Applying the Internet of Things to composites production efficiency

» The Internet of Things, or IoT, is defined as the technology of connecting devices, systems and services that goes *beyond* mere machine-to-machine communications. Its means of oversight — data collection, analysis *and* decision-making — does not necessarily require human intervention in the moment, yet it *does* include supervision not only of machines but also of materials, tools, process parameters *and the people that handle the materials, make the tools and run the machines*. Its significant benefits are cost and time savings and reduction of waste. This new "take" on technology is now setting footprints in various forward-thinking sectors, such as healthcare, transportation, energy, aerospace and composites manufacturing. In fact, it is my contention that it has become a *necessity for survival and competitiveness* in the aerospace and composite component manufacturing industries.

The goal of every leading aerospace manufacturer is to increase quality, productivity and traceability. This is an especially challenging proposition because building an aircraft requires collecting hundreds of thousands of data points throughout the entire build process.

Although economies of scale are expected to reduce the unit cost as the production volume increases, in many cases the opposite is the result, due to loss of process control. This causes an accelerated increase in waste. *Research shows that the waste is estimated at hundreds of thousands to millions of dollars per year for a mid-size fabricator.*

Such losses can be eliminated by bringing the world of IoT to composite parts fabrication. Two practical tools enable IoT implementation: Radio frequency identification (RFID) technology and the more recently introduced mobility technologies, e.g., tablets and smartphones. Leveraging these two tools makes it possible to automatically track and manage materials, kits, tooling, assemblies *and staff* on the production floor. By combining best-of-class engineering and manufacturing practices with these technologies, OEMs and fabricators can further push the productivity envelope, reducing their buy-to-fly ratios.

Step 1: Regain control and see the complete picture

RFID tags and scanners enable real-time, accurate information about material kits and rolls, in and out of the freezer, and provide alerts before they reach expiration thresholds. Mobility platforms, including not only tablets and smartphones but *wearable devices*, replace paper forms and barcode scanners and enable real-time reporting, online collaboration and the ability to take immediate action without relocating personnel for a meeting.

Throughout the production line, assets inherit information from "parent" assets: assemblies inherit data from kits, and kits inherit data from materials. In fact, the data set that travels with the component part includes data collected not only from each station on the production floor (preforming, molding, curing, machining, etc.) but also from tooling, assembly, kitting and even as far back as the originating material roll! Having access to such a gigantic collection of data points over a variety of timeframes, however, is of limited benefit without the ability to use that data to make decisions and take appropriate actions.

Step 2: Context-aware, real-time, data-driven action

Current practices rely on serial decision-making by separate teams of people who operate in loosely integrated systems. This can be too slow, and few teams see the whole picture. Some actions, if not taken at the right time, are no longer beneficial and, in some cases, can result in loss of precious time and material. What's missing is intelligent automation that can detect events, recognize context and act accordingly on the production floor in order to take real-time, data-driven *actions*. IoT brings to the production floor an opportunity to practice this as a holistic approach, making "context-aware" decisions, that is those that to a great degree are *dictated* by the data and, therefore, *don't need human supervision*. Examples of context-aware decisions that can arise following a holistic approach include which material to use based on expiration date, ETL (exposure time left) or roll length; triggering of work orders based on availability of tools; creation of optimized cut plan and update of roll length, according to actual work on the production floor and tool maintenance plan; and purchasing decisions and submission of bids based on real-time data. To make IoT useful, however, one must leverage the data. This requires a fully integrated, software-based, total production optimization system, which bridges the gap between engineering and manufacturing, together with full tracking of assets on the production floor, to create a true, real-time, holistic, optimized decision framework.

Turn your data into decision-making

Leading aerospace companies are now deploying advanced control and measurements applications that leverage the benefits of the IoT. To make the Internet of Things useful, one must turn that data into knowledge, and then move up to context-aware, optimized decision-making. Get your assets to start talking and collaborating. Implement the Internet of Things in your production plants. CW

ABOUT THE AUTHOR

Avner Ben-Bassat is the president and CEO of the aerospace-industry production automation and optimization software solutions provider Plataine Ltd. (Waltham, MA, US). He has 15 years of experience in the field of complex, multi-dimensional optimization software. Ben-Bassat holds an MBA with distinction from Duke University's Fuqua School of Business and a BSc (Magna Cum Laude) in mathematics and computer sciences from Tel Aviv University.