

How U.S. Manufacturing Is About to Get Smarter

written by Lauri Moon | December 7, 2016

The aim is to make factories more productive, less costly to operate, and more reliable

(WSJ - Christopher Mims: 11-13-16) Here's a paradox of America's highly automated, increasingly labor-independent manufacturing — while sophisticated, for the most part, it isn't all that high-tech. Picture metal-stamping machines in an auto-parts factory that can easily have a long useful life of up to 40 years.

Now picture the assembly line just outside Austin, Texas, where Samsung Electronics Co. makes core chips for Apple Inc.'s iPhones. I toured the facility last summer. It is a pristine white environment filled with WALL-E-like robots ferrying boxes full of silicon wafers from one station to the next. Every detail of the factory is measured by sensors pouring data into a centralized repository where it can be processed to optimize production. The only humans present are there to fix the machines doing all the work.

But that means there is still a big opportunity to use in manufacturing all the learning Silicon Valley has applied to, for example, advertising. "People are really thinking about applying venture capital and technology innovation to things that are 10 times the size of the ad market," says Jon Sobel, chief executive of Sight Machine Inc., which helps companies process all the data coming off their assembly lines. Manufacturing is a \$12 trillion industry globally a year. Annual spending on ads globally is just north of a half a trillion dollars.

This transformation in the way we make things has many names—the fourth industrial revolution, the industrial Internet of Things, smart factories—but at base it is about harvesting as much data as possible from all the machines in factories, shipping it to the cloud, parsing it with artificial intelligence, and using the results to make those factories more productive, less costly to operate, and more reliable.

The goal is to break data out of its silos—the machine, the factory floor, the shipping and logistics system—and pool it in a way allows for real-time decision-making.

Here are examples of what this “revolution” can accomplish: deciphering how ambient air temperature affects productivity of an entire factory. Or ramping up and down production in a way that is more responsive to sales. Or preventing unplanned downtime as when a single critical machine breaks unexpectedly, which can be incredibly costly because it can hold up an enormous production line stretching from raw materials to finished goods.

We’ve seen this “preventive maintenance” pioneered in jet planes and even our cars where sensors plus software can determine in advance when a part will fail and alert operators to preemptively replace it.

I’d thought, based on all the industry chatter about the “industrial internet,” that we were pretty far along in this process. But that turns out not to be the case.

Even General Electric Inc.—which along with Siemens AG, International Business Machines Corp., Cisco Systems Inc. and others has been a major proponent of the industrial internet in the U.S.—has faced challenges implementing the new process in its own manufacturing facilities.

“Candidly, one of the things we work on is how we can get our legacy equipment connected,” says Karen Kerr, senior managing director at GE Ventures. GE has nearly 500 factories, and the company’s goal is to transform 75 of them into smart, connected factories this year.

Part of the challenge is to properly use the hardware companies already have. Newer machinery is bristling with sensors and data ports that are typically only used when these machines are being built or repaired, says Dennis Hodges, chief information officer of Inteva Products LLC, a major manufacturer of auto parts. Though the data from these sensors was never intended to be used for real-time insight into how a machine is doing, it turns out that even indirect measures of a machine’s health, like its temperature, can be combined with other data to allow engineers to understand things about a device they can’t measure directly, and what to do to keep them from breaking.

Others are working on ways to put additional sensors where they weren’t previously—an effort that creates new challenges, like how to power them all.

Recently I put on a smartwatch on that could be a harbinger of this sensors-everywhere future. The Matrix PowerWatch, launching this week, never needs recharging. Its power source is

thermoelectrics, which means that it can turn any difference in temperature—typically that between a solid object and the air around with it—into electricity. As I looked at it, a little power bar slowly grew, until the watch was generating 200 microwatts of energy harvested directly from my body heat. It is a relatively tiny amount of power, but enough for a smartwatch—or for the sensors and transmitters deployed in smart factories.

Power sources like this, or solar panels, or piezoelectrics, which gets power from vibrations, are key to getting sensors onto more of our built environment, preventing the cost and time in changing sensor batteries.

“You want to be able to put it there and forget about it,” says Mr. Hodges of Inteva. “Just the fact that you don’t have to run power or a network drop could really be an interesting thing,” he adds, especially in factories that are up to 750,000 square feet, as some of Inteva’s are. Such devices, combining a sensor, wireless transmission and Matrix’s energy technology, are under development by Civionics Inc., says CEO Gerry Roston.

The application of these technologies to watches and manufacturing is just the beginning. Civionics’ customers include a company that monitors the health of bridges in India, and a multinational mining giant that needs to put sensors on its largest and most expensive equipment. The giants in these fields have taken notice— 3M Co. is a strategic investor in Matrix, and GE is an investor in Sight Machines.