No-Cost Energy Assessments for Small to Midsized Manufacturers

written by Lauri Moon | December 1, 2016

Save Money Through Pollution Prevention and Energy Efficiency Strategies

IMC, in partnership with PennTAP, is providing free energy assessments for manufacturers to reduce pollution, improve energy efficiency and decrease greenhouse gas emissions that will result in reduced operating costs. Technical advisors will perform these pollution prevention and energy efficiency assessments through onsite visits, provide recommendations for improvements in energy utilization and waste reduction, prepare and deliver site assessment reports and provide assistance completing grant applications for follow-up project implementation.

To take advantage of your no-cost energy assessment email info@imcpa.com or call 570-329-3200 to get in touch with your IMC Business Advisor.

Industry 4.0: The Future of Competitiveness in U.S. Manufacturing

written by Lauri Moon | December 1, 2016

(Reshoring Initiative Blog — Sandy Montalbano D'Amico: 8-20-16) Industry 4.0 is defined as a fourth wave of technological advancement, driven by nine technology

advances that will increase manufacturing productivity and increase competitiveness in manufacturing industries.

According to the Boston Consulting Group (BCG), "In this transformation, sensors, machines, workpieces and IT systems will be connected along the value chain beyond a single enterprise. These connected systems (also referred to as cyber physical systems) can interact with one another using standard Internet-based protocols and analyze data to predict failure, configure themselves, and adapt to changes. *Industry 4.0 will make it possible to gather and analyze data across machines, enabling faster, more flexible, and more efficient processes to produce higher-quality goods at reduced costs.*"

A Level Playing Field

Industry 4.0 has the potential to level the global playing field for U.S. firms and give them the opportunity to reshore more U.S. manufacturing. As American companies adopt a more comprehensive total cost analysis, they are finding that rising offshore labor rates combined with other "hidden costs" of offshoring often counterbalance any remaining savings from cheap price or labor abroad. They are also finding that separating research and development from manufacturing has a negative impact on innovation.

American companies that more accurately evaluate sourcing alternatives and adopt 4.0 technologies will be in an optimum position to increase competitiveness, take advantage of the benefits of localization, and manufacture profitably in the U.S. for the North American market.

The Future of Productivity and Growth

The Fourth Industrial Revolution was the focus of this year's World Economic Forum meeting in Davos. The scope and impact of this industrial revolution is expected to be transformational, and disrupt almost every industry in every country, changing entire systems of production, management, and governance. According to the global agenda, "there is clear evidence that the technologies that underpin the Fourth Industrial Revolution are having a major impact on businesses." A recent BCG report shows how connectivity and interaction among parts, machines, and humans will

make production systems as much as 30 percent faster and 25 percent more efficient. Industry 4.0 has the potential to have a dramatic impact on U.S. manufacturing competitiveness and reshoring of U.S. jobs.

The Challenge for the United States

According to the Reshoring Initiative data report, the bleeding of manufacturing jobs to offshore has stopped. Reshoring, including FDI, balanced offshoring in 2015 as it did in 2014. In comparison, in 2000-2007 the United States had a net loss of about 200,000 manufacturing jobs per year to offshoring.

According to Reshoring Initiative calculations, about 265,000 manufacturing jobs have been brought to the U.S. from offshore in the last seven years. That job gain is the result of both new reshoring—the return of manufacturing work by U.S. headquartered companies—and foreign direct investment (FDI) in the manufacturing sector by foreign headquartered companies. Those 265,000 jobs represent about 30% of the total increase in U.S. manufacturing jobs since the recent low of 11.45 million in February 2010.

Now, the challenge is to bring back another 3-4 million manufacturing jobs that are still offshore as measured by our $500 billion/year trade deficit. Between the health of the industry overall and the balancing of the job flow, the beginnings of a manufacturing renaissance are evident, but many actions are required to maintain the momentum.

How Modern Technology Solutions and Better Sourcing Decisions Impact Reshoring

We need continuous improvement in operations and in sourcing decisions to make domestic production the clear first choice in more cases.

Corporate Investment

The benefit of Industry 4.0 for U.S. companies is the increased productivity and efficiency that enable more flexible and efficient processes to produce higher-quality goods at reduced costs. The first step then must be continued corporate investment in the nine technologies that are transforming industrial production – the building

blocks of Industry 4.0:

- Big data and analytics
- Robots
- Simulation
- Horizontal and Vertical System Integration
- The Industrial Internet of Things
- Cyber Security
- The Cloud
- Additive Manufacturing
- Augmented Reality

Government Action

Second, government action to make the U.S. more competitive: skills training, lower nominal corporate tax rate, and a combination of an overall lower USD and an end of offshore currency manipulation.

Better Sourcing Decisions

Third, consistent, disciplined use of Total Cost of Ownership (TCO) analysis so companies recognize that domestic manufacture is in most cases their best choice.

Reporting Success Stories

Finally, thorough reporting on reshoring success stories so that corporations realize that reshoring is worth reevaluating and investing in … and so prospective skilled workers realize that their best career opportunities might again be in manufacturing.

The Winning Strategy

The impact of offshoring on the U.S. economy and the environment has been significant. According to the Economic Policy Institute, the growing U.S. trade deficit with China alone cost 3.2 million jobs between 2001 and 2013. Job losses occurred in every state, primarily in manufacturing. Offshored jobs have diminished American employment opportunities, helped contribute to wage erosion, had a

dramatic and negative effect on the domestic economy, and negatively impacted the environment through higher carbon emissions and other pollution from some developing countries and from long distance transport.

The winning strategy is balancing the trade deficit with a strong investment in new technology and skills training and increased corporate use of total cost for sourcing and plant siting decisions.

By reducing our trade deficit, reshoring has the potential to increase US manufacturing by 25%, curtail unemployment and the budget deficit, improve income equality, strengthen our defense industry and motivate skilled workforce recruitment. Achieving this potential requires your help at your company and in your community!

In summary, Industry 4.0 solutions give manufacturers the tools to increase speed to market, and boost productivity and the competitiveness needed to support reshoring efforts.

****

The Reshoring Initiative provides a broad range of free resources to bring back more manufacturing, including:

- Total Cost of Ownership Estimator® — A free online tool to help OEMs evaluate sourcing alternatives and suppliers.
- Reshoring Library — Contains 3500+ linked articles on reshoring. See what your competitors are reshoring. Learn from them. See what companies in your customers' industries are reshoring. Sell to them.
- Case Studies — Submit your own reshoring case for free publicity and to make reshoring more visible. Receive a free "Manufacturing is Cool" T-shirt.
- Economic Development Program — Strengthen your region by replacing imports with local production, ideally yours. Have your local economic developers contact us.

(Sandy Montalbano D'Amico is Consultant to the Reshoring Initiative®)

This New GE Factory is a Blueprint for the Future of Manufacturing

written by Lauri Moon | December 1, 2016
The brilliant factory is GE's new take on how we make things. It involves machines are embedded with sensors and connected to the Industrial Internet. The factory uses GE's Predix software platform to stream data …more….

Read the full article at www.gereports.com.

Companies Bringing Manufacturing Jobs Back to US

written by Lauri Moon | December 1, 2016
(IW – Adrienne Selko: 8-25-16) From January 2010 until July 2016 the Reshoring Initiative estimates that 265,000 jobs have come back to the United States from abroad.

The Reshoring Initiative's 2015 Reshoring Report found that the reasons companies gave for coming back to the U.S. included:

- Government incentives
- Ecosystems/localization
- Proximity to customers

- Skilled workforce

At the same time, companies cited lower quality, supply interruption (this category had the largest increase from last year), high freight costs and delivery as leading problems offshore. Cumulatively, rising wages and total cost have been major drivers in reshoring decisions.

Regionally, the trend remained strongest in the Southeast and Texas, but in 2015 the West displaced the Midwest to hold second place for most jobs shifted from offshore.

See below the list of some of the companies that have brought jobs back. The list was compiled by the Reshoring Initiative for 24/7 Wall St. and is based on company announcements.

Ford – 3200 jobs that went to Georgia

Boeing – 2200 jobs that went to Missouri

General Electric – 2656 jobs that went to Kentucky, New York and Ohio

General Motors – 2345 jobs that went to Tennessee and Michigan

Caterpillar – 2100 jobs that went to Georgia and Texas

Flextronics – 1700 jobs that went to Texas

Farouk Systems – 1200 jobs that went to Texas

Mars – 1000 jobs that went to Kansas

Why Manufacturing Will Make or Break the Future of Energy

written by Lauri Moon | December 1, 2016

Increasingly efficient manufacturing processes are poised to accelerate commercialization of clean technologies.

(GreenBiz – Lauren Hepler: 8-23-16) From solar panels a decade ago to energy storage today, the history of clean tech is littered with capital-intensive concepts poised to radically alter the relationship between industrialized society and the environment.

But why do these widely heralded breakthroughs always seem to limp along so slowly when it comes to actually hitting the market? The dreaded valley of death between conception and commercialization is one increasingly recognized explanation, dooming novel technologies to relegation in never-ending pilot projects as follow-on investment lags.

For Mark Johnson, the Department of Energy's resident innovation expert, the real problem often boils down to production. That is, not just inventing a new energy-centric technologies, but making sure those new tools can be reliably made in a cost-effective manner.

"We can do a lot to invent new technologies relevant to energy," Johnson, director of the DOE's Advanced Manufacturing Office, told GreenBiz. "But where you get those real breakthrough adoption moments is when the technology drives to the point where it reaches cost parity because of manufacturing innovation."

The "maker" craze has gripped consumer imagination in the form of 3D-printed plastic trinkets. Meanwhile, government labs and corporate innovation clusters at automakers, electronics giants and all manner of other companies are focused on advanced manufacturing at scale.

It's a field that encompasses everything from additive manufacturing to high-tech materials to Internet of Things sensors to a range of robotics possibilities, with the

latter poised to crack open a Pandora's box of labor automation anxiety.

Johnson's agency aims to help make sense of it all, particularly as the world grapples with fallout from fossil fuel-powered manufacturing and a shift toward renewable energy.

The Advanced Manufacturing Institute has embarked on a number of efforts aimed at not just inventing and patenting new technologies related to energy generation, grid integration and related areas, but also building better infrastructure for advanced manufacturing techniques that they hope will wring waste — and costs — out of the production process.

Those efforts include a network of 15 new U.S. "manufacturing innovation institutes" promised by President Barack Obama in his last State of the Union address. A separate Smart Manufacturing Institute based at the University of California, Los Angeles is one of multiple public-private efforts aimed at advancing nascent energy technologies with a potential manufacturing efficiency upside, such as applying Internet of Things connectivity and data analytics to factories.

The promise of advanced manufacturing doesn't stop with products explicitly associated with clean energy, though. The overall goal of the Clean Energy Manufacturing Initiative at the DOE is "to increase U.S. competitiveness in manufacturing clean energy technologies and increase U.S. manufacturing competitiveness across the board by boosting energy productivity and leveraging low-cost domestic energy resources and feedstocks."

Where you get those real breakthrough adoption moments is when the technology drives to the point where it reaches cost parity because of manufacturing innovation.

That could mean finding ways to economically produce lighter-weight consumer vehicles, or, as the energy agency's new REMADE program hopes to do, encouraging more aggressive recycling or circular economy approaches to production.

Still, increasingly fragmented global supply chains complicate the production puzzle. It's not just businesses, but also their many suppliers wrestling with the financial

and technical feasibility of major manufacturing upgrades.

“We don’t have vertically integrated companies anymore,” Johnson said. “Ford controlled everything from iron mines to dealerships they could get the value out of everything in that supply chain. Now they have tier 1, tier 2, tier 3 suppliers.”

The challenge now is getting all those moving parts working together, particularly as the DOE and a range of consortia partners such as federal laboratories and universities blaze the trail on nascent clean technologies.

Moving the needle on manufacturing

Manufacturing is by no means a monolithic category. From small-scale upcycled products to massive factories churning out cars, textiles or smartphones, the scope and environmental impact of manufacturing operations varies dramatically by scale and geography.

At a high level, however, federal data from recent years does show that the way we power production systems is beginning to change. As global energy intensity falls, the U.S. Energy Information Agency also documented a 17 percent decline in manufacturing energy consumption from 2002 to 2010, with the coal, oil and petrochemical industries remaining the biggest users in production.

“If you look at the use of energy in the manufacturing sector, over half of that energy goes to just a limited set of energy-intensive industries,” Johnson said.

Producing the ethylene that serves as the foundation of the myriad plastics used in different products is one of the most energy-intensive industrial processes, along with production of ammonia for use in fertilizer, he said. Pulp and paper and primary metals manufacturing are also both energy- and resource-intensive.

Advanced materials such as carbon fiber and graphene represent one field that could start changing the way a range of products are made — if it makes sense to make them in the first place.

“The challenge is that the cost is about three to four times higher than the cost of competing materials,” Johnson said, noting that the process of making carbon fiber

is both time- and capital-intensive.

Going in circles — in a good way

In addition to the emissions and ecological impacts that can result from heavy manufacturing, there's also the issue of waste to contend with.

"Up to 50 percent of the materials we produce wind up in a landfill within 12 months of their production," Johnson said. "The embodied energy — in other words, all the energy it took to make those things — is essentially being put into a landfill."

That's where he hopes some circular logic can come in handy.

Rather than trashing used products, their packaging and other manufacturing scraps, Johnson hopes to use them as "feedstocks" for new things — a core tenet of the circular economy push among sustainability advocates for production built on reuse rather than non-renewable virgin materials.

"Can you use those wasted materials, whether it's at the end of life or used as some mid-stream product, and wind up actually using it again?" he said. "The limiting factors are cost and energy."

A range of companies are already experimenting in the space, although what's really a variation on recycling and what represents a truly circular model varies depending on who you ask.

Tech companies such as Apple are focused on cutting e-waste by investing in reverse logistics, in this case iPhone-dismantling robots, to break down — and ideally, to find and repurpose — electronics components. In an example from the world of weird materials, Ford is partnering with Jose Cuervo to evaluate ways to use agave left over from tequila production in bioplastic car parts.

While the possibilities are vast, Johnson said the breakthroughs for clean energy manufacturing ultimately will have to come from the supply chain.

"A lot of OEMs have sustainability programs, whether its automotive, aviation, textiles," he said. "*What they need is a supply chain that can wind up applying those*

processes.“

Why Manufacturing Education Needs to Advance, Just Like You Have

written by Lauri Moon | December 1, 2016

Stuck in the Industrial Age, skills training doesn’t place enough emphasis on smart, connected product manufacturing, advanced material development and digital design integration.

(IW – Randy Swearer: 8-23-16) If you’ve read the Manufacturing Institute report, you’ve heard the statistics: 84% of manufacturing executives believe there is a talent shortage in the U.S. and worry that they won’t find the workforce they need to keep up with the increasingly more advanced and sophisticated demands of the industry.

And talent is the number one driver of global manufacturing competitiveness.

So why can’t manufacturers find and attract skilled talent?

One reason is that our manufacturing education system is stuck in the old Industrial Age of metalworking and welding. It doesn’t place enough emphasis on smart, connected product manufacturing, advanced material development and digital design integration.

Due to this gap, students—your next potential employees—may not be aware of exciting developments like 3-D prototyping and printing taking place within the industry or the multitude of careers available to them.

With the world economy placing a higher value on advanced manufacturing, we need to place a higher value on advancing manufacturing education.

Here are some ways we can build a more advanced and dynamic workforce:

Create Hands-on Opportunities Within Education Systems

As with most disciplines at the university level, manufacturing curricula in fields like engineering, software development and IT are still taught from a textbook. The setting and structure take away the hands-on, real-world learning that students could be experiencing. They miss out on the exciting part, and don't really understand what manufacturing is like on a day-to-day basis.

Businesses and educational institutions need to work together to develop new curricula that provide hands-on, learning-through-making opportunities.

We are beginning to see the success of these collaborative learning environments at several universities, such as *Rochester Institute of Technology's Studio 9.30*, a multidisciplinary studio focused on the development of health-technology products that benefit community partners. *Penn State Behrend's new Advancing Manufacturing and Innovation Center* provides a space for academic and industry partners to collaborate on research and manufacturing projects.

Not only will these students have real-world experience, but they will also understand the vast changes and advancements that are taking place within our industry.

Focus on Real-world Application of Skills

As long as traditional grades continue to be the marker for success at higher institutes of learning, students won't gain the critical hands-on education to prepare them for their future careers.

According to the 2014 U.S. Department of Labor report, 65% of careers that students will be taking on in the future don't exist today. Therefore, the chasm between what students learn in their current classroom environment and the expectation for skills in the real world is wide and difficult to breach.

This gap will only close if universities take a bold approach and redefine what success means and how students get there. For example, an influx of teachers is utilizing online platforms to help students publish work done outside of the classroom, so it can be accounted for as part of the curriculum. Through learning platforms, employers are able to look for and assess design and engineering candidates beyond a letter grade by viewing an individual's e-portfolio.

Georgia Institute of Technology student Israel Del Toro's e-portfolio consists of hypothetical as well as real-world design projects he completed in and outside the classroom, such as a new hand-held power tool, an electric razor and an innovative light fixture.

If you haven't done so already, encourage your hiring managers to place value on applicants who have pursued external opportunities outside the classroom, and have something to show for it.

Develop and Elevate Micro-credentialing Programs for Students and Employees

With school curricula slow to change, students are increasingly going across disciplines and outside of the classroom to learn new things and pursue their interests.

With the proliferation of organizations like *General Assembly*, *Codecademy* and even public makerspaces like *TechShop*, students not only want to learn new skills; they also want to be recognized for their accomplishments outside of school. *With micro-credentialing and digital badges, they can highlight their new competencies to potential employers*.

More than a hundred educational institutions, private companies and employment groups have banded together in a recent initiative called *Connecting Credentials* to make it easier for candidates and employers to build the skill sets they need. In addition, *Certiport* works with software companies to develop and administer certifications in specialized industry competencies, such as 3D design skills through AutoCAD and Autodesk Fusion 360 certifications.

Both the talent gap and education divide are not going to be solved overnight. However, a good starting point is a collective conversation around advancing the education system to better fit this ever-changing industry. Ultimately, working together will lead us to a better-equipped advanced manufacturing workforce.

(Randy Swearer is the vice president of global education experiences for the design and engineering software company Autodesk.)

‘Smart Operations’ New Key to Manufacturing Excellence

written by Lauri Moon | December 1, 2016

Smart operations use pervasive data collection, advanced analytics, technology investments and deeper collaboration with partners to prepare their value streams for the next industrial revolution.

(MH&L – Staff: 8-15-16) Over the next three years, a growing number of successful manufacturers will enhance their manufacturing processes with smart operations, a broader supply chain strategy that extends beyond the factory walls, according a UPS report, The Rise of Smart Operations: Reaching New Levels of Operational Excellence.

Smart operations use pervasive data collection, advanced analytics, technology investments and deeper collaboration with partners.

Lean and Six Sigma methods remain the standard for manufacturers, but continuous improvement has a downside, according to the report. Overly optimized processes can become inflexible, leaving the business unable to adjust rapidly to disruptions in the supply chain and changing customer demand.

However smart operations are better positioned than others to compete and in today’s fluctuating markets because increased visibility of inventory location and transportation allow companies to better analyze and quickly manage changes to their supply chain both upstream and downstream of the factory, the report says.

“Smart operations are crucial to the long-term success of manufacturing companies,” said Derrick Johnson, vice president of marketing at UPS. “The strategy enables manufacturers with limited resources to serve their increasingly demanding customers more flexibly.”

The report, which was done with IDC research firm, assessed how far along companies are in implementing smart operations. The report showed that 53% of companies were at a relatively low level of overall maturity. Still, 47% of the survey

respondents said their company's progress toward smart operations exceeded that of their peers.

There are five areas essential to smart operations:

- Connected products: Increasingly, industrial manufacturers sell products that are connected in the cloud. This connectivity allows companies to offer better maintenance service, which sometimes even generates new revenue streams.
- Connected assets: Manufacturers with connected assets are better able to monitor their operations to anticipate and even correct problems before they occur.
- Supply chain decision making: The data and analytic tools used in smart operations help manufacturers resolve issues in the supply chain faster.
- Buy-side value chain: Smart operations allow manufacturers to automate purchasing with their vendors and manage the inbound transportation of those supplies.
- Sell-side value chain: Smart operations allow manufacturers to change transportation modes and speeds as well as destinations based on shifting customer demand.

U.S. Expected to Lead as the Top Manufacturing Nation by 2020

written by Lauri Moon | December 1, 2016

WASHINGTON, Dec. 4, 2015 /PRNewswire/ –The United States is expected to become the most competitive manufacturing nation over the next five years, with the current leader China sliding into second position, according to the upcoming 2016 Global Manufacturing Competitiveness Index report from Deloitte Touche Tohmatsu Limited's (Deloitte Global) Global Consumer & Industrial Products Industry group

and the US Council on Competitiveness (Council). Read from PR Newswire [more]

The Future of Manufacturing: 2020 and Beyond

written by Lauri Moon | December 1, 2016

(IW Research Report – Kronos: 7-27-16) This joint research product between *IndustryWeek* Custom Research and Kronos shines a light on manufacturing strategy, management practices and investment priorities over the next five years and beyond.

While U.S. manufacturing employment has declined over the past 25 years, the future outlook is bright. Taken alone, the U.S. manufacturing sector would be the ninth-largest economy in the world, according to the National Association of Manufacturers.

As our research found, *manufacturing leaders are overwhelmingly positive about their business growth prospects*. Nine out of ten expect revenues to grow, and more than half expect revenues to grow 5% or more per year over the next five years.

The top challenges to meeting these strong growth expectations are market volatility, rising material costs, price reduction pressures and increasing labor costs. To thwart such threats, according to our research, manufacturers are pushing hard to improve performance across a range of capabilities, starting with improving production processes, strengthening customer relationships and finding people with the right skills and experience.

To achieve their growth targets, manufacturers are investing in areas that will improve productivity and speed responsiveness. Company leaders also are prioritizing investments that will make it easier to collaborate with customers and suppliers, gather market intelligence and streamline customer communication. Topping the list of specific technology investments are quality management and lean manufacturing systems. To better align labor and production capability with daily demand, they’re also budgeting for demand planning/forecasting systems, workforce/labor management systems and performance dashboards.

While innovation is always a strategic priority, a surprisingly large percentage of manufacturers (45%) have not yet set a specific goal for reducing new product development cycle times. Among those working to shorten product development cycles, they're trying to better understand customer and market needs, improve professional labor productivity and create prototypes faster.

To attract and retain people with the right skills and experience, manufacturers are primarily emphasizing leadership training, performance management and skills training. Not surprisingly, companies that are investing in new systems and equipment also are more likely to be investing in the personal growth and development of their people.

This research report details the leadership priorities and investments that U.S. manufacturers are making in new systems, equipment and people to remain globally competitive through 2020 and beyond.

Download this research report to learn more details about manufacturers' challenges, strategies, management practices and investment priorities in the foreseeable future.

Free Energy Audits for Manufacturers

written by Lauri Moon | December 1, 2016

Is your company interested in saving money through pollution prevention strategies and energy efficiency assessments? PennTAP technical advisors and Penn State students will spend a day at your facility examining manufacturing operations to identify opportunities to save energy and reduce waste and operating costs. This service is offered to you at no cost through Environmental Protection Agency (EPA) grant funding, the Department of Energy (DOE) and the Department of Environmental Protection (DEP). PennTAP technical advisors and Penn State engineering students will perform one-on-one pollution prevention and energy

efficiency onsite visits, provide recommendations for improvements in energy utilization and waste reduction, prepare and deliver site assessment reports and provide assistance completing grant applications for project implementation.

This free assessment can add a fresh set of eyes for your company to increase efficiency and reduce overhead costs, which can help retain existing jobs or lead to job creation. Contact IMC at info@imcpa.com and learn how to get your free energy assessment.