



Hexagon Smart Factory Update: ‘Make It Smarter’



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In a previous article in this publication (Ref. 1), I outlined Hexagon’s Smart Factory strategy. For the first time in history it’s now possible for factories to harness the full potential of their manufacturing and simulation data. If we look backwards to what was called ‘Industry 3.0’, factories in the 20th century were focused on simple automation of tasks. The term ‘Smart Factory’ is just another way of saying that companies who want to move their manufacturing towards a fully connected and intelligent ecosystem to leverage a constant stream of data from simulations, connected operations, and production systems to learn and to adapt to new and changing conditions. By removing the common problems of data silos, data gaps and data wastage, processes can be continuously optimized in a Smart Factory. The result, we believe, will be a more efficient

and agile ecosystem, less downtime, and a greater ability to predict and adjust to changes within the facility, as well as changes in the supply chain or in customer demand, thus promising a more sustainable future for manufacturing.

Making Smart Factories Smarter

Manufacturers today typically can’t afford the cost and disruption of replacing their existing infrastructure with completely new facilities to create Smart Factories. Hence, the Smart Factory of tomorrow must be an evolution of the existing manufacturing Factory ecosystem of today (see Figure 1). We believe that taking steps toward the Smart Factory now will produce revolutionary results in the long term. In effect, we

want to give our customers the ability to make their products smarter today. In April 2019 we announced the release of a first solution from our SFX solution portfolio at Hannover Messe in Germany. The release of HxGN SFX | Asset Management, introduces a new IoT business model. Asset Management is a cloud-based solution that will maximize the value of our customers' assets through Remote Monitoring, Analytics for Resource Management and, in 2020, adding Pro-active, Predictive and Prescriptive maintenance. At present, Asset Management targets the sCMM market (latest controllers only), but the technology roadmap includes more focus areas in the near future: Laser trackers, Arms, older CMM controllers, other CMM brands, CNC machines, etc. Over time we are aiming to offer specific solutions that enable customers to better harness their manufacturing data. Every SFX product we will make will offer a smarter alternative to an existing practice and will produce data that informs better decision making.

Hexagon's Manufacturing Intelligence division makes manufacturing smarter by converging predictive design and engineering from MSC Software, production and metrology solutions to enable Smart Factories. Our solutions for the Smart Factory use Xalt as a framework, and bring together traditionally siloed areas of the manufacturing process to improve quality and productivity:

- Our **Design and Engineering simulation software** solutions (CAE from MSC Software) embed predictive quality into product design, and ensure manufacturability and productivity downstream.
- Our **Production software solutions** (for CAD/CAM) ensure that design intent is maintained throughout the product lifecycle, improving productivity and continuously delivering high-quality components.



- Our **Metrology hardware and software solutions** capture real-world data for positioning and inspection, providing actionable information that continuously improves quality and productivity.

All our solutions are built on open-architecture software that embraces technology from partners and third-party suppliers.

Smart Factory Example: Multiphysics Optimizes Part Designs for Additive Manufacturing Processes

Additive Manufacturing (AM) has the potential to deliver a range of benefits to manufacturers and OEMs. Delivering new experiences, product performance, and time-to-market are just a few of the outcomes that drive the desire to utilize AM as a manufacturing process; however, there are significant challenges that stand in the way of mass adoption. Time, cost



Figure 1: Hexagon's Smart Factory Ecosystem



Figure 2: Hexagon's unique Additive Manufacturing solution suite and application workflows

and quality are a few of the challenges that Hexagon can deliver competitive solutions to solve, namely the ability to optimize the designs of parts for specific AM processes, simulate, predict and influence the behaviors of the parts during the 3D printing process and then dimensionally validate the resulting parts.

Engineering a success story with Additive Manufacturing means understanding dependencies between several factors: the function and application that the product is designed for, the optimization and application of Design for Additive Manufacturing rules, the scope of the material and printing technology, the design options and the 3D print software. These factors among others require a multi-disciplinary approach in order to improve parts at the design stage, and create manufacturing, inspection and secondary operation plans to ensure that products are produced at the lowest cost, in the shortest time with repeatable and reproducible quality.

Two areas that Hexagon has best in class solutions are multi-physics co-simulation (MSC Software) and Metrology (Figure 2):

- Design and process optimization problems involve combinations of physical phenomena including structural analysis, fluids, thermal, multibody systems, acoustics, controls, hydraulics and electromagnetics; the outcomes are using topology optimization to lightweight parts and create organic geometries that exhibit better performance characteristics, then simulating the 3D printing process to identify and eliminate part deformations and residual stresses or dimensional variations.



Figure 3: Artist's Impression of the Hexagon Smart Factory facility being built in Hongdao, China

- Hexagon's strength in delivering metrology solutions tailored to the various manufacturing phases and processes is well known today. Validation and verification are clearly essential steps to accelerate the transformation of Additive Manufacturing into an integrated design-to-manufacturing tool. This will result in fewer iterations of AM print builds to yield reproducible results and a more intimate understanding of the accuracy, repeatability and reproducibility of a specific combination of machines, processes and materials

With Hexagon's production software, design & engineering (MSC) software and metrology scanners in Additive Manufacturing; you can plan, optimize, validate, and replicate high quality additively manufactured metal or plastic parts robustly, accurately, and faster than other solutions. With this toolchain workflow, you can optimize the 3D print and not just the geometry.

Update on our Hongdao Smart Factory Build Project

We are pioneering the Smart Factory by laying the foundations for our own Smart Factory (Figure 3) in Hongdao, China, following full regulatory approval from the Chinese authorities. It is due to open in May 2020, it will be 52,000-square-metres. This state-of-the-art manufacturing facility will produce products and services for our customers in China and the surrounding region. It will also show our customers that we practice what we preach. It will illustrate how our smart manufacturing hardware and software enable more agile, productive and autonomous ways of working. Among the products on display will be our enterprise construction solution, HxGN SMART Build, which we're using to build the Hongdao site along with other solutions from across the Hexagon portfolio.

A demonstration center on-site in Hongdao will provide our customers with a real-life view of how a flexible, data-driven, smart manufacturing environment increases productivity and enhances quality from design through to delivery. Call us to find out more.

Reference

1. 'Hexagon's Smart Factory Opens its Doors', *Engineering Reality Magazine*, Vol 8, Winter 2018, pp15-17.