTENANCE SUPERVISOR:** Responsible for overseeing mechanical and processing technology. Typically a mechanical engineer or someone who has risen through the ranks on the maintenance side of the operation.

**ENVIRONMENTAL MANAGER:** As regulatory compliance and permitting issues become even more complex, some plants are putting full-time environmental engineers on staff.

**QUALITY CONTROL STAFF:** is made up of laboratory supervisor and lab assistants who are responsible for two primary functions: 1) monitoring the cooking process (starch to glucose) and the enzymes required; and 2) monitoring the fermentation process (yeast health, yeast counts, alcohol content, acidity, etc.) All positions typically require a degree in chemistry or microbiology. A lab manager will earn \$40K to \$60K annually.

**MARKETING:** Marketing staff varies from plant to plant and many plants rely on third-party companies to handle the marketing of both ethanol and the distillers grains co-product. If marketing staff is in-house, it can involve inbound grains/feedstock as well as outbound fuel and co-product marketing. Employees with commodity trading or grain marketing experience are especially well suited for these positions.

**OPERATORS:** Initially, a new operator is trained in a specific area such as computer controls/instrumentation, cleaning, boilers/energy center, drying, etc. Once operators are familiar with one process, they move to another to cross-train. The goal is to have several operators familiar with all processes. "If a college program could help accelerate this process by training people on the basics ahead of time, that would be very helpful," said one plant manager. A two-year degree is considered an advantage, but not typically required for these positions.

Duane Carrow of Minnesota West further simplified the operations structure in an ethanol plant. He said there are typically three operator positions and one shift supervisor position in an ethanol plant. There is an operator responsible for utilities/heat (boilers, etc.); one for distillation and evaporation; and one for cooking. The shift supervisor is a person familiar with all three operations and has typically risen from the rank of operator. Typically there will be three to four crews of this configuration to handle the 24/7 production process. Pay is typically around \$14 per hour.

Another source provided this list of typical job titles within a biofuels plant:

- General manager
- Plant manager
- Shift supervisors
- Production managers
- Maintenance manager
- Boiler operator
- Maintenance worker
- Welder
- Electrician
- Electronics technician/instrumentation
- Lab manager
- Lab assistant
- Plant accountant
- Receptionist
- Grain merchandiser
- Rail attendant
- Truck attendant
- Grain sampling/records
- Custodian
- Entry “floater” (an as-needed employee assigned to tasks on demand)

A cursory look at career opportunities on biofuels company Web sites offered a wide range of available positions:

- Maintenance technician
- Shift supervisor
- Process operator
- Lab technician
- Instrumentation technician
- Purchasing and inventory agent
- Maintenance planner/scheduler
- Environmental health and safety manager
- Reliability engineer
- QA/QC laboratory manager
- Shipping and receiving manager
- Plant manager
- Project cost administrator
- Plant engineer
- Permit/procedure coordinator
- Process operator
- Distillers sales coordinator
- Grains manager
- Network support technician
- Commodities administrator
- Risk management assistant

Employee turnover is a challenge, with plant managers in particularly high demand. Typically, a person who has risen through the ranks to a position of supervisor or production manager can name his/her price when approached by a new start-up plant looking for leadership. When that happens, a plant that has invested resources and time into that person loses that investment.

**“Employee turnover is a challenge, with plant managers in particularly high demand.”**

Operator positions are less subject to turnover given the opportunities for advancement within (different shifts, different responsibilities, supervisory positions, etc.) and the fact that these employees tend to be from the local area -- making it more difficult for them to justify a move. As more plants are concentrated in geographic areas, however, these positions will likely see a higher turnover rate as well.

## **EDUCATIONAL PROGRAMS AND DELIVERY SYSTEMS**

In response to the need for qualified employees in the biofuels industry, a number of educational programs have been developed, or are being developed, primarily across the Midwest.

Minnesota West Technical College in Granite Falls, Minn., is widely recognized as the first post-secondary institution to offer education specifically targeted to renewable fuels. Granite Falls is the hometown of Fagen, Inc., which provided some impetus for the program. The college does little to train Fagen employees but has worked directly with a number of biofuels facilities across the Upper Midwest and has created a program that is being adopted by other colleges.

Duane Carrow, program director for renewable energy technology at Minnesota West, characterizes jobs in the renewable fuels industry as “gold collar opportunities.” “About 20 percent of the jobs in the United States are blue collar -- requiring people to do things with their hands,” he said. “Another 20 percent are white collar jobs that require thinking and managing. A gold collar job combines both thinking and doing -- and those are the kinds of jobs that are available in the renewable fuels industry.”

**“A gold collar job combines both thinking and doing -- and those are the kinds of jobs that are available in the renewable fuels industry.”**

*- Duane Carrow, Minnesota West*

Minnesota West built its program from scratch, relying heavily on industry sources for information and guidance. Carrow’s strategy included bringing in industry leaders to lecture on their specific area of expertise (distillation, evaporation, lab functions, etc.) and using that information to build course content.

A certificate program at Minnesota West is offered 100 percent online. Composed of five courses and 11 credits, the certificate is targeted to current employees in the industry, especially new hires. The A.A.S. degree combines on-campus and online courses. In response to a growing biodiesel industry, the college has recently hired a chemist who will develop biodiesel curriculum.

Carrow said the challenge lies in keeping up with rapid changes in technology and having an educational structure in place that facilitates quick response and development of appropriate curriculum.

In Carrow's experience, plants tend to provide tuition assistance for current employees who want to upgrade their skills. Sometimes tuition reimbursement is based on the course grade achieved by the employee.

**“We hope to give our students the skills to be proactive in multiple disciplines.”**

- Duane Carrow, Minnesota West

In a recent interview in *Ethanol Today* magazine, Carrow said: “We hope to give our students the skills to be proactive in multiple disciplines. For instance, having an understanding of the biological process, knowing that you can actually kill enzymes by running the process at too high a temperature. Or understanding how the

computer interacts with the equipment. Students who have these insights bring more value to their employer. We see...our graduates going into a company and advancing very quickly.”

Dan Schmidt, program manager for energy technology at Bismarck State College (BSC) in Bismarck, N.D., said their renewable fuels program grew out of the college's “process and power” program which includes electric transmission and generation, nuclear power, and electrical power service and technology. For the past three years, BSC has included an ethanol/biodiesel process program, which has been modeled on refinery processing. The two-year program involves both online and on-campus courses and qualifies a graduate for a position as an entry-level operator in a biofuels plant.

BSC is a two-year college but was recently approved to offer a bachelor's degree in energy management beginning in 2007. Most students enrolled are either graduates of the two-year program or are currently employed in the energy industry. BSC sees such potential in this area that they have recently added a vice president for energy programs and put energy education programs under its Corporate Continuing Education division. This division encompasses multimedia specialists who work in partnership with faculty and industry to create effective online educational programs.

A four-year Bachelor of Applied Science degree in energy management (offered in conjunction with Minot State and Dickinson State) has been offered entirely online (no on-campus courses required). The online program at BSC graduates about 30 students per year and has had students from 49 states. The program employs a combination of animations, simulations and hands-on/mentoring experiences in cooperating energy plants (including biofuels facilities). “The challenge lies in finding a plant or lab for the hands-on experience, especially if the online student lives in an area that doesn't have a nearby facility,” Schmidt said.

(NOTE: Several biofuels companies said they would see a 100 percent online course as somewhat suspect in terms of preparing employees to enter the workforce. “There is no question that prospective employees need to have some hands-on experience in-plant if they expect to come in at anything other than an entry-level position,” one manager said.)

**“There is no question that prospective employees need to have some hands-on experience in-plant if they expect to come in at anything other than an entry-level position.”**

*- Plant Manager*

Schmidt echoed other educators when he said: “Have industry involved right at the beginning. Create templates and clear expectations for internships and hands-on experiences. Establish an industry advisory committee that is involved -- and listen to what they say,” he said. “As educators, we need to trust what industry tells us. Everything in biofuels is new, and it’s happening right now.”

Mike Cartney, vice president of Lake Area Technical Institute (LATI) in Watertown, S.D., said that the college offers a two-year A.A.S. degree in Energy Technology. The LATI program is focused primarily on developing maintenance crews for energy plants -- providing training in turbines, pneumatics, hydraulics, welding, milling, machine tool, and the ability to read architectural and mechanical blueprints. “Technical trades require hands-on experience,” Cartney said. “On-campus training and on-site internships are a big part of our program.”

The program is designed to provide maintenance basics applicable in virtually any type of power plant or energy facility, and, Cartney said, ethanol production is similar in this regard to power production. “There will always be the need for plant-specific training. Our job is to provide the foundation and, most importantly, help students learn how to learn,” he said.

Industry agrees. Leaders interviewed said the best-case scenario would be for colleges to provide a basic understanding of the process and the technology so that new employees would not be starting from ground zero. In this way, the plants can focus training on their specific processes and expectations, and accelerate the ability to capture value from the new employee.

Industry leaders also noted that continuing education for employees is important, though many handle this internally through mentoring. Northeast Community College (NECC) in Norfolk, Neb., is launching its Renewable Energy program in fall 2007. NECC has adopted curriculum from Minnesota West of Granite Falls, Minn., the first educational institution to create a program focused specifically on biofuels. NECC’s two-year associate degree program will provide graduates with ethanol process fundamentals. The program articulates with four-year programs with no loss of credits. The University of Nebraska accepts graduates of the program into its renewable fuels engineering program.

Joe Ferguson, director of business, industry and economic development at NECC, says that the college met with plant managers, state agencies, the University of Nebraska and public power representatives to discuss what an effective biofuels production training program would look like.

**“The rapid growth in recent months has outpaced industry’s ability to handle much of this itself and has depleted the pool of potential qualified employees.”**

- Joe Ferguson, NECC

This industry advisory committee was very involved in curriculum development. “Until recently, the industry found a way to get where they needed to be in terms of training,” he said. “But the rapid growth in recent months has outpaced industry’s ability to handle much of this itself and has depleted the pool of potential qualified employees.”

According to Ferguson, leadership training and team building skills are critically important since the number of employees within a biofuels plant is relatively small (30 to 40).

Ferguson reiterated the need for awareness at the secondary level. “There is no existing employee pipeline to the industry,” he said. “There is a critical need for communication with high school counselors, teachers, parents and economic development groups to make them aware of the career opportunities in biofuels.”

**“There is a critical need for communication with high school counselors, teachers, parents and economic development groups to make them aware of the career opportunities in biofuels.”**

- Joe Ferguson, NECC

Bob Dinneen, executive director of the Renewable Fuels Association (RFA), said that his organization is working with National FFA to develop a biofuels curriculum that will be used in FFA chapters across the nation to introduce high school students to this career area. The curriculum is scheduled to be available in January 2008.

A new option for employee training is offered by the National Corn-to-Ethanol Research Center (NCERC) at Southern Illinois University-Edwardsville. Monthly training classes, which began in June 2006, offer continuing education on a wide variety of topics, many of which are also taught in undergraduate courses in two-year and four-year institutions. The difference at NCERC is that courses are tightly tied to hands-on operations, not just theory. According to the September 2006 edition of *Ethanol Producer*, the center started offering workforce development programs in response to requests from industry to address the “major hang-up” that is workforce training. “The rapid growth of the industry has left ethanol facilities scrambling to recruit qualified employees, often from other process industries. As the industry matures, finding a qualified, experienced workforce may become an easier task.”

Dr. Jon Van Gerpen, head of the Biological and Agricultural Engineering Department at the University of Idaho, brings a dose of reality to the biodiesel industry workforce. Assuming that all 250 plants in operation and under construction are running to capacity -- and assuming an average of 30 employees per plant (which is on the high side, according to him) -- the industry will have a total workforce of 7,500 direct jobs. “However, only about one-third to one-half of those are operations people who need technical and mechanical skills,” he said. “The rest are in management, administrative, clerical or chemistry.”

“On the high side, let’s say that the biodiesel industry needs 5,000 people in the mechanical or operations sector of the plant. How many college programs do we need to train that many people, especially considering that about half of those jobs are already filled with people who have been trained?” he said. “The fact is this is a finite industry. We will not be creating a need for tens of thousands of skilled people.”

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<sup>1</sup> Employment Impact of Biodiesel of Minnesota’s Economy. Minnesota Department of Agriculture. Prepared by Su Ye, Agricultural Marketing Services Division. September, 2006. [www.mda.state.mn.us](http://www.mda.state.mn.us), August 13, 2007.

<sup>2</sup> Contribution of the Biodiesel Industry to the Economy of the United States. Prepared by John M. Urbanchuk, Director, LECC, LLC for the National Biodiesel board. September 30, 2006.

<sup>3</sup> Contribution of the Ethanol Industry to the Economy of the United States. Prepared by John M. Urbanchuk, Director, LECC, LLC for the Renewable Fuels Association. February 19, 2007.

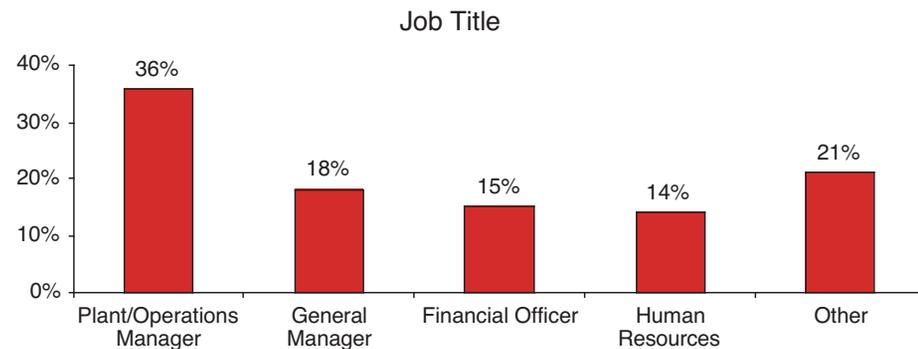
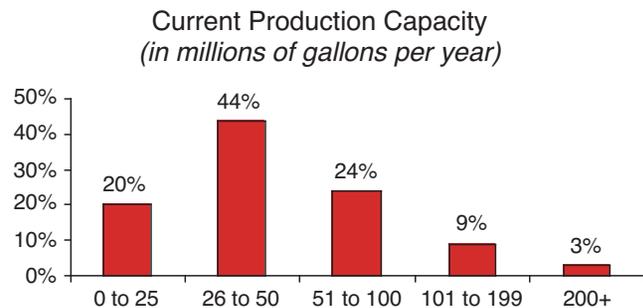
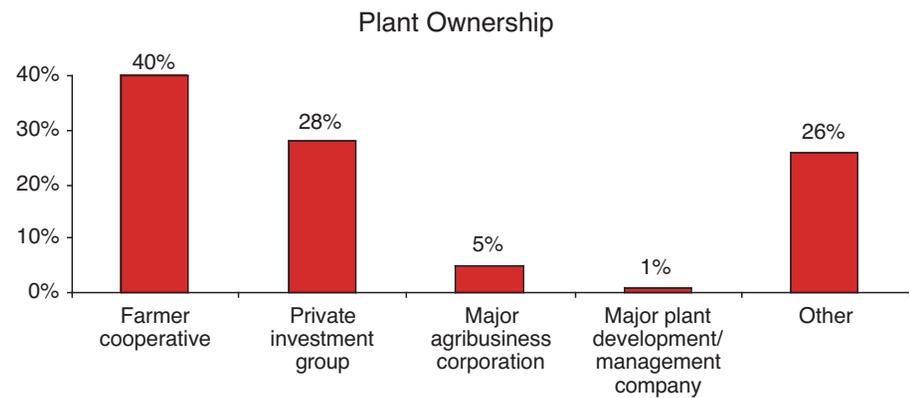
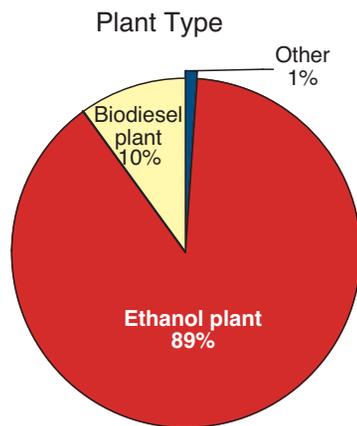
<sup>4</sup> Minnesota Ethanol: Production, Consumption, and Economic Impact. Agricultural Marketing Services Division, Minnesota Department of Agriculture. [www.mda.state.mn.us/renewable/ethanol/productionimpact.htm](http://www.mda.state.mn.us/renewable/ethanol/productionimpact.htm), August 13, 2007.

<sup>5</sup> Telephone interview with John M. Urbanchuk, Director, LECC, LLC. October 3, 2007.

# PHASE II: FINDINGS

## DEMOGRAPHICS

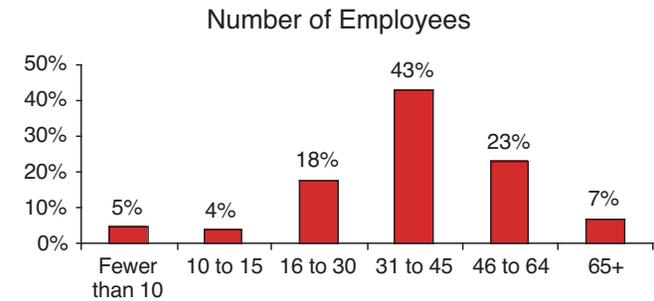
The majority of respondents (89%) are employed at ethanol plants, with the remainder in biodiesel (10%). Forty percent of the plants are owned by farmer cooperatives and are relatively small, with two-thirds of them producing 50 million gallons per year or less. Keeping in mind that some of the respondents hold multiple positions within a plant, 36 percent identified themselves as plant or operations managers, 18 percent as general managers, 15 percent as financial officers, and 14 percent as human resources professionals, and the remaining indicated that they hold a variety of other roles.



Forty-three percent of biodiesel and ethanol plant managers said they employ 31 to 45 employees, followed by 46 to 64 (23%), 16 to 30 (18%), or 65 or more (7%). Less than 10 percent said they employ 15 or fewer employees.

### CHALLENGES AND PRIORITIES IN THE BIOFUELS INDUSTRY

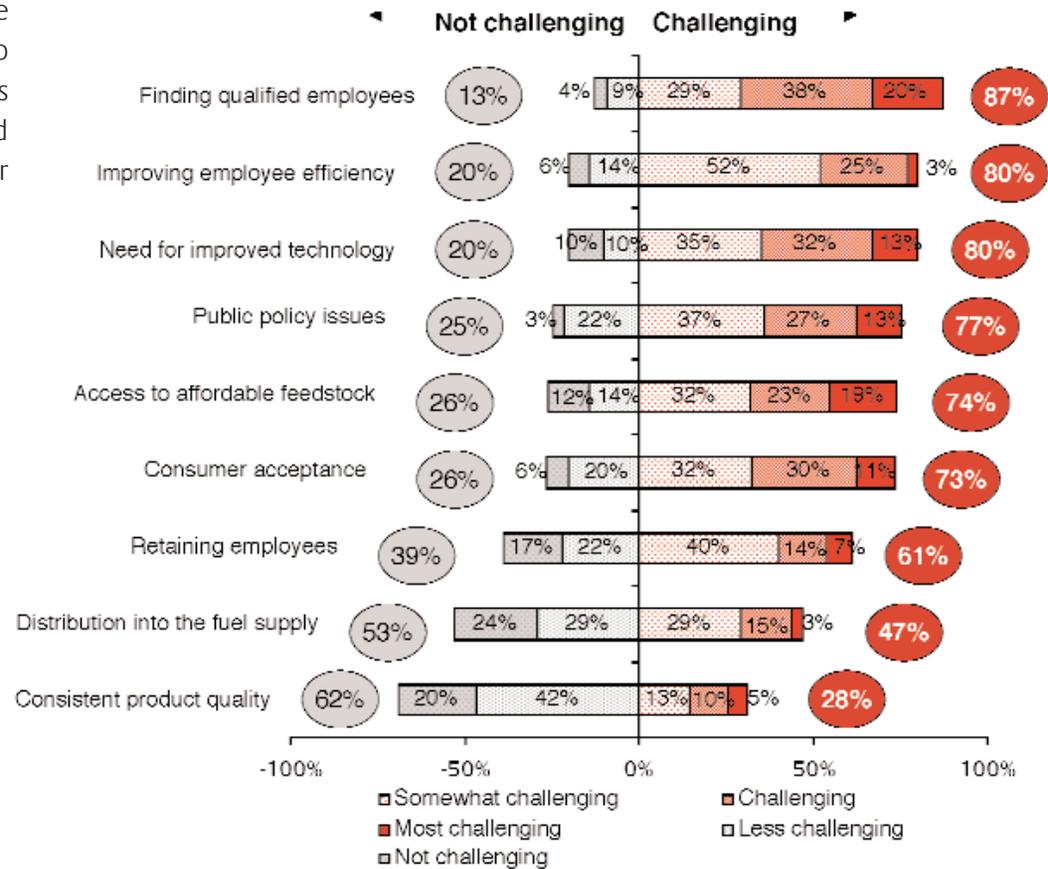
Biodiesel and ethanol plant management were most likely to say finding qualified employees for the industry is a challenge (87%). They also cited the need for improving employee efficiency (80%) and technology (80%) as key issues. Other most challenging factors pointed out by respondents were public policy issues (77%), attaining consumer acceptance (73%), access to affordable feedstock (74%) and ability to retain employees (61%). Less than half of respondents identified distribution in the fuel supply (47%) and consistent product quality (28%) as problematic in their industry.



Key Issues

	Most to Somewhat Challenging
Finding qualified employees	87%
Improving employee efficiency	80%
Need for improved technology	80%
Public policy issues	77%
Access to affordable feedstock	74%
Attaining consumer acceptance	73%
Retaining employees	61%
Distribution into the fuel supply	47%
Consistent product quality	28%

Multiple responses allowed



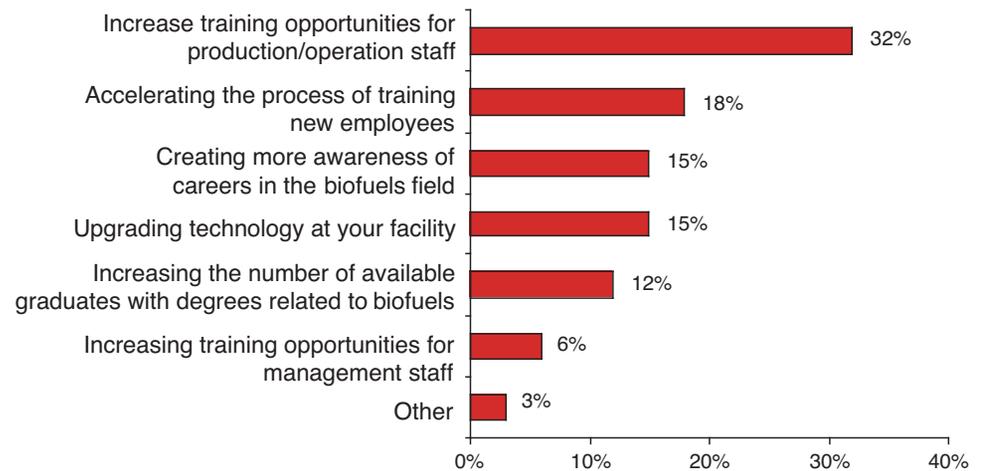
When asked what would be beneficial in helping their organization improve and grow, plant managers were most likely to cite increased training opportunities for operations staff (32%). Accelerating the process of training new employees ranked second (18%), followed by creating more awareness of careers in the biofuels field and upgrading technology (15%). Also cited as beneficial were increasing the number of available graduates with degrees related to biofuels (12%) and increasing training opportunities for management staff (6%). Three percent noted other areas, such as conducting their own training.

### AVAILABILITY OF QUALIFIED TALENT

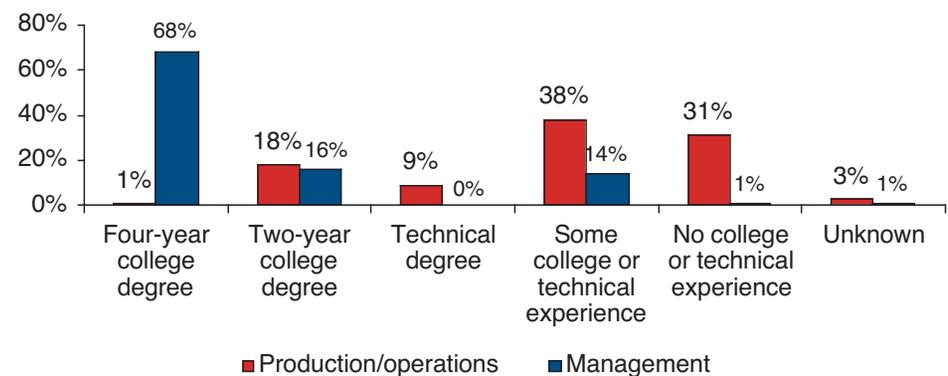
According to survey participants, over a third of employees in biofuels production have some college or technical experience (38%) and a third have no educational experience (31%). It was believed that biofuel production employees are less likely to have a two-year college degree (18%) or a technical degree (9%), and unlikely to have a four-year college degree (1%). Three percent were unsure.

Nearly seven in 10 management employees (68%) at biofuel plants were reported to hold a four-year college degree. A far lesser number of management employees had a two-year college degree (16%), or some college or technical experience (14%). One percent was unsure.

In your opinion, which of the following options would be most beneficial in helping your organization improve and grow?



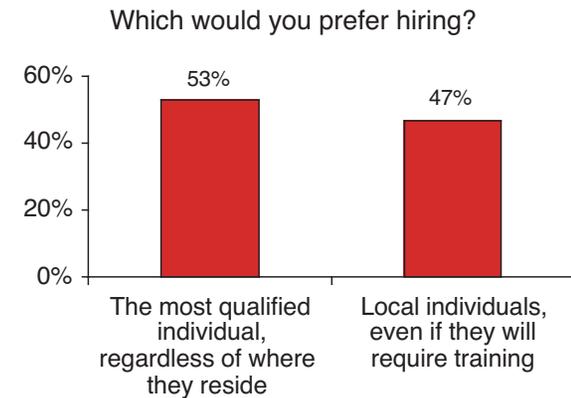
What is the education level of your typical employee?



## HIRING AND RECRUITMENT PREFERENCES/ LIMITATIONS

Biodiesel and ethanol plant managers were somewhat split as to whether they would prefer hiring the most qualified individuals, regardless of where they reside (53%), or local individuals, even if they will require training (47%).

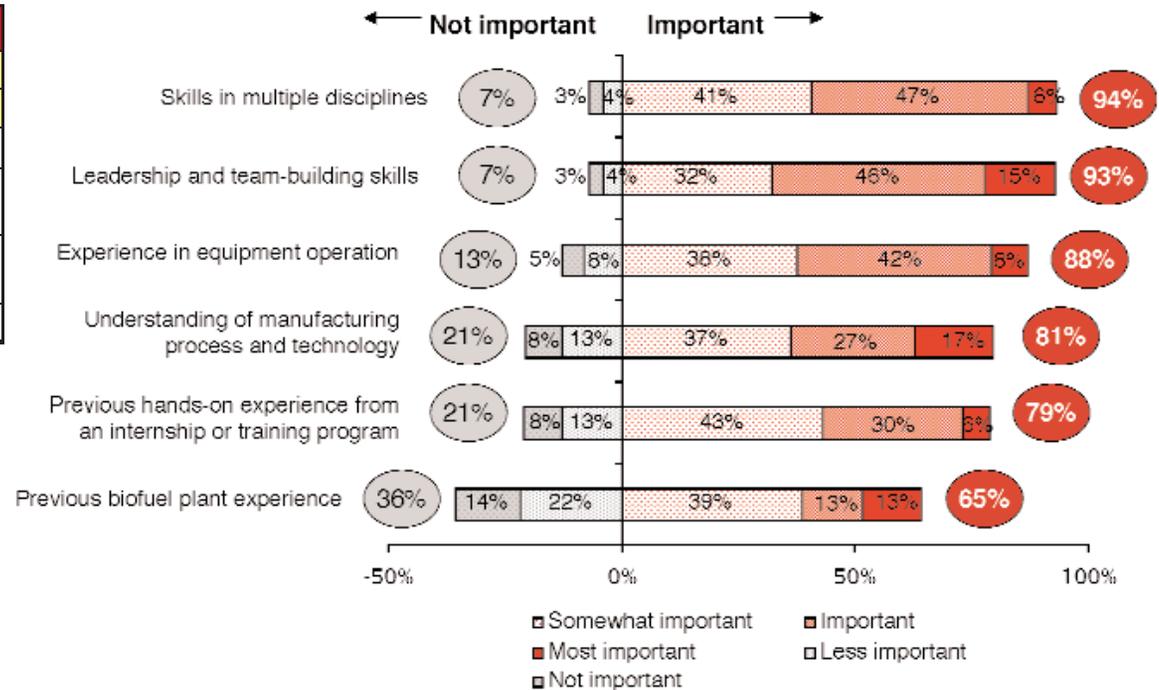
The greatest priorities in hiring new employees were skills in multiple disciplines (94%); leadership and team-building skills (93%); and experience in equipment operation (88%). Also of importance were an understanding of the manufacturing process and technology (81%); and previous hands-on experience from an internship or training program (79%). Two-thirds (65%) also expressed the need for new employees to have previous biofuel plant experience.



### Most Important Factors When Hiring New Employee

	Important
Skills in multiple disciplines	94%
Leadership and team-building skills	93%
Experience in equipment operation	88%
Understanding of the manufacturing process and technology	81%
Previous hands-on experience from an internship or training program	79%
Previous biofuel plant experience	65%

Multiple responses allowed

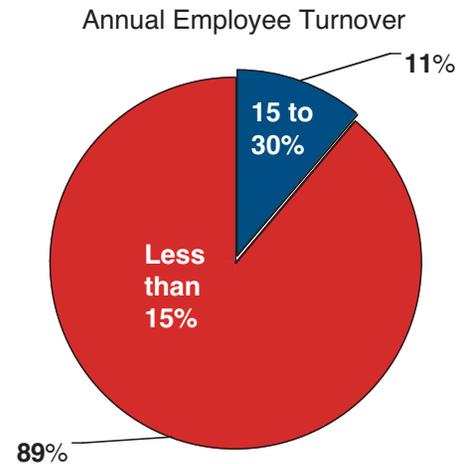
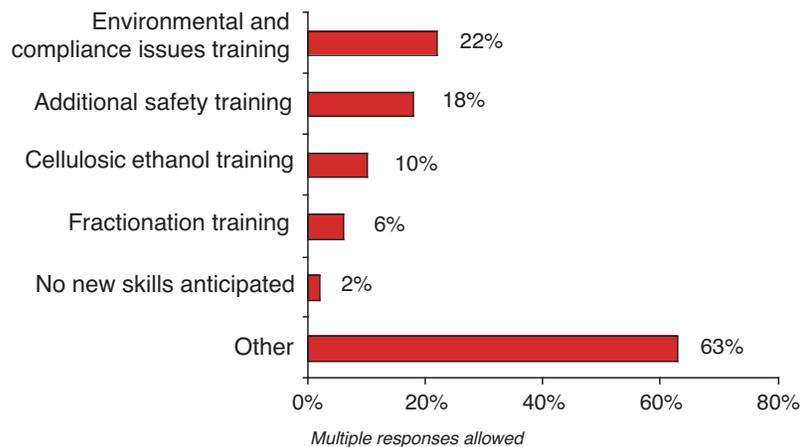


### SHORT-TERM AND LONG-TERM HIRING NEEDS

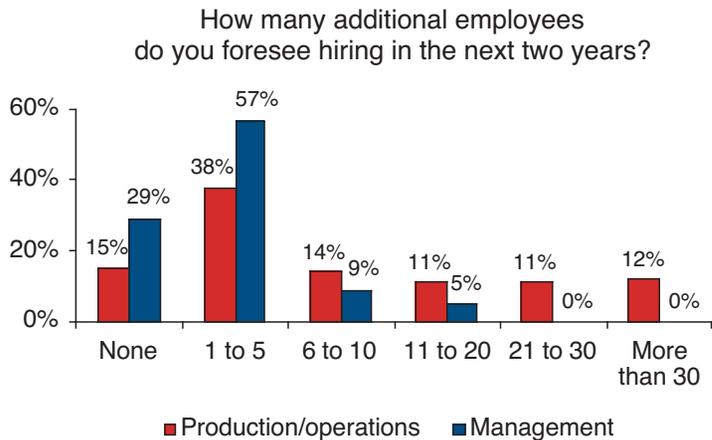
When asked which new skills they anticipate employees needing in the next five years, 22 percent of study participants said environmental and compliance issue training, followed by additional safety instruction (18%). A few cited cellulosic ethanol training (10%) and fractionation (6%), while two percent felt no new skill needs were anticipated. Nearly two-thirds cited other new skills being needed, including technology/computer skills, science/chemistry/engineering and business/management skills. [See full listing in Appendix.]

Nine out of 10 managers cited an annual employee turnover rate of less than 15 percent, with another 11 percent saying 15 to 30 percent leave in a typical year.

As your industry develops in the next five years, which new skills do you anticipate your employees needing?

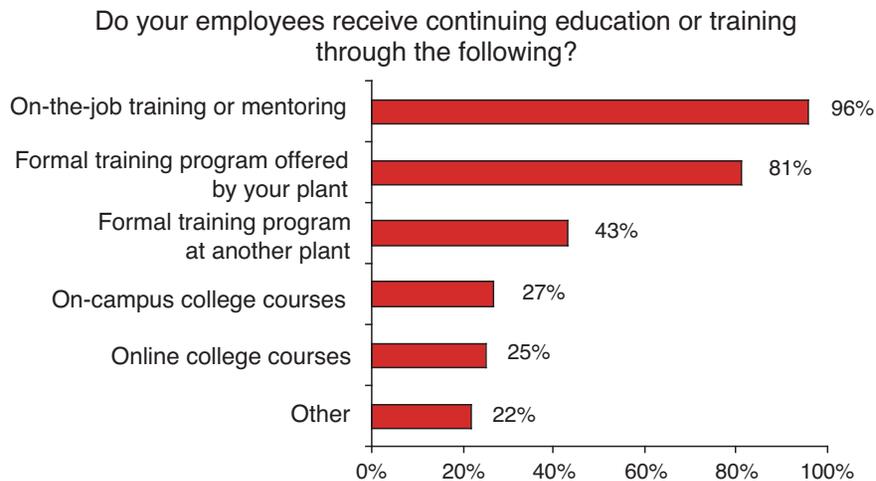


Over half of respondents (57%) said they foresee hiring one to five additional management staff in the next two years, while two in five said they will probably hire that many production/operations staff. Nine percent of study participants felt six to 10 would be hired in management; 14 percent felt the same would probably be true for production/operations. Five percent felt they would hire more than 10 new management staff, while a third said production/operations staff had the potential of being hired at that quantity in the next two years.

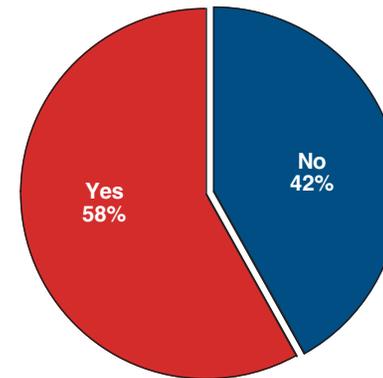


**CURRENT TRAINING SITUATION**

On-the-job training has become the primary way in which most plants (96%) provide employee education. A large number of plants reported having their own formal training program (81%); 43 percent said their employees currently take formal training offered at another plant. At the same time, over half of all plants surveyed offer training to employees from other plants (58%). Fewer current employees receive their education through on-campus (27%) or online college courses (25%). Twenty-two percent cited other resources for training, such as on-site vendors and literature.



**Do you provide training to employees from other plants?**

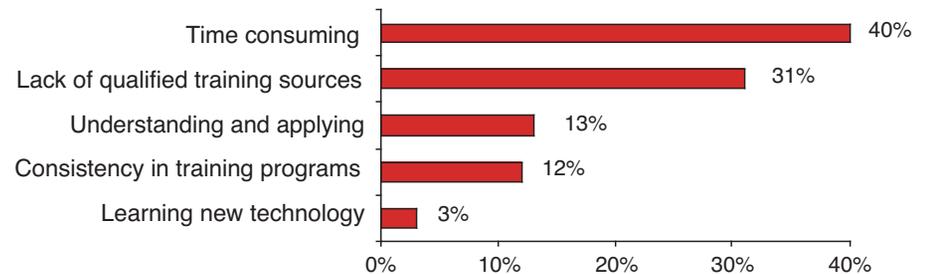


When asked about any concerns associated with on-the-job training, the most common difficulties were the availability of time (40%) and access to qualified, internal training resources (31%). Other concerns voiced by respondents included the ability to understand and apply the training gained on the job (13%), consistency in training programs provided (12%), and learning new technology (3%).

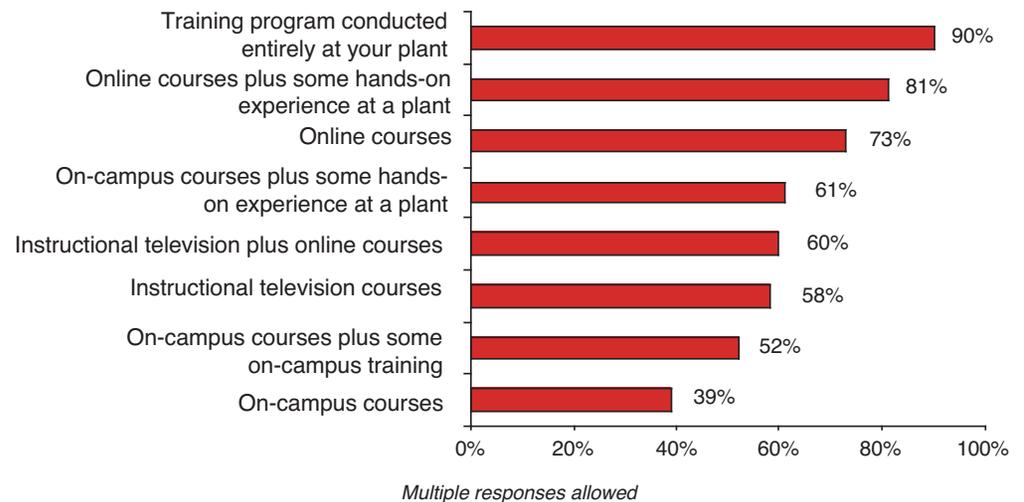
**PREFERRED TRAINING METHODS AND SUBJECT AREAS**

In an effort to identify the most effective and preferred training structure, respondents were asked to identify the delivery methods that would work well for their plant and employees. The majority (90%) felt that training conducted at their plant and through online courses with a hands-on experience component (81%) would be most beneficial. A significant number of respondents also preferred online courses (73%); on-campus courses with some hands-on experience at a plant (61%); a combination of instructional television and online courses (60%); and instructional television courses (58%). Less popular, but still acceptable, were on-campus courses with (52%) or without (39%) some hands-on training component.

What do you feel is the most significant issue in providing on-the-job training to your employees?

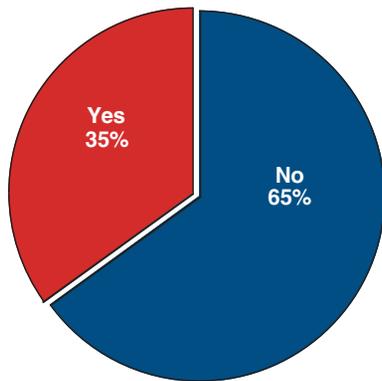


Would the following training delivery methods work well for your plant and your employees?

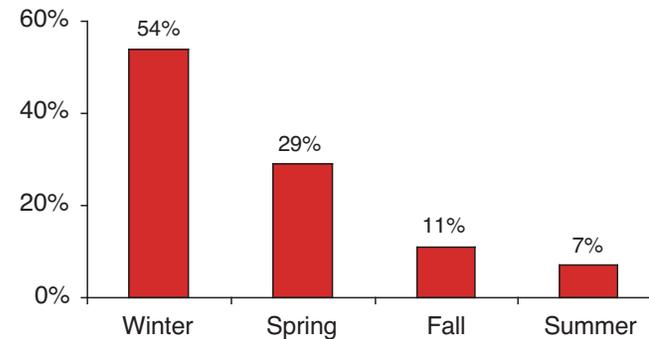


One-third of respondents (35%) said there are certain seasons of the year when employees have more time for training, with the most popular season being during the winter (54%). The second-best reported season was Spring (29%), followed by fall (11%) and summer (7%).

Are there certain seasons of the year when your employees have more time for additional training?

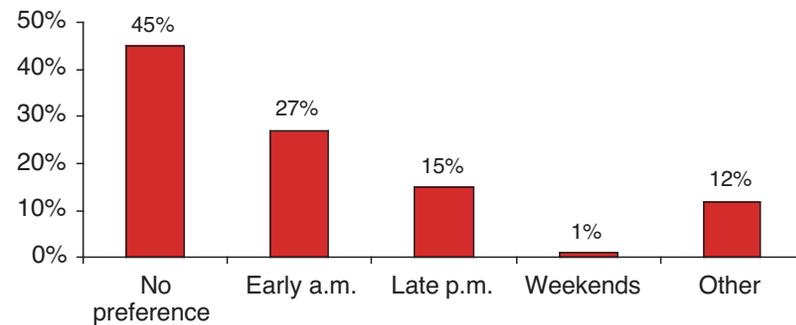


Which seasons?

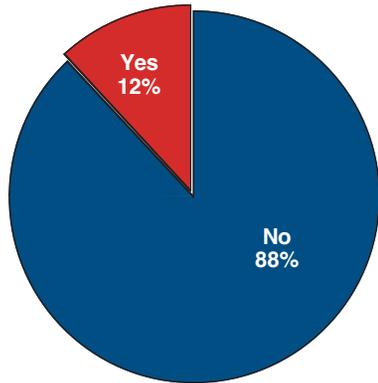


When asked if a particular time of day would work best for employee training, 45 percent had no preference. Early morning was the most popular timeframe (27%), followed by later in the day (15%). One percent preferred weekends, while 12 percent gave other responses, such as afternoons or anytime.

If classes could be offered at a certain time of day, what time of day would be better for your employees to undertake additional training?

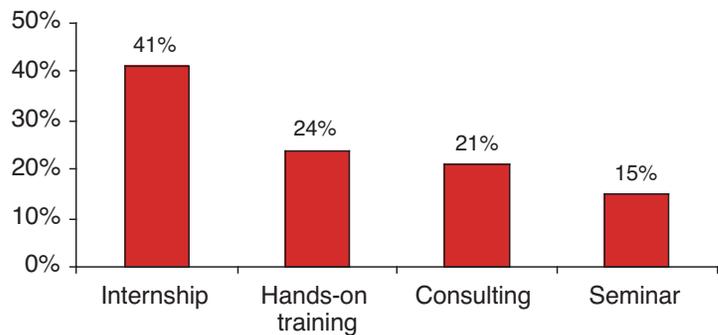


Is there any reason why you would *not* encourage your employees to take additional training through a college or university?



\* Reasons why management would not encourage employees to take courses include travel, legitimate program concerns, cost, work schedule and internal training already offered.

Are you aware of any other ways, beyond offering classes, that a college or university could help improve your business?



Twelve percent of respondents said they would *not* encourage their employees to engage in additional training through a college or university. Reasons cited included travel, concerns of whether it would be a legitimate program, cost, work schedule and the fact that internal training is already offered.

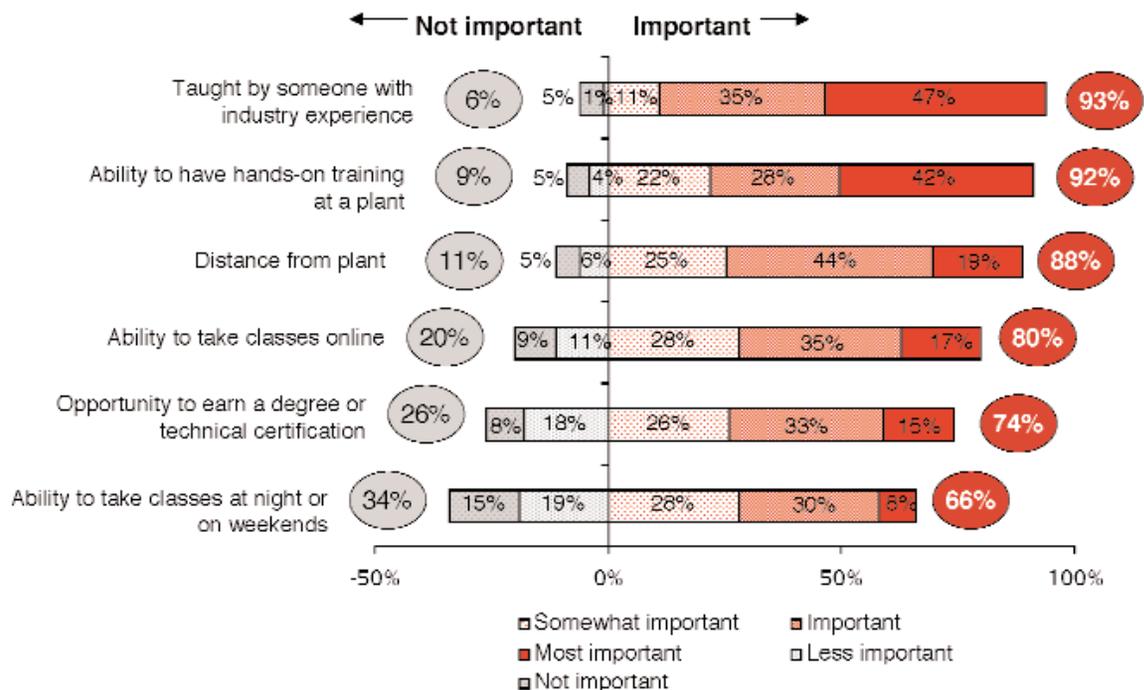
Study participants felt colleges and universities could help improve their business through internships (41%), hands-on training (24%), consulting (21%) and seminars (15%).

When asked about the importance of factors involved in training selection, biodiesel and ethanol plant management were most likely to say that training taught by someone with industry experience (93%) and the availability of hands-on training at a plant (92%) are most important. Eighty-eight percent felt the location of the training site is important, followed by the ability to take classes online (80%), earn a degree or technical certification (74%), and take classes at night or on weekends (66%).

Factors in Training Selection

	Important
Taught by someone with industry experience	93%
Ability to have hands-on training at a plant	92%
Distance from plant	88%
Ability to take classes online	80%
Opportunity to earn a degree or technical certification	74%
Ability to take classes at night or on weekends	66%

Multiple responses allowed

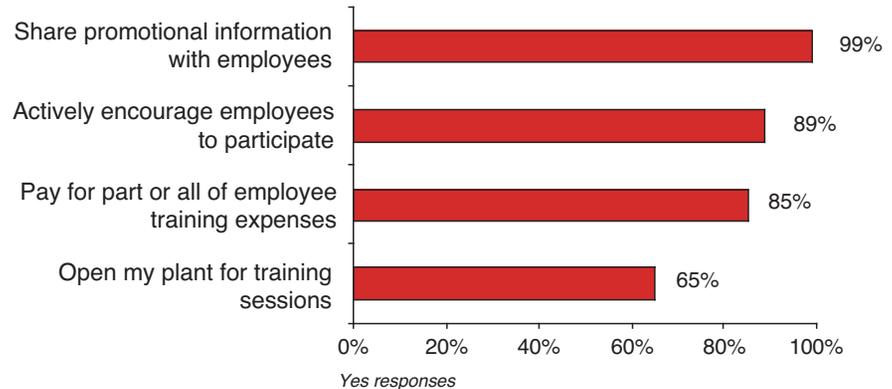


If a college or university offered training opportunities specific to their industry, nearly all respondents (99%) said they would be willing to share promotional information with employees. They also said they would actively encourage employees to participate in training (89%), including being willing to pay for part or all of the training expenses (85%). Two-thirds (65%) said they would be willing to open their own plant for training sessions.

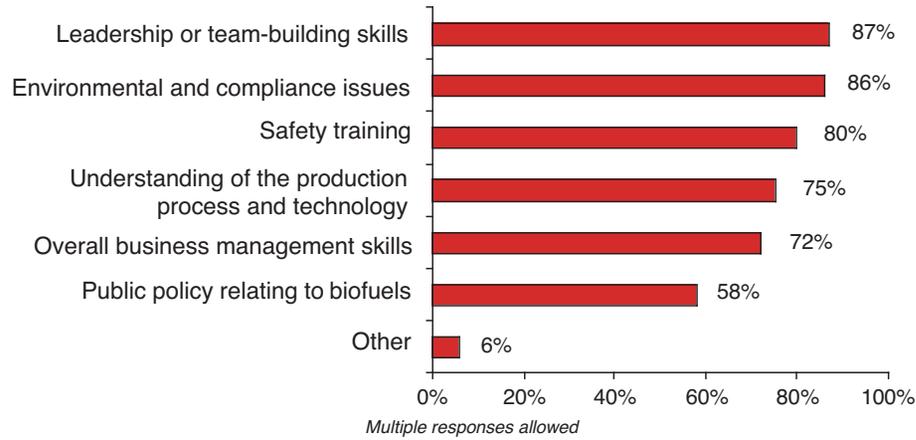
**SKILLS IN HIGHEST DEMAND**

Biodiesel and ethanol plant managers said they believe management staff would benefit the most from additional training in leadership or team-building skills (87%) and environment and compliance issues (86%), followed by safety training (80%); understanding of the production process and technology (75%); and overall business management skills (72%). Training participants were least interested in was public policy relating to biofuels. Six percent cited other areas of training.

If a college or university offered training opportunities specific to your industry, would you be willing to...?



Would your management staff benefit from additional training in the following areas?



## RECOMMENDATIONS

Based upon Phase I and Phase II research findings, the following recommendations are provided for consideration:

**CREATE MORE AWARENESS OF CAREER OPPORTUNITIES AND POTENTIAL** in the biofuels industry through communication with high school students, counselors and teachers; colleges; and community leaders. Virtually every person interviewed or surveyed agreed that there is a *serious* lack of awareness and employment consideration throughout the potential talent pool.

**INCREASE THE NUMBER OF QUALIFIED, DEGREEED CANDIDATES FOR OPERATIONS AND MANAGEMENT POSITIONS** in order to accelerate the process of developing staff, increase employee efficiency, improve retention and meet the increasing demand of the growing biofuels industry. Ideally, talent development will focus upon the nurturing of multidisciplinary talent that comes in more highly trained, is able to ramp-up quickly in-plant, and has the ability to draw upon a myriad of skills to be flexible within this rapidly evolving industry.

**PROVIDE CONTINUING EDUCATION OPPORTUNITIES FOR CURRENT OPERATIONS STAFF** to help them “break through the wall” for top-level positions within the plant. Operations employees currently being hired without any formal technical education can be promoted internally over time, but most may not qualify for mid- to higher-level positions. In providing these opportunities, the industry will gain as well. An important consideration in delivering training to production staff is the need to share the *value* message. Since many at this level currently do not have advanced, formal training, they will need to be taught *why* it is important in order to ensure enrollment.

**DEVELOP BIOFUELS MANAGEMENT DEGREE PROGRAMS** specifically applicable to plant manager and general manager positions, which require the most education/experience and are the hardest to fill – especially for new and small-size plants. Due to the shortage of qualified candidates for these positions, managers are often recruited from other industries or competitor plants. Unless addressed, retention will likely become a growing issue.

**PROVIDE CONTINUING-EDUCATION NON-TECHNICAL TRAINING FOR BIOFUELS MANAGEMENT EMPLOYEES** in such areas as leadership or team-building skills, environmental and compliance issues, safety guidelines, and overall business management and decision-making skills via seminars, consulting sessions or qualifications development courses.

**INCORPORATE HANDS-ON TRAINING WITHIN THE CURRICULUM.** According to plant management, experience in equipment operation (particularly within a biofuels plant) will give students a significant advantage in terms of landing a well-paid job and advancing rapidly. Educational institutions should incorporate a hands-on training component – offered via internships, pilot plants, or equipment and process training on campus – with any biofuels programs they offer and consider making such training a requirement for completion of the program. It will be critical to explore how training, at least in part, can take place on-site at plants.

**ENSURE TRAINING STAFF HOLDS INDUSTRY KNOWLEDGE AND EXPERIENCE,** for this is the most important factor that plants consider in program selection. Educational institution representatives must also stay in close touch with the industry – attending trade shows and conferences, reading trade journals, visiting plants, etc. – in order to anticipate and react to advancements and changes in the industry. Biofuels industry representatives indicated a willingness to collaborate with colleges and universities in this process, including participating on advisory boards.

**DELIVERY METHODS FOR EMPLOYEE TRAINING MUST ADDRESS THE LONG-DISTANCE NATURE OF PLANT LOCATIONS.** Online and instructional television training courses can accommodate uninterrupted work flow in the 24/7 non-stop operation environment typical at plants. Those institutions that are located in greater Minnesota may have an inherently easier time developing program buy-in due to an industry desire for accessible training options.

**ALL TRAINING CURRICULA SHOULD BE CONSISTENT AND STANDARDIZED TO SOME DEGREE.** Plants are currently concerned about consistency of training and its recognition within the industry. To alleviate these concerns, educational institutions should consider developing – through close collaboration with the industry – a standard set of skills, courses, certifications or degrees that would be recognized and eventually considered a requirement for different positions within a plant.

**CAPITALIZE ON MANAGEMENT’S WILLINGNESS TO PROMOTE TRAINING OPPORTUNITIES** by maintaining close communication regarding opportunities for continuing education, involving them in program development, and providing internal marketing materials to elicit participation.