“EFFICIENT INDUSTRY IS THE SOLE KEY TO PROSPERITY.”

Henry Ford, who provides this quote, would likely be intrigued—but not at all surprised—by the Industry 4.0 manufacturing transformation of today.

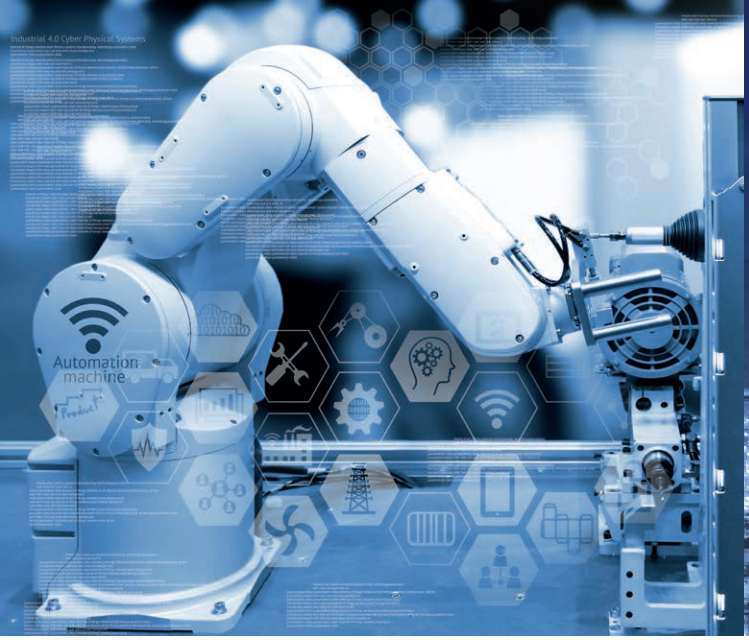
Mahmoud Awwad

These are prophetic words from an industrial visionary. When people think of defining milestones in manufacturing efficiency, an example often cited is that of the ingenious Ford Motor Company (Ford) moving assembly line, implemented in 1913.

Indeed, assembling the Ford Model T at a rate previously unimaginable put the company at the front of the auto-motive pack. Tasks were divided into more than 80 different steps as auto chassis were pulled down the line. Production volumes exponentially increased because the time to assemble a single vehicle plummeted to about 90 minutes versus 12 hours.[1] Naturally, this also lowered cost and extended automobile affordability to a larger population.

Leveraging massive digitalization, sensor inputs, cloud computing and the Internet of Things (IoT) device connectivity, real-time analysis and on-the-fly corrective actions push efficiencies to new levels and, just as in Ford’s case, make product costs and industries more competitive.

FIND OUT MORE ...



Digital Industrialization, Transformed and Evolving

Digital control and high-speed data analytics balance and optimize production across lines, factories and global enterprises; alongside the workforce, robots move materials to keep line supply constant and workflows efficient; and as issues arise, self-learning systems analyze, adapt and correct. All of this is happening today, but there is much more to come.

As Henkel's Business Development Manager Mahmoud Awwad notes, the near future of Industry 4.0 will increasingly integrate augmented reality and artificial intelligence (AI) to further drive efficiencies.

> **"In the medium term, augmented reality will be leveraged to remotely diagnose production issues and enhance knowledge," explains Mahmoud. "Eventually, artificial intelligence and machine learning – which are being adopted already – will play a more central role, tackling complex systems for more enhanced operations."**

The amount of data being generated in an industrial environment is mind-boggling. In addition to volume, the speed of data analysis is critical to an operation's efficiency and is pushing control module and system functionality to new levels.

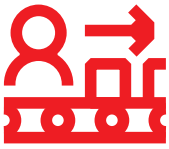
Brains and Brawn

If software and data analytics are the brains of modern-day industrial automation, drives and control units that fuel computing power and next-generation equipment are the brawn. Just like any cohesive system, all elements must work in concert to achieve increasingly demanding objectives, which include:

HIGH FUNCTIONALITY

HIGH RELIABILITY

EFFICIENCY



FAST TIME-TO-MARKET

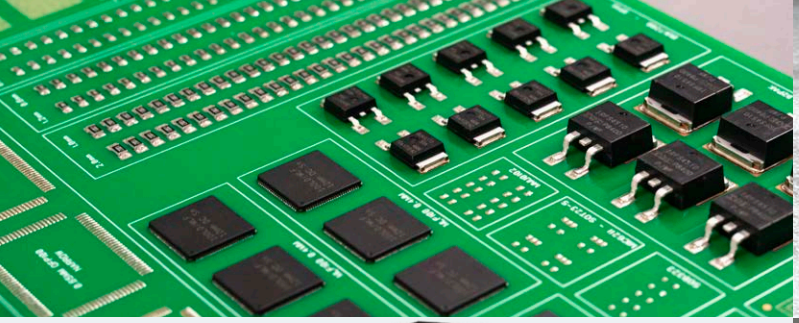
REDUCED COST

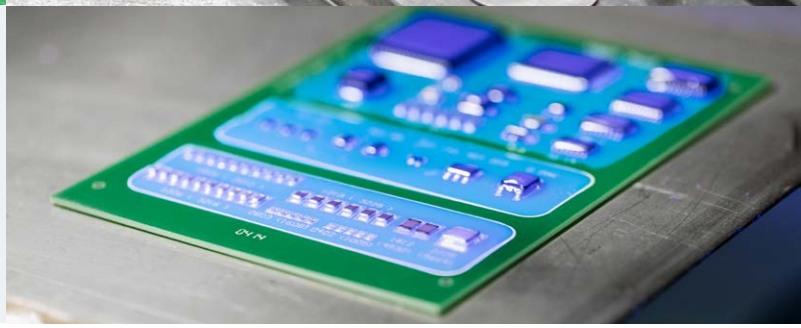
SIZE DECREASE
POWER DENSITY INCREASE

> **"Honestly, these ambitions really haven't changed much over the years, but the norms have," says Mahmoud. "Production output expectations, quality levels, long-term reliability demands and cost-competitiveness have all accelerated, to say the least."**

And, modern manufacturing operations have responded. As reported in Assembly magazine, BMW's plant in Regensburg, Germany is a prime example of this digital-mechanical integration. In this facility, over 3,000 machines, robots and autonomous transport systems with connectivity enabled by the company's customized IoT platform help manufacture some of the highest performing vehicles on the road today. Customization of digital tools by experienced staff also lends to workstation-specific relevance while, on a broader scale, data analytics are assessing quality in real-time – such as torque in the bolting systems, for example – to enable on-the-fly correction, reliable products and more cost-effective, time-sensitive production.[2]

> **"In an Industry 4.0 operation, ensuring all of these systems work quickly, dependably and efficiently day in and day out, 24/7 and for the long-term definitely requires brilliant software, robust mechanical systems and, very importantly, a strong foundation," concludes Mahmoud.**



"The Industry 4.0-manufactured products leaving the shipping dock are in large part made possible because of the advanced materials ingenuity enabling superb electronics development."

Underlying Success

High reliability, production adaptability, quality and cost competitiveness are key – not only for the products being produced, but for all components of the manufacturing operation as well. And, given the decreasing sizes and increasing power densities of modern control and power modules, maintaining these priorities is tough. Starting with the most reliable materials to provide high integrity electrical connections, effective mitigation of performance-diminishing heat, and protection of electronics from stress and harsh environmental conditions delivers the strong foundation on which modern manufacturing is built.

"Like industrial automation itself, the electronic and structural materials used to build these factories of the future must advance," Mahmoud shares, noting that significant innovation in material capability has occurred in the last five years.

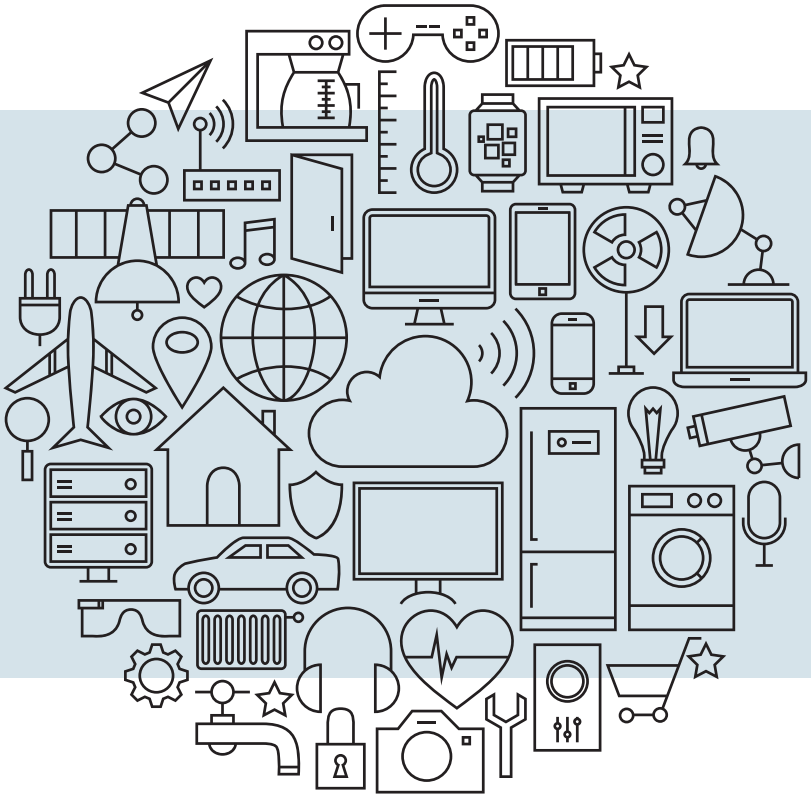
"Today, we have thermal management solutions with very high thermal conductivity and low outgassing characteristics, as well as protective materials to defend against environmental contaminants and stressful operational conditions."

The End Game

So, what's the end game and ultimate objective of Industry 4.0, the Internet of Things and massive global connectivity? In short, giving people more of what they want, in less time and at a perceived reasonable cost. As the old saying goes:

"The more things change, the more they stay the same."

INTERNET OF THINGS



"We have had just one main purpose during these years, and that is to give the people transportation of the most dependable quality at the lowest possible cost."

Henry Ford, circa 1928

Mahmood Awwad

The Author

Mahmoud Awwad currently serves as Henkel's Business Development Manager for Power and Industrial Automation within the company's Adhesive Technology business unit.

In 2008 Mahmoud joined Acheson in Scheemda (acquired by Henkel in 2008) – in 2011, he joined Henkel Electronics as an Inside Sales Account Manager and has since worked in different account management positions. He has a broad experience in electronic materials solutions for a variety of applications within the electronics market. With a long history of serving customers in multiple markets including Industrial Automation, Power Conversion, Automotive, Medical and Power Electronics, Mahmoud is passionate about identifying needs of the overarching market trends and translating them into solutions that fit customer requirements.

Based in Utrecht area, the Netherlands, Mahmoud holds a Bachelor's degree in Business Administration from the Hanzehogeschool of Groningen.

Sources

[1] *https://corporate.ford.com/articles/history/100-years-moving-assembly-line.html*

[2] *www.assemblymag.com/articles/94983-assembly-plants-at-the-forefront-of-industry-40?*

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