

Automation: The American Advantage

Automation, Robotics, Augmentation, and Micro-Manufacturing In The Work Place

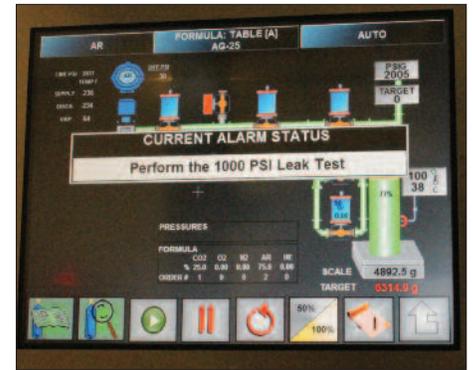
By Hector Villarreal

The return of manufacturing to the United States in 2013 made economic history, yet most American's are not aware of this momentous event. The reason for this is that few American workers were directly impacted by the great migration of manufacturing back to US shores. The question must be asked, with manufacturing jobs once the great bastion of the American middle class, how is this possible? The answer lies in the shift of labor from man to machine.

The New Industrial Middle Class

The media, economists, and politicians have not been shy about waving the flag to herald the return of manufacturing to America. The January 19, 2013 issue of *The Economist* (economist.com) featured an article titled, "Reshoring Manufacturing Coming Home."

The April 11, 2013 cover of the venerable *TIME Magazine* read "Manufacturing Is Back In the US...But Where Are the Jobs?" (<http://business.time.com/2013/04/11/how-made-in->



the-usa-is-making-a-comeback/) and it is the contents of that issue that really hit upon the reason that most American's have not been paying attention to the return of US manufacturing. The cover featured twin robotic welders that hint to the changing nature of the workplace. The use of automation, robotics, artificial intelligence, and augmentation are being leveraged in the American workplace like never before. Unfortunately, there are too few workers with the required skill set who can thrive in this changing environment.

Those with the required skills are enjoying economic rewards and the promise of long-term security. They make up the new industrial middle class and are programmers, electrical engineers, welders, mechanics, field technicians, CNC (Computer Numeric Control) operators, integrators, and web designers. This group is enjoying good benefits because its members have the skills that are sorely needed in order for the US to continue to prosper.

From the Front Lines

In this country many high-tech entrepreneurs have benefited from the efforts of the US government. The US has a rich history of innovations developed by NASA and the military that eventually trickle down into the marketplace. A good example of this is the now ubiquitous GPS (global positioning system). Few of us think of GPS as a war tool, but it was created in the early 1960s by the US military. The early satellite based global positioning system was called TRANSIT. In 2000, President Clinton signed the bill that made modern GPS products available to the masses.

Today on the battlefields of Afghanistan, the American military has deployed container-sized field factories that greatly accelerate the supply chain needs of the US war effort. These factories are rapid prototyping labs that



The use of automation, robotics, artificial intelligence, and augmentation are changing the American workplace and people with the proper skill set are becoming part of the new American middle class.

include an industrial 3D printer, CNC machines, plasma cutters, welders, magnetic mounted drill presses, electric hacksaws, routers, circular saws, and jig saws, according to 3D Printer World (3dprinterworld.com/article/us-army-deploys-rapid-prototyping-labs-afghanistan).

Each field manufacturing development pod comes complete with a senior scientist and an assistant whose sole responsibilities are to build whatever the military needs in order to complete its missions. The ability to rapidly prototype and then build the necessary equipment to wage war so near the battlefield is unprecedented. In a short time, it is expected that US manufacturers will benefit from the military's front line knowledge of the emerging technology that we know as 3D printing.

The New Breed of Robots

There is no better example of the US government technology trickle down than the very popular NASA Mars Rover program. The technology to remotely control a Volkswagen-sized robot on Mars from Earth directly ties into our ability to wage war on foreign soil through the use of drones. This same technology, according to Jeff Bezos, will someday allow Amazon to ship products on the same day that you order them through the web, and deliver them directly to your doorstep (amazon.com/b?node=8037720011). In fact most of you may be surprised by the competitive tech grab that two of the largest most innovative companies in the world (Amazon and Google) are waging today.

Robotics is another area where the US military has taken the lead. The US Defense Advanced Research Projects Agency (DARPA) and the Army Research Laboratory's RCTA funded project originally called "BigDog" has led to some amazing developments in autonomous robotic technology by a company called Boston Dynamics. The BigDog autonomous robot was developed to carry heavy gear for US soldiers through rough terrain. The amazingly organic gait of the robot called BigDog made it eerily life-like. Recently Google acquired Boston Dynamics, which hopefully will accelerate the technology trickle down into the marketplace.

Not to be outdone by Google, Amazon purchased a company called Kiva in March of 2012. Kiva is a robotics company that focuses on making warehouses more efficient. Kiva's robots are the size of an ottoman and

are like a robotic lift truck that picks orders in warehouses and delivers them to the out-sort area near the docks, where people bundle and package the delivery.

The warehouse system that coordinates the Kiva robots activities runs off of a central computer. It physically tracks the location of every Kiva robot, making sure that they don't run into each other. The sensors on the units also make sure that they don't run into a wandering human that accidentally walks into its work area. The Kiva robot communicates the work orders as well.

Interestingly, many companies that were using Kiva systems — *Soap.com*, *Diapers.com*, and *Zappos.com* — have been purchased by Amazon. It is still unknown if Amazon will continue to sell the Kiva technology to anyone else. Reports indicate that Kiva has continued to hire engineers and programmers, but has quietly eliminated its in-house sales and marketing staff, hinting at just what their intentions may be.

It is worth noting that Amazon has announced that they plan to build 69 more warehouses in 2014. CNN estimates a cost of \$15 to \$20 million in direct investment for robots per warehouse, making this a significant technology investment for Amazon (<http://money.cnn.com/2012/03/20/technology/amazon-kiva-robots/>: <http://www.businessweek.com/articles/2013-08-29/why-amazon-is-on-a-warehouse-building-spreed>).

Also worth noting is that in the fall of 2013 Amazon suffered a fair amount of negative PR when their warehouse employees publicly complained about extremely high temperatures and mandatory overtime within Amazon's warehouses.

TIME Magazine posited an interesting observation on this subject: "Prior to Amazon's recent investment in Kiva systems the vast majority of robotic purchases were for stationary units that were used primarily in the automotive or electronics industries. Amazon's purchase of actively mobile robots whose payback greatly exceeds the industry payback standard — two times an employee's annual salary — is a strong indicator that innovative, profitable companies are now willing to take the long view on automated investments because they increase productivity, safety, and minimize the need for managing people issues i.e. avoiding bad publicity and lawsuits." (<http://techland.time.com/2012/03/21/amazons-775-million-acquisition-of-kiva-systems-could-shift-how-businesses-see-robots/>)



BigDog robot image courtesy of Boston Dynamics

Artificial Intelligence

Many of you may recall when IBM's Watson beat the reigning champions on *Jeopardy!*. Watson is an artificial intelligence system that is now being marketed to call centers as an alternative to human operators answering questions. Watson is a learning system, that is, the more information that it is exposed to the "smarter" it becomes.

Watson has also been used by medical facilities as a tool for medical diagnosis. According to IBM, Watson's ability to absorb and analyze vast quantities of data is better than that of human doctors, and its deployment through the cloud could reduce healthcare costs.

Another device being used in the medical field is the da Vinci Surgical System. The da Vinci is referred to as a robot but only rudimentarily so, because the surgeon controls 100 percent of da Vinci's actions. da Vinci is in fact another augmentation device being used to improve what a surgeon can do. The makers of da Vinci claim that the device is less invasive, more precise, and provides patients with faster recoveries.

Unfortunately, da Vinci's manufacturer, Intuitive Surgical Inc., suffered through some lawsuits in 2013. Very telling, however, is the fact that even though sales of the robotic surgery platform dropped slightly in the fourth quarter of 2013 — the company sold 138 da Vinci surgical systems in the 4Q13 versus 175 in 4Q12 — the number of procedures by surgeons using da Vinci increased by about 12 percent in 4Q13, according to the *Wall Street Journal* (<http://online.wsj.com/news/articles/SB10001424052702304549504579320411927237366?KEYWORDS=da+Vinci>)

The Compressed Gas Industry

Weldcoa (weldcoa.com) is the largest provider of compressed gas Automated Filling Systems in North America, and the only company in the US to offer complete turnkey systems, from initial design and manufacture to final installation, active real time monitoring, and long term support. Weldcoa has seen a rapid increase in the roll out of automated filling systems around the country. This rising trend began before 2008, stalled during the recession, and then immediately picked up speed during the recovery years.

Recently, Weldcoa was honored and recognized by Mitsubishi Electric Automation, Inc. as one of the industry's finest automated system integrators in the US by becoming an authorized Mitsubishi System Integrator.

From Weldcoa's point of view it has been amazing to be recognized by one of the world leaders in automation as being a "best in class" company. The opportunity for growth is massive now that Weldcoa is a Mitsubishi recommended Automation Integrator. Given the potential of new business from the Mitsubishi Group and based on current trends, Weldcoa

believes its Automation Division will become its largest business unit within the next 3–5 years.

In 2014, Weldcoa's commitment to advancing its in-house manufacturing capabilities includes capitol investments in new laser cutting capabilities, additional robotic welders, and new 3D printing manufacturing technologies. (See "Spotlight on Technology: Robotic Welding at Weldcoa," *CryoGas*, October 2013, p. 44.) Weldcoa believes automation is the key to its future success and that this success and experience is of direct benefit to the compressed gas industry.

One Last Thought

If you harbor any doubt that automation is the key to America's future, consider what was recently reported by *The New York Times*. Foxconn Chairman Terry Gou announced in 2013 that the company was building an industrial park in the Taiwanese city of Taichung, where it hopes to produce one million robots in three years to replace around 500,000 jobs. Foxconn manufactures products for Apple, Dell, Amazon, and Hewlett Packard. (nytimes.com/2013/05/07/business/global/foxconn-tries-to-move-beyond-apples-shadow.html?_r=0)

This illustrates the fact that companies manufacturing in countries with a much lower labor rate than ours are heavily investing in more machines. The machines are now smarter, more affordable, and easier to use. The future is not man versus machine; it's man working with machine to produce a better, more affordable product. The efficiency achieved through increased automation allows manufacturers to streamline operations and management issues in order to realize a better rate of return.

And that brings us to the heart of the matter. The manufacturing and labor landscape in the US is demanding better quality, increased safety, and faster production. People with the necessary skills to work along with intelligent machines are quickly becoming the new norm on manufacturing floors all over the country. The trend will not reverse itself. The future is literally here and must be recognized by companies and workers alike. ■

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In December 2014, CryoGas looks at workplace issues in the industrial gas industry.



Weldcoa's most recent Panasonic-designed dual arm robotic welding system can produce a complete pallet every eight minutes.



This year, Holston installed a fully automated palletized filling system with 24 cylinder fill bays, 12 moving fill heads, and six operator control touch screens. The entire Fill Island is 82 feet long.