Pittsburgh
ENGINEER
WINTER 2012
Quarterly Publication of the Engineers' Society of Western Pennsylvania

What's New in American Manufacturing?

INSIDE...

- Marcellus Shale Development
- Fueling the Future
- US Manufacturing Looks to Engineers
- Pittsburgh Innovation
- The "Comeback Kid"
- Plus: Take the Engineers Quiz

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In this issue...

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Guest Editor Column

By: Petra Mitchell

Petra Mitchell

US Manufacturing Looks to Engineers to Keep Our Competive Edge

Hello fellow engineers, I am excited to be the guest editor of this Manufacturing issue of Pittsburgh Engineer Magazine I have my bachelors degree in mechanical engineering from the University of Dayton and an M.S. in engineering with a concentration in manufacturing management from the University of Cincinnati. For most of my career I have worked for a manufacturer, General Electric, or to support manufacturers, Catalyst Connection. I have seen first hand how well-engineered products and processes are the foundation of a successful manufacturing company. Manufacturing shaped and built the economy of southwestern Pennsylvania. The industrial revolution of the 19th century created a new economy and way of life here and across the country. The 20th Century was the American Manufacturing Century.

> *"...the American public had started to concede to the loss of thousands of manufacturing jobs and billions of dollars in production revenues..."*

The last 20 years or so has been difficult for American Manufacturing. Tough foreign competition due to low wages and trade policies have lead to decline among many industries that had been dominated by American manufacturers for the century before. What was even more troubling is that the American public had started to concede to the loss of thousands of manufacturing jobs and billions of dollars in production revenues. Talk turned to the United States as a service economy and many planners began looking at a future with manufacturing as an insignificant piece of our national fabric. Those of us who work closely with manufacturing didn't agree. We realized that Manufacturing is an important part of the nation's economy today and for generations to come. The companies that have transitioned through this period became stronger. They increased productivity and developed innovative products that customers wanted. They invested in technology and relied on an experienced workforce to make products better than could be made anywhere else on the planet. American Manufacturing survived and the American public has taken notice.

A few years ago, there seemed to be more general discussion about the importance of this country's industrial base. Political candidates from both parties made manufacturing jobs a top priority. Manufacturing, once again, became the talk of small towns and large cities, alike. Manufacturing is now looked at as the engine to pull our stagnant economy back to dynamic prosperity. This is no more evident than here in Pennsylvania.

Pennsylvania has been the center of important manufacturing news. Marcellus Shale is literally right under our feet and not only is it an important energy source, it is creating new local manufacturing opportunities. From equipment and fixtures used at drilling sites to transportation and construction products needed to support this infrastructure, the leading energy companies need large amounts of manufactured goods that can be provided quickly. Many of Pennsylvania's manufacturers have begun supplying these needs and others are still working through the process to be part of this new supply chain.

In August, the tri-state region was awarded a $30 million grant to manage the National Additive Manufacturing Innovation Institute (NAMII). NAMII will explore the exciting new additive manufacturing technology which will allow parts that previously had to be molded, welded and machined, to be created with a 3-D printing technology. This has the potential to provide local manufacturers with another tool to compete globally.

In 2012, Governor Tom Corbett formed the 24-member Governor's Manufacturing Advisory Council, or GMAC, who recently submitted a report to outlining the necessities of a strong manufacturing. The report stated the importance of Pennsylvania's largest industry sector in terms of contribution to gross state product. Manufacturing contributes $71.0 billion, or 12% of gross state product, employs over 560,000 Pennsylvanians with an average wage of $55,243, and supports an additional 1.6 million jobs. 70% ($9.8 billion) of the state's research and development expenditures come from manufacturing companies and they received 60% of all issued patents. Small businesses with fewer than 500 employees make

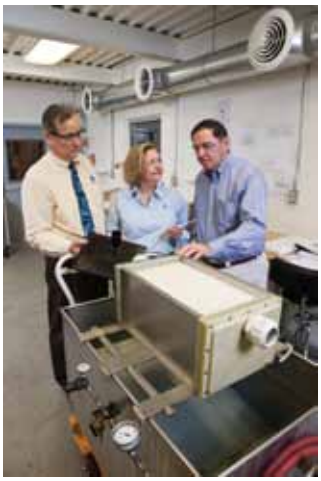
up 98% of Pennsylvania manufacturers and account for 75% of the total manufacturing workforce.

> *"Catalyst Connection is...tasked to help our region's manufacturers develop and implement the tools necessary to find new customers and compete in any environment"*

The Governor's council also provides a list of 15 key recommendations they believe will help Pennsylvania remain a strong manufacturing state. These fall under five initiatives: development of talent and workforce, opening new markets, making government work better for manufacturers, innovation and access to capital. I am happy to report that Catalyst Connection has been supporting small manufacturers with each of these initiatives for 25 years.

Catalyst Connection is a southwestern Pennsylvania economic development organization, funded in part by state and federal governments, tasked to help our region's manufacturers develop and implement the tools necessary to find new customers and compete in any environment.

We work with our clients on innovative web-based strategies and social media and help commercialize new products by working with technical experts in universities and laboratories. We also help companies implement lean manufacturing to reduce costs and develop their talent by investing in professional development for their workforce. Like manufacturing itself, we adapt to the needs of our clients. We recently created the Technology Acceleration Regional Innovation Consortium (T-RIC) to help manufacturers develop and commercialize new product innovations and the Marcellus Shale Regional Innovation Consortium (M-RIC) to help manufacturers enter the energy supply chain.



Catalyst Connection working with representatives from Cannon Boiler Works, Inc., New Kensington, PA

Manufacturing may seem to have re-emerged to many in this country, but we know it has always been an innovative and adaptive industry that keeps America a strong global player. This is an exciting new age of opportunities but it is clear that in order for American Manufacturing to remain strong, companies will look to the engineers to create new innovations and keep US products superior to global competition.

Petra Mitchell is President and CEO of Catalyst Connection.

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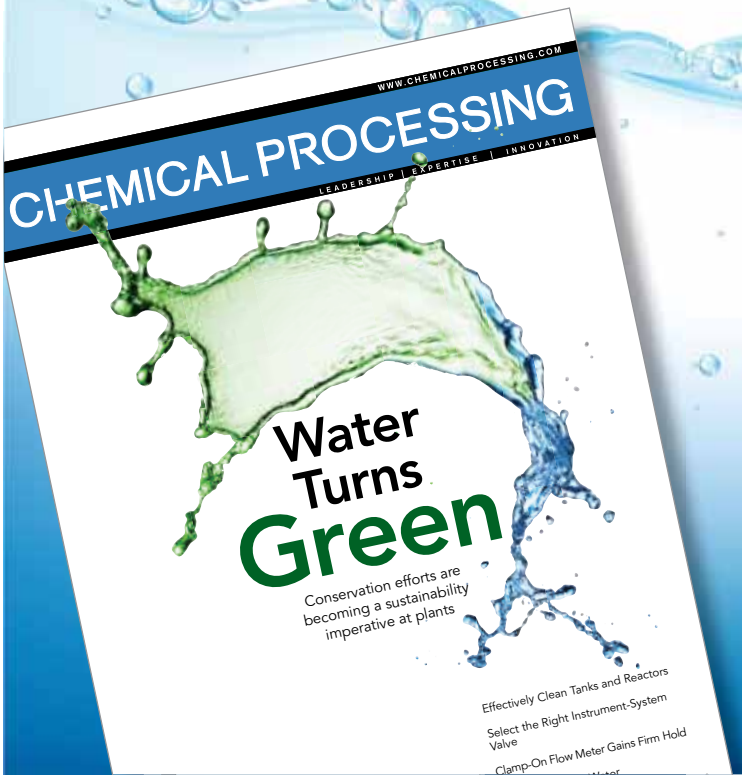

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A Historic Pittsburgh Strength, Energy is Fueling the Future of the Region with Jobs, Investment

by Bill Flanagan

Pittsburgh, the birthplace of the energy industry, is today's energy innovator, and energy is fueling the region's 21st-century economy. It's a big reason that Pittsburgh has outperformed the nation in terms of employment over the past five years and that the region was ranked by The Economist in December 2012 as one of America's healthiest economies, alongside Dallas, Denver and Houston.*

The investment and job creation related to the Marcellus Shale has been attracting most of the attention. Since 2010 natural gas exploration has accounted for 7.5% of all jobs gained here. But there's a lot happening beyond natural gas. Metro Pittsburgh is a national leader across seven energy-related industries, including coal, natural gas, nuclear, solar, wind, transmission and distribution and green building. Add to that more than $1 billion a year in annual energy research spending through the National Energy Technology Laboratory (NETL) in South Park, our colleges and universities and our corporate research centers and the region has got a critical mass of opportunity and innovation that is attracting global attention and investment.

Today there are approximately 60,000 direct energy jobs at 1,700 energy-related establishments throughout the 32 counties of "greater" Pittsburgh, a region composed of portions of four neighboring states – Maryland, Ohio, Pennsylvania and West Virginia. Together these energy industries contribute about $25 billion to annual economic output, about 15% of total economic activity.

There is plenty of reason to believe that this trend of increasing employment opportunity is going to continue for decades if not generations. First, our economy is diverse and balanced with strengths across five key industry sectors: advanced manufacturing, financial & business services, energy, health care and life sciences and information and communications technology. Energy's a big economic driver, but all five sectors are performing well and growing in the region. Additionally, a sector, such as energy, often converges with other sectors – information technology, for example – and creates new business opportunities and generates employment.

Second, all of these sectors are competing for many of the same skills. Each needs employees skilled in the "STEM" disciplines: Science, Technology, Engineering and Math. Thousands of jobs are going begging today because local employers can't find enough people – blue and white collar – with the skills they need. As thousands more jobs are created here we're going to need people to fill them, too.

Third, there's a big difference between our region's population and that of the rest of the country. The population trends older here. That means in coming years the region's Baby Boomers are likely to be cutting back or retiring in greater numbers than in other places. They'll be vacating jobs and adding their positions to the new jobs being created. It all adds up to increasing employment opportunity for people who have the skills to succeed.

Last year the Allegheny Conference on Community Development and the Energy Alliance of Greater Pittsburgh set out to better understand energy workforce needs. With a focus on the jobs that are most in demand and hardest to fill, the organizations completed

and published a "Workforce Analysis Report: Energy Sector Jobs in Greater Pittsburgh." The research and report are unusual in that they are forward-looking, making an effort to capture not just the needs of energy industries today, but the likely demand for skilled workers through the end of the decade. Thanks to the effort, the region now has a planning tool to help frame workforce development efforts.

The study identified 14 critical, difficult-to-fill jobs across industries. Many of jobs are just as important to manufacturing, as they are to energy. Only five of the occupations require a four-year degree. Eight require training beyond high school. All of them, even "sales manager," demand at least a comfort level with science and math.

At the same time, employers expressed serious concerns regarding their ability to fill these high-demand jobs with the current available workforce. Survey respondents indicated being highly confident in their ability to fill only one out of every five forecasted openings in these 14 occupations. The most common reason for their lack of confidence was the deficiency in technical and/or professional skills required to perform these jobs.

How many jobs will there be to fill? The study was not predictive, as the sample was not scientific. But it was suggestive of future workforce demand, as the sample did represent energy-related employers of various sizes spread across the 10 counties of southwestern Pennsylvania.

The bottom line between now and 2020 is that employers will need to attract tens of thousands of workers in these high-demand occupations and others to fill the jobs they expect to create and to replace the Baby Boomers they expect to retire.

Whether or not an employer is in an energy-related industry, it is important to pay attention to these results. Manufacturers and IT companies, as well as financial and health care employers, are seeking workers strong on STEM (Science, Technology, Engineering and Math). They will be competing for talent amid growing demand in energy.

What's the solution? The report makes several recommendations.

Target Jobs	Coal	Gas	Nuclear	Solar	Transmission and Distribution	Wind
Mechanical Engineers	●	●	●	●	●	●
Electrical Engineers	●	●	●		●	●
First-Line Supervisors of Production and Operating Workers	●	●			●	●
Welders, Cutters, Solderers, and Braziers		●	●	●	●	
Computer-Controlled Machine Tool Operators, Metal and Plastic		●			●	●
Helpers--Installation, Maintenance, and Repair Workers		●			●	●
Industrial Machinery Mechanics	●	●			●	
Machinists	●		●	●		
Sales Managers	●	●			●	
First-Line Supervisors of Construction Trades and Extraction Workers	●	●				
Heavy and Tractor-Trailer Truck Drivers		●			●	
Inspectors, Testers, Sorters, Samplers, and Weighers			●	●		
Property, Real Estate Managers (Landman)	●	●				
Petroleum Engineers		●				

Nine of the 14 Target Jobs appear across three or more sectors. Efforts to build the needed workforce skills for any one of these jobs will have a positive effect across the region's broader energy footprint. Source: Workforce Analysis Report 2012.

- Industry, the public workforce system and educational institutions *need to collaborate* – developing common messaging that effectively promotes the long-term stability and earning potential of these energy-related careers.
- Companies must collaborate to market these jobs aggressively, especially to younger talent, as *high-paying, important, and rewarding careers*.
- In advising both youth and adults on career opportunities, *more emphasis should be placed on occupational competencies and skills*, rather than discussions focused solely on a single industry or sector.
- Clear educational pathways between secondary and post-secondary education and training need to be articulated and far more widely promoted. The traditional dichotomy of college track versus non-college is no longer a useful construct; the reality is that a 21stcentury energy workforce will not only need post-secondary education, but will need to remain in a *continuous learning mode.*
- It will be *critical to extend awareness* of the depth and significance of economic opportunity – and what will be required from students – to teachers and school administrators focused on grades K-8, not just those serving high school. Middle and high school students all require a strong grounding in a rigorous STEM (Science, Technology, Engineering, and Math) curriculum.
- *Industry must take the lead* in proactively creating and supporting partnerships with and among regional secondary, technical and community colleges, helping to ensure effective curricula and learning tracks for each of the Target Jobs.

Together, we can meet the demand for skilled workers and capture the opportunity ahead – to the benefit of new generations of workers and the Pittsburgh region, the new Center of American Energy.

**Pittsburghers drilled the first oil and natural gas wells and built the first natural gas pipeline; electrified America with alternating current and commercialized nuclear power; pioneered scrubbers for coal-fired power plants; and were innovators and early adopters of green building technologies that use energy more efficiently.*

Bill Flanagan is Executive Vice President of the Allegheny Conference on Community Development and Affiliates

PE

Marcellus Shale Development Driving New Markets

By: Joy Ruff

When natural gas prices plunged in the winter of 2011-2012, it was a blast of cold reality for the Marcellus Shale industry, which had enjoyed many months of seemingly unstoppable growth. The downturn prompted retrenchment of drilling plans and widespread concern about the possibility of a prolonged slump. But in the soft market, many producers are discovering opportunity — the chance to trim their costs, build out their infrastructure and solicit new customers. They're demonstrating that there are ways to trump the slump and prepare for a prosperous future.

The decline was dramatic. By early 2012, the price of gas on the New York Mercantile Exchange plummeted to $2.77 per million British Thermal Units; worse, at least one major industry analyst was predicting a skid below $2, which would represent a drop of more than 77 percent since 2008, according to the Wall Street Journal. Industry veterans, of course, have weathered price cycles before. Indeed, some observers attribute the downturn largely to many of the same factors — mild winter temperatures, abundant supply, sluggish national economy — that historically have triggered price declines.

While some forces behind the slump are the usual suspects, others may be unique to the Marcellus drilling environment. "It's reasonably new when you look at the history of the natural gas industry, so we're in uncharted territory," says Rich Bohr, president of Whitetail Natural Gas Services. "These days, there are more issues that can have an effect on commodity prices."

Map of Pennsylvania showing locations of Compressed Natural Gas Fueling Stations

Among those new factors is the volume of leased wells throughout the Marcellus footprint. As growth in the fields boomed, drillers leased more and more wells under agreements that often require them to drill or lose the lease. Squeezed by such contracts, some producers opted to drill wells, even when economic conditions didn't justify it, rather than try to renegotiate leases. Lease-driven drilling may have contributed to an already abundant supply.

Worrisome as weak prices may be, many producers are finding ways to exploit the slump and solidify their foundations for growth with the inevitable rebound. For example, extensive drilling now might not make sense, but managing the lower expenses that limited drilling yields makes a lot of sense. How much will you save during your drilling interregnum, and how should you redeploy those resources? Sharp operators will come up with the answers.

> ***"Extensive drilling now might not make sense, but managing the lower expenses that limited drilling yields makes a lot of sense"***

A pause in drilling also gives producers a chance to complete any unfinished infrastructure; with pipeline in place, producers will be poised to tap wells as soon as the market improves. "Some wells aren't producing because the infrastructure isn't available to connect them," Bohr says. "In a time like this, route plans, engineering, ordering, permitting — those things all can be ongoing. It's a good time for mid-stream companies to do that."

While low prices are no cause for celebration, they might be attractive to potential new users who could be considering a switch to lower-cost fuels. The lull in drilling is a great time to market to those prospects. Power-generating utilities, large-scale manufacturers and fleet operators continue to be primary targets, but there's no reason to stop there. Entities such as school districts, government agencies

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and mega-manufacturers and distributors typically have fleets that are prime candidates for conversion to natural gas. Pitching such prospects is an excellent way to profit from dawdling prices, which should be a powerful attraction for new customers.

Many producers are making a compelling case for natural gas by shifting over their own fleets. "There is an opportunity for the industry to set the example for using natural gas as a transportation fuel," Bohr says. "All producers can be looking at converting all their equipment at the well pad and the drilling rig itself. We've been doing diesel to natural gas conversions for years. All of this is doable. It's not new science or engineering. It's those kinds of examples that help to alleviate doubt in consumers' minds." Such conversions will save producers money over the long term, and they serve a valuable public

Grand-opening of a new Dandy Mini-Mart in North Towanda, PA offering compressed natural gas for vehicle fueling

Target the most likely prospects. Fleets with vehicles housed in multiple communities, or on multiple sites within the same community, may not be your best candidates, since it would be cumbersome to refuel scattered vehicles at a central location. But if a fleet departs from, and returns to, a common site, a central refueling station can serve all customer vehicles. Organizations so situated may be your top prospects.

Sell all the advantages of natural gas. Potential customers will know about the savings they may realize, but are they aware that the elimination of a single diesel-powered truck has the same beneficial impact on the environment as the removal of 325 automobiles? They will if you tell them.

Familiarize yourself with government incentives. State and local government may offer loans and grants to support conversion, but this is an ever-changing landscape. New programs are introduced even as funds for older initiatives dry up. Keeping abreast of government incentives will help you point prospects in the right direction.

Joy Ruff is the Community Outreach Manager for the Marcellus Shale Coalition. PE

ESWP Member News

More than 80 firms are represented in the Corporate Member program of the Engineers' Society of Western Pennsylvania (ESWP). Memberships are available at 3 levels: Gold, Silver and Bronze. Gold members are entitled to 14 memberships that can be exchanged by employees; Silver, 9; and Bronze, 5 — annual dues are $2400, $1700, and $1000 respectively. In addition, ESWP Corporate Member Firms may add 2 additional individuals in our Under-35 age category at no additional cost. More information can be found at eswp.com. Please contact the ESWP Office (412-261-0710) for additional details.

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PittsburghInnovation

By: The Pittsburgh Technology Council

Pittsburgh's fast-growing technology and advanced manufacturing industries are at the leading edge of innovation

More than three decades ago, as heavy industry collapsed in Pittsburgh and the surrounding region, economic seeds were being planted in an effort to regrow the economy.

This would require a pivot, a complete rethink as to how a region could become a vibrant center of commerce and industry again. Nearly a generation ago, business leaders, economic stakeholders and political leaders on both sides of the aisle rallied resources and networks to build an industry fueled by university research, manufacturing clout and deep entrepreneurial roots.

The Pittsburgh Technology Council was one of the many resources that emerged from this economic pivot to serve as a focal point for the region's growing technology and advanced manufacturing companies. (Be sure to watch the Pittsburgh Pivot at youtube.com/user/PittsburghTechnology) In fact, 2013 marks the 30th anniversary of the Pittsburgh Technology Council and its mission to help technology companies succeed. Today, nearly 1,400 companies belong to the PTC, representing what has become Pittsburgh's innovation economy.

The Pittsburgh region is teaming with companies -- both new and old -- that are blending the traditional worlds of manufacturing and materials with the bleeding edge of technology. Here are just a few examples of Pittsburgh Technology Council member companies that are taking innovation to a new level.

Aquion Energy

Based in Pittsburgh with manufacturing facilities in East Huntingdon, Twp., Aquion Energy designs and manufactures a revolutionary type of battery based on research at Carnegie Mellon University. The company has developed a novel Aqueous Hybrid Ion (AHI) battery that will enhance the electrical grid by providing flexible, emissions-free capacity that optimizes existing generation assets and enables broad adoption of renewable energy technologies.

The Pittsburgh region is teaming with companies -- both new and old -- that are blending the traditional worlds of manufacturing and materials with the bleeding edge of technology.

Aquion's battery system will also address other energy storage application challenges. Beyond minimized cell and system costs and dramatic performance enhancements over incumbent technologies, the company is building batteries that are safe, environmentally benign and long lasting.

Under the leadership of CEO Scott Pearson, Aquion is producing modules that can be assembled into economically compelling electricity storage systems ranging from kW scale household products to hundreds of MW's to manage energy use at the grid scale. Low-volume production began in the summer of 2011.

Aquion made headlines last year when it leased space in the former Sony manufacturing plant with operations to begin this year. As part of a first phase manufacturing commitment at this site, Aquion expects to create over 400 high-tech manufacturing jobs by the end of 2015. Learn more at aquionenergy.com.

nanoLambda

nanoLambda's SpectrumSensor works as an optical spectroscopemeter that can read and interpret the unique wavelengths of light in material. It uses this information, then, to perform a myriad of functions depending on what a client needs.

In its most visible example currently, nanoLambda has engineered the SpectrumSensor to maximize the color quality, consistency, and brightness in consumer electronics, including televisions, smart phones, tablets, watches, and more. The sensor will monitor the color quality of LEDs for the color consistency over time and temperature, which is one of the biggest challenges in the soon-to-explode LED markets.

Thanks to its ultra-compact size and very low cost, SpectumSensor, the world's first and smallest product of its kind, can be directly embedded inside innumerable personal everyday devices – even beyond consumer electronics, into non-invasive health monitoring, cosmetic skin tone measurement, and water quality monitoring, among others. Learn more at nanolambda.net.

Calgon Carbon

Founded in 1942 to supply activated carbon to the U.S. military, Calgon Carbon has grown into the world's leading supplier of granular activated carbon by pioneering innovative purification systems for drinking water, wastewater, odor control, pollution abatement, and a variety of other manufacturing processes.

Employing about 1,100 people around the world at 15 different facilities, Calgon Carbon is a true global player in rapidly growing global market for activated

Local Manufacturing at Creekside Springs LLC, Ambridge, PA

carbon. While the manufacturer has maintained steady, cumulative growth throughout its 70-year history, the future holds even greater potential for Calgon, as an increasing number of countries around the world move to establish and implement regulations aimed at making our environment cleaner and safer.

Markets where growth potential is the greatest include the control of disinfection byproducts in municipal drinking water; global expansion of Calgon's reactivation services, with a specific focus on growing Asian markets; mercury removal from power plant flue gas; and ballast water disinfection, which is the largest growth opportunity for Calgon Carbon.

The growth in this market is being fueled by international regulations requiring disinfection of a ship's ballast water to prevent the transfer of invasive species from one ecological system to another. By 2018, Calgon estimates that this will be a $15 billion global market.

Just recently, the company added 100 employees to support its growth in the ballast water treatment market. Look to Calgon Carbon to continue to take advantage of the ever-growing number of global applications for activated carbon and its innovative purification solutions. Learn more at calgoncarbon.com.

Bayer MaterialScience

Based in Pittsburgh, Bayer MaterialScience is a world-leading materials provider. According to the Bayer Group's mission statement "Science For A Better Life," Bayer MaterialScience works on solutions for the challenges of our time.

So, imagine a thin sheet, so unobtrusive that you may never even notice its existence, saving you from pain and infection. It's one of the newest developments from Bayer MaterialScience working in conjunction with the PA NanoMaterials Commercialization Center.

These flexible sensing films, utilizing new Baytubes® carbon nanotubes technology from Bayer, have been developed with the help of the Quality of Life Technology Center, a joint venture between Carnegie Mellon University and the University of Pittsburgh.

The sensing films utilize the mechanical properties of Baytubes® carbon nanotubes, which provide electrical conductivity through their large surface area. By leveraging the benefits of the nanotubes in the final product, the technology will potentially provide flexibility, durability and customization to prevent pressure sores and deep tissue damage for wheelchair users.

Carbon nanotubes are very small semi-conducting materials that can transmit current. By putting them into coatings and applying them onto flexible film, researchers at Bayer MaterialScience found that they could help in this specific application – informing people that they need to adjust their positions to avoid sores and infections. According to the PA NanoCenter, prototypes will continue to evolve and could find its way into applications like pressure sensory pads for spinal cord patients or foot pads for diabetics.

Dynamics, Inc.

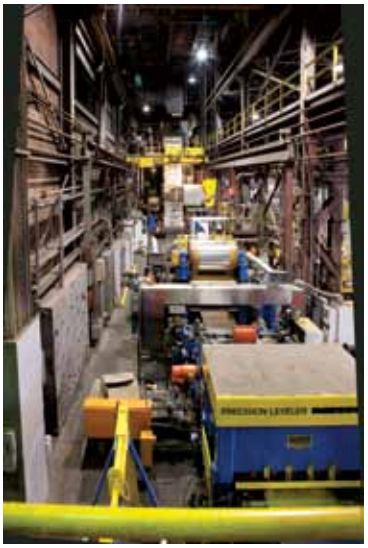
Nestled in Cheswick, Pa., right in the Allegheny Valley, Dynamics Inc. has made a name for itself producing a paper-thin, flexible computer with high processing capabilities and low power requirements. The computer can be laminated into a number of different card-based products.

Dynamics' first product is the Dynamic Credit Card. The card periodically changes a portion of a user's credit card information – both visually and magnetically. In doing so, the Dynamic Credit Card annually eradicates more than $20 billion in credit card fraud and associated costs.

Dynamics nationally launched the ePlate™ Visa® payment device in late 2012. This battery-powered credit card opens an entirely new payments category with revolutionary consumer-facing payment "apps." With this groundbreaking technology, a consumer can now choose between two app experience buttons on their ePlate Visa payment device and reconfigure the functionality of the card and the reward they receive as a result of the "app" they prefer. Dynamics ePlate is issued by UMB Financial Corporation. Learn more at dynamicsinc.com

These companies are just the tip of the innovation iceberg in the Pittsburgh region. Over the past 30 years, a marriage of technology and innovation has driven the Pittsburgh region's manufacturing sector. From the roots of heavy industry and a tradition of university R&D, a world-class center of innovation has become a reality.

Learn more about these companies and Pittsburgh's innovation economy at pghtech.org, facebook.com/pghtech or twitter.com/pghtech.



The Steel Industry at work at The Techs, a division of Steel Dynamics Inc., Pittsburgh, PA

Editor's Note: company narratives were derived from corporate web sites, the PTC Technology & Business Index and TEQ news magazine.

PE

Advanced Manufacturing Is "Comeback Kid" in Western Pennsylvania

By: Chriss Swaney

Research for advanced manufacturing in a new Pennsylvania program is designed to encourage manufacturing competitiveness and job creation.

In December, Commonwealth of Pennsylvania Governor Tom Corbett handed out a portion of Pennsylvania's $5 million contribution to a $70 million public-private partnership that government and industry officials hope will spark a manufacturing renaissance.

"Manufacturing adds more than $75 billion in value each year to our state's economy, and it is paramount that we do all that we can to grow that sector of our economy," said Corbett. "Through partnering with our world-class research institutions, we can provide the tools needed for Pennsylvania companies to create jobs and compete in a global economy."

Two Pittsburgh companies and one in Bucks County are getting state funds to hire graduate students from Carnegie Mellon University and Lehigh University who will help the companies with projects involving additive manufacturing, a technology that is expected to revolutionize traditional manufacturing. Also known as 3-D printing, the technology has been touted as the next industrial revolution for manufacturing. The companies awarded the funding included aerospace industry supplier Acutronic, ExOne and Paramount Industries of Langhorne.

Additive manufacturing enables companies to make finished products without bending, molding, grinding or assembling various components. A digital image of the product is sliced into thousands of layers the size of a human hair.

A 3-D printer similar to a laser jet printer sprays layers of powered metals and other materials and sand into a box, binding them together with a proprietory liquid. Once each layer is printed, the sand is vacuumed away and the finished product is hardened in a furnace.

The state's commitment of $5 million in $1 million increments helped a consortium of businesses and universities in Pennsylvania, northeast Ohio and West Virginia win $30 million in federal funding to start the National Additive Manufacturing Innovation Institute. Companies, universities and governments will provide the other $40 million.

From Left, Rick Lucas, Cecil Higgs, PA Governor Tom Corbett and Burak Ozdoganlar during the recent RAMP grant ceremony and facility tour

Carnegie Mellon University Mechanical Engineering Professor O. Burak Ozdoganlar estimated that $1 million in state funds could support 12 to 15 internships at CMU and Lehigh, the schools Gov. Corbett selected in June for the program.

In June, CMU and Lehigh were tapped to manage this new $1 million manufacturing and innovation development program to help foster a renaissance in Pennsylvania manufacturing globally.

The Research for Advanced Manufacturing in Pennsylvania program (RAMP) is funded through the Department of Community and Economic Development's Discovered in PA - developed in the PA (D2PA) program. The D2PA program, created by the Corbett administration, is designed to build capacity to better support Pennsylvania's businesses and to spur creativity and innovation in the allocation of economic development services.

The RAMP program is designed to tap the research and innovation capabilities of both Lehigh and CMU and provide technical and economic benefits to the state's small, medium and large-sized manufacturing companies enabling knowledge transfer, the discovery of new technologies and retention of highly-skilled students.

RAMP will operate as a competitive funding program that provides small incentive grants from 1 to 1.5 years in duration to faculty-led teams at CMU and Lehigh that engage in short-term innovation projects in cooperation with a Pennsylvania manufacturing company. Each successful RAMP proposal will be awarded between $25,000 and $75,000 to help support graduate students working with successful participating companies.

"This program is designed to help Pennsylvania companies invent and develop advanced manufacturing capabilities to compete in the global marketplace," said Gary Fedder, director of CMU's Institute for Complex Engineered Systems (ICES)and a professor in the Electrical and Computer Engineering Department and Robotics.

"Additionally, RAMP will build off the successful history at Lehigh and CMU of partnering with Pennsylvania companies and provide a gateway for these companies to tap into the unique technical capabilities that are available at these research universities," said Richard Sause,

director of Lehigh University's ATLSS Engineering Research Center.

The new program falls on the heels of the U.S. governments tack to forge new ways to collaborate on discovery, commercialization and the building of workforce skills to ensure that advanced manufacturing creates jobs in the U.S.

CMU research has shown that moving manufacturing overseas to developing countries can reduce the economic viability of emerging technologies.

"We find that in the case of early-stage industries with immature processes that when U.S. firms shift production from the U.S. to countries like China, the most advanced technologies that were developed in the U.S. no longer pay," said Erica Fuchs, an assistant professor in the department of Engineering and Public Policy at CMU.

The new National Additive Manufacturing Innovation Institute, located in Youngstown, Ohio, is one of 15 manufacturing institutes proposed by President Barack Obama as part of the strategy to revitalize manufacturing.

Companies supporting the effort are Allegheny Technologies, a Pittsburgh specialty metals producer and Kennametal, a Latrobe-area tool supplier. PE

TAKE THE ENGINEERS QUIZ

BE ONE OF FIVE WINNERS OF A LUNCH FOR TWO AT ESWP'S EXECUTIVE DINING ROOM...by answering all the following questions correctly:

I. The first school in the USA to offer engineering courses was:
   A. RPI
   B. MIT
   C. USMA
   D. CMU

II. The first college in the USA to offer a degree in engineering was :
   A. Yale
   B. RPI
   C. Cal Tech
   D. Harvard

III. The famous Pittsburgher who wrote a book on the design and construction of the Panama Canal is:
   A. Gene Kelly
   B. David McCullough
   C. Mary Cassat
   D. Jim O'Brian

IV. The architect of the Chicago World's Fair who also designed many buildings in the Pittsburgh area was:
   A. Frank Lloyd Wright
   B. I.M. Pei
   C. H.H. Richardson
   D. Daniel Hudson Burnham

V. George Westinghouse showcased this product at the Chicago World's Fair:
   A. The air brake
   B. The long-lasting Incandescent light bulb
   C. The transformer
   D. The mustache

Please submit your answers by 4/1/13 to David Teorsky, via email to: d.teorsky@eswp.com, with the subject line "Engineers Quiz." Quiz developed by Pete Geissler

Western PA Manufacturers Remain Optimistic for Opportunities, Despite Concerns over Economies, Regulations and Taxes

By: Lawrence P. Barger, CPA

The Western Pennsylvania region's manufacturers are optimistic about the future and recognize potential opportunities for continued success, while at the same time being realistic in their concerns about such challenges as the domestic and international economies, governmental relations, taxes and ongoing challenges related to hiring and retaining a skilled manufacturing workforce. This according to a recently released 2012 Biennial Regional Manufacturing Survey developed by Alpern Rosenthal and the University of Pittsburgh Institute for Entrepreneurial Excellence[1].

The manufacturers surveyed varied in size, with revenue ranging from less than $5 million with 5% of companies at $300 + million and the number of employees ranging from 3 to more than 1,500. Over 100 regional manufacturers responded to the survey.

> **"It appears that overall our area's manufacturers have recovered well from the "great recession" of 2008-2009 and experienced success in 2012."**

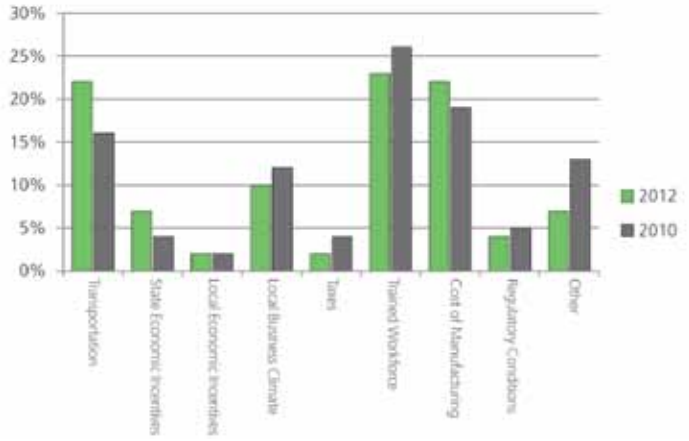
Every two years when we complete this survey, it's always quite interesting to compare our regional manufacturers' responses and sentiments to what we read and hear about the national economy, the health of manufacturing in the United States and various opportunities and challenges that face most manufacturers; as well as how their responses compare to those in previous surveys.

From the survey results, it appears that overall our area's manufacturers have recovered well from the "great recession" of 2008-2009 and experienced success in 2012. Nearly 70% of the respondents said they have seen a revenue increase over the last surveyed 3-year periods; however, those numbers are still not back to the 85% of the respondents who saw an increase before the 2008-2009 recession. Nonetheless, 70% is an improvement over the 51% from 2010; and additionally, the number of companies that are reporting revenue decreases of 20% or greater fortunately have declined from 22% in 2010 to just over 5% in this year's survey.

The manufacturers responding to the survey continue to be optimistic about revenue growth in the future; however, they appear to be more cautious about their projections this time around. Nearly 93% of the survey respondents in 2012 projected revenue increases, but only 15% of those are projecting increases of more than 20%. That's in comparison to 43% from the 2010 survey expecting those kinds of revenue increases over the next three years.

Also as part of our survey, we were interested in the perceptions of our region's manufacturers related to conducting business in Pennsylvania. The 2012 survey results found that similar to past surveys, the availability of a trained workforce and transportation as well as the (lower) cost of manufacturing remain the three most commonly cited strengths of doing business in Pennsylvania. Meanwhile, the availability of a trained workforce has decreased somewhat as being an asset for doing business here.

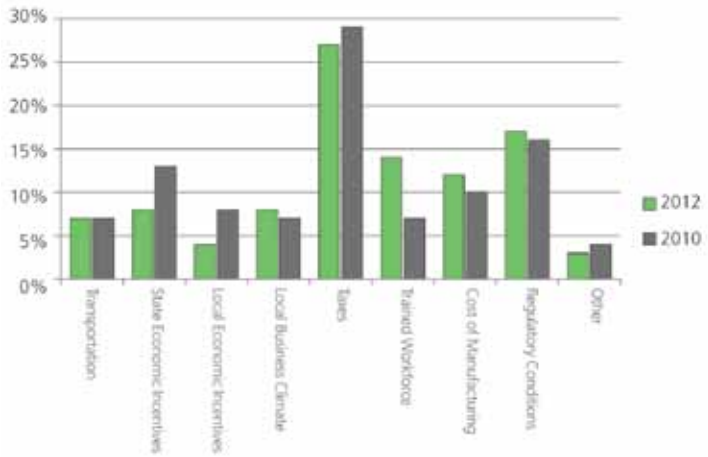
Reasons to do business in PA



The tax structure, regulatory conditions and (lack of) a trained workforce are the three most cited concerns in this year's survey related to doing business in Pennsylvania. However, two years ago, lack of state eco¬nomic incentives was in the top three, rather than lack of a trained workforce. This shift may reflect both more of an interest or need for economic incentives in 2010 as

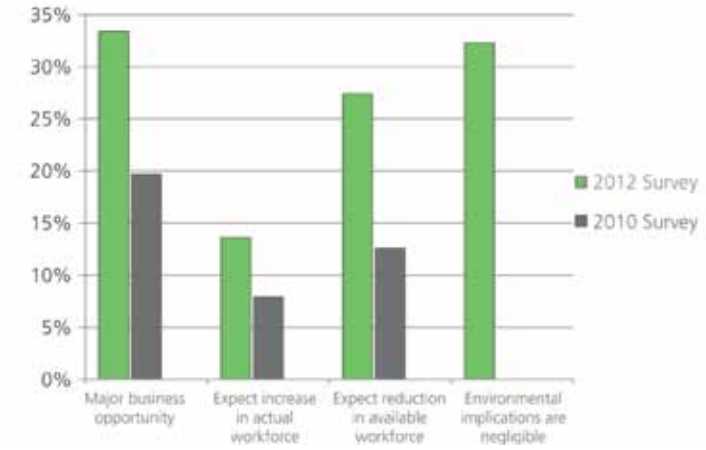
manufacturers were recovering from the 2008-09 recession, and also the current need for more skilled manufacturing employees as the economy continues to slowly improve and the nature of Western Pennsylvania manufacturing continues to evolve.

Concerns Regarding Doing Business in PA



Beginning with our 2010 survey, we added questions related to the impact on manufacturers related to the Marcellus Shale boom. The 2012 survey results indicate that more than one-third of the manufacturers surveyed see Marcellus Shale as a significant business opportunity. However, this year the percentage of respondents who noted that the Marcellus Shale boom will reduce the workforce available to western Pennsylvania manufacturers more than doubled.

Economic implications of Marcellus Shale



Overall, it appears that Western Pennsylvania manufacturers are in a positive frame of mind after experiencing success in 2012 while at the same time indicating a somewhat tempered level of enthusiasm as seen in our 2012 Biennial Regional Manufacturing Survey. These sentiments are certainly understandable given that during the second half of 2012 and especially late in the year, many business owners and executives felt a sense of uncertainty and a bit of unease related to the larger domestic and international economic conditions as well as the potential negative outcomes resulting from the prolonged "fiscal cliff" negotiations that were not (partially) resolved until January 1, 2013. And even then, most knowledgeable observers felt that the congressional action taken was somewhat limited in nature, especially on the government spending side of the ledger and will require further resolution in 2013.

As we all know, manufacturing has played a significant role in the post-recession economic recovery both nationwide and right here in Western Pennsylvania. And although there was some slow down in manufacturing activity nationwide during the latter part of 2012, the manufacturing indicators released in early January 2013 for the month of December were encouraging. Hopefully, manufacturers will have reason to continue their optimism and positive results into and through 2013.

Lawrence P. Barger, CPA, is an Audit & Assurance Director at Alpern Rosenthal and the Director of Manufacturing & Distribution Services.

1. The full survey report can be downloaded from the web site www.alpern.com. For a more detailed discussion on the results of the 2012 Biennial Regional Manufacturing Survey, please contact Lawrence P. Barger at lbarger@alpern.com or 412-281-2501.

Did You Know...

- The United States is the world's largest manufacturing economy, producing 18.2 percent of global manufactured products, according to the World Bank. China is second with 17.6 percent.1
- U.S. manufacturing produces $1.8 trillion of value each year, or 12.2 percent of U.S. GDP. For every $1.00 spent in manufacturing, another $1.48 is added to the economy.2
- Manufacturing supports an estimated 17.2 million jobs in the U.S.—about one in six private sector jobs. Nearly 12 million Americans (or 9 percent of the workforce) are employed directly in manufacturing.3
- In 2011, the average U.S. manufacturing worker earned $77,060 annually, including pay and benefits. The average worker in all industries earned $60,168.4
- U.S. manufacturers are the most productive workers in the world, far surpassing the worker productivity of any other major manufacturing economy, leading to higher wages and living standards.5
- Two-thirds of manufacturers pay income taxes at individual rates. Therefore, any tax increase on individuals is a tax increase on manufacturers.6
- U.S. manufacturers perform two-thirds of all private sector R&D in the nation, driving more innovation than any other sector.7
- Taken alone, U.S. manufacturing would be the tenth largest economy in the world.8

For more details, read the full report Facts About Manufacturing, found here: http://www.themanufacturinginstitute.org/Research/Facts-About-Manufacturing/Facts-2012.aspx

Source: National Association of Manufacturers. http://www.nam.org/Statistics-And-Data/Facts-About-Manufacturing/Landing.aspx

Engineers' Society of Western Pennsylvania
Affiliated Technical Society Membership

The Engineers' Society of Western Pennsylvania (ESWP) was founded in 1880 by many of Pittsburgh's most prominent names of industry and technology. Names like Westinghouse, Carnegie, Ferris, Brashear, Hunt and others helped to forge an organization that has endured for more than 130 years. In addition to the many benefits ESWP offers its members, ESWP also offers support services to other technical organizations in the region. We know that your time is valuable and the challenges of managing an organization can be plentiful. ESWP can help! Our Affiliated Technical Society program provides support services by the same fulltime professional staff supporting ESWP. As such, we have a lot in common with your organization, or as we like to say "Your business is our business."

Membership Benefits

- Opportunity to have a voice in the Organization which has represented the Western Pennsylvania Technical Community since 1880
- Enrollment in ESWP's Technical Society Referral Service - as your volunteer officers change from year-to-year, your phone and mailing contact doesn't have to. Allow ESWP to become your home base so that you may establish a permanent home address.
- Receive the Pittsburgh Engineer magazine, ESWP's quarterly publication still printed and direct mailed to all subscribers.
- Publication of you Group's meetings, activities and announcements in ESWP's monthly e-Technicalendar newsletter and on our website and calendar of events.
- Opportunity to participate in the Technical Society Forum and Leadership Forum
- Use of the Engineers' Club Dining Room, Lounge and Private Meeting Rooms for your groups monthly meeting*
- Opportunity to participate in programs dedicated to enhancing the engineering process
- Eligibility for one representative from your Society to enjoy an ESWP membership for just $60.00 per year*
- Opportunity to use ESWP headquarters as a mailing address and telephone number for your Society's business affairs
- Opportunity to use ESWP administrative services to support your Society's business affairs*
- Access to reasonably priced storage space for your society's archive materials*
- Availability of ESWP Services to take individual reservations for your functions, meetings and conferences*
- Opportunity to co-sponsor National Engineers Week activities
- Access to ESWP Services to help you develop and coordinate joint technical programs
- Eligibility to participate on ESWP's Technical Society Committee to coordinate and partner with other similar organizations
- Annual Dues range from $200-$245 per year, based upon membership size

To learn more about Affiliated Technical Society membership, please contact David Teorsky at the Engineers' Society at 412-261-4300, or by email at d.teorsky@eswp.com

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