Innovations in Infrastructure Will Boost Manufacturing

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(Area Development – Stephen Gray: First Quarter 2016) From innovative road repair, driverless trucks, bullet trains, and 3D bridges, advances in technology will help to bring the nation's infrastructure up to speed while creating high-skilled manufacturing jobs.

When the long-term highway bill was signed into law last December, it was a step in the right direction not only for our nation's transportation sector, but for manufacturing as well. It's common knowledge that the United States' aging infrastructure makes it harder for manufacturers to deliver products to customers on time, which in turn creates a major ripple in our country's overall competitiveness. This bill is one of the most important things that congress can act on for our country. Infrastructure's critical role in our nation's overall competitiveness cannot be ignored any longer.

Rehabilitating Infrastructure Through Innovation

Rosabeth M. Kanter, who holds the Ernest L. Arbuckle Professorship at Harvard Business School, wrote in her book *Move: Putting America's Infrastructure Back in the Lead*, "We should be thinking not just about repair, which tends to be the conversation. We should be thinking about reinvention. I'm arguing for more technology, better connections, and understanding how to design a system in which the parts augment and enhance each other."

We should be thinking not just about repair, which tends to be the conversation. We should be thinking about reinvention. I'm arguing for more technology, better connections, and understanding how to design a system in which the parts augment and enhance each other. Kanter is exactly right. The future of American mobility is hinged upon not only the repair of what we already have, but more so on the innovation required to bring us back on the playing field. As a key driver of global competiveness, innovation is at the forefront of advancing every industry in the world. Just as manufacturing is seeing rapid changes in efficiency and production

thanks to advanced technology, transportation infrastructure is on the cusp of this transformation as well.

Construction materials and methods used to repair and rebuild our infrastructure are being designed to be more efficient, reliable, and durable. For example, manufacturers are now producing ground tire combined with asphalt that extends the lifespan of pavement by 20 years. Three-D printers can now make reinforced structural beams for the construction of buildings and bridges. There are even gravity-defying robots being built that promise to 3D print a steel bridge in mid-air. These changes will not only revolutionize infrastructure maintenance and rehabilitation in America, they also hold the promise of creating American manufacturing jobs that will help us to better fulfill our economic potential.

Driverless Trucks to Transform Logistics and Transportation

A recent Forbes article estimated that the technology enabling driverless trucks to take off would largely be in place within three to five years. The first driverless freightliner, manufactured by Daimler, hit the road in May 2015 in Nevada. Autonomous trucks could provide a host of advantages to manufacturers, particularly in the logistics space. For example, whereas human drivers are required to take mandatory rest periods resulting in lost time, autonomous trucks can move continuously, driving increased efficiency and fewer delays in delivery — not to mention the fact that the shortage of humans willing to take the wheel is only worsening. The American Trucking Association predicts that by 2022, the industry could be short some 240,000 drivers, which does not fare well for manufacturers and distributors who are being challenged with increased demands for efficiency from online shoppers.

As this promising new mode of transportation takes off, auto manufacturers will see an increased need for highly skilled workers trained to maintain the technology required to keep these vehicles safe on the road. Likewise, if the layout and design of interstate roads are adjusted to accommodate the operation of driverless trucks, the impact on the industrial material manufacturing market could be substantial.

Bullet Trains to Bolster Manufacturing

A recent issue of Gray Construction’s external newsletter publication, the GrayWay,

discussed how high-speed rail in the U.S. could be a major game-changer for our nation's infrastructure. In addition to alleviating congestion on the highways, waterways, and airways, high-speed rail could have powerful implications for manufacturing.

"If you get one of those lines up and running, I think it would be quite an eye-opener," says Marcia Hale, president of Building America's Future. "And just think of the jobs that could be provided in manufacturing engines and cars and rail lines and the steel that's needed."

A recent Forbes article estimated that the technology enabling driverless trucks to take off would largely be in place within three to five years. Though several delays have hindered its course thus far, California is one state that's ready to roll on high-speed rail, as evidenced through the billion-dollar bullet train contract introduced last year. And Siemens is eager to capitalize on the opportunity. Last summer, Siemens opened a 125,000-square-foot manufacturing facility on its French Road plant site in Sacramento, California, in hopes of using it for manufacturing high-speed trains. With this facility will come more highly skilled, technical manufacturing jobs for the state.

The Reinvention of Construction Materials

As stated, also set to advance transportation infrastructure is 3D printing. For example, the first 3D printed bridge is set to be "built" in 2017 by 3D printing R&D firm MX3D, Autodesk, and construction and civil engineering company Heijmans. The pedestrian steel bridge will be built across a canal in Amsterdam by a multi-axis robotic 3D printer that "draws" structures in the air.

Engineers will use AutoCAD to first input the design and give directions to the robotic printers. Then, robots will heat the metal to a molten 2,700 degrees Fahrenheit and construct the bridge "drop by drop." Amazingly, the steel, which is developed to "dry" rapidly, will be able to neutralize the effects of gravity to keep the lines straight. The autonomous robots will create their own supports and have the ability to cross the metal formations as they build a self-supporting bridge design. While this bridge, in particular, will not support vehicles, it does prompt one to wonder if similar technologies could eventually be applied on larger-scale

infrastructure projects in the future.

Another advancement in transportation infrastructure that's already made a major impact is the creation of "instant bridges" through accelerated bridge construction. These bridges can be built off-site and transported into place in a matter of days (as opposed to years), resulting in a lighter impact to traffic flow than a long-term bridge construction project.

Looking to the Future

As new technologies become more widely adopted across the industry, more high-skilled jobs in manufacturing will be generated. Future jobs in the operations and maintenance of 3D printers, the management of complex and hyper-connected supply chains, and advanced manufacturing facilities will be generated, with hope that they spark the interest of industry newcomers and address the skills gap.

These innovations barely scratch the surface of what's possible, or needed, to move our nation's transportation infrastructure forward. But, with the National Network for Manufacturing Innovation (NNMI) advanced manufacturing hubs working hard to continually unveil new technologies to boost our competitiveness, I am hopeful that we will continue to see positive advancements. Our friends at the National Association of Manufacturers have long been rallying for a greater focus on our country's infrastructure, as these improvements are critical for the future productivity and the global competitiveness of manufacturing as a whole. So, as we look to the future of repairing America's transportation infrastructure, let's not forget that our leaders must embrace the power of innovators to create the changes that will have a lasting effect on our economy.