Modern Manufacturing Execution Systems

Bridging the Information Gap from Assets to Insights

IFS

From the shop floor to the top floor: How to unlock the true benefits of A&D 4.0 with Manufacturing Execution Systems–and be Industry 5.0 ready

Aerospace & Defense 4.0 is gaining momentum and is being chased along by Industry 5.0. Learn how Manufacturing Execution Systems (MES) are unlocking previously unattainable benefits for A&D manufacturers and providing a springboard into Industry 5.0

The maturity curve of "Aerospace & Defense 4.0" has been relatively slow in comparison to other manufacturing sectors, where Industry 4.0 technology has been transforming processes since the early 2000s. Many A&D manufacturers have been cautious to adopt Industry 4.0 technologies due to concerns about cyber security with the incredible volume of data passing through and stored in new technologies.

However, times are changing. Increasingly, A&D manufacturers are starting to adopt Industry 4.0 technologies to take advantage of benefits such as leaner operations, increased uptime, and improved quality.

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The manufacturing stage is now set for Manufacturing Execution Systems (MES) to evolve and play a vital role in unlocking these benefits–getting the data to flow from the shop floor to the top floor to improve production execution, quality control, and Overall Equipment Effectiveness (OEE) for A&D manufacturers.

Not only will MES help attain previously unattainable benefits, but it will make Defense Contract Management much smoother with its fully-integrated workflows and lend an all-important automated helping hand to take advantage of emerging Industry 5.0 technologies, such as enhanced human-machine interfaces for unparalleled safety and efficiency, helping solve many human capital problems.

In 2020, IFS conducted research into the A&D 4.0 maturity curve, with encouraging results. The polling results from a webinar attended by A&D manufacturers found that only 12% of nearly 150 attendees had not yet made Industry 4.0 an enterprise-wide priority, while the majority of the remaining manufacturing companies were actively researching how these technological advances could help achieve their digital transformation goals (68%) or had identified Industry 4.0 adoption as an enterprise-wide priority and were actively looking to leverage Industry 4.0 technologies (20%).

The A&D 4.0 evolution

While the interest in 4.0 technologies was clear to see within other markets, the A&D market was still at the beginning of the adoption journey until recently. Crossing the chasm from interest to adoption would ultimately rely on positive results from early adopters prospering from deploying the latest solutions.

The widespread emergence of Industry 4.0 technologies in A&D is finally here, though, and the implementation of flexible enterprise software platforms is helping unlock previously accessible financial, operational, and security benefits for A&D manufacturers.

The next chapter for A&D manufacturers – Industry 5.0

As with many other technologies, Industry 4.0 has already progressed and Industry 5.0 is beginning to emerge, causing confusion for many as Industry 4.0 is still relatively new.

The main focus of Industry 5.0 technologies is to enable employees to work in harmony with advanced robotics and IoT devices and in the future, within completely automated industrial environments. Industry 5.0 is centred around how new technologies, such as IoT and Big Data, can aid the empowerment of human work and increase their capabilities.

How Manufacturing Execution Systems (MES) can help

Enlisting powerful Manufacturing Execution Systems (MES) is now a pre-requisite to unlock current Industry 4.0 benefits, as well as providing a steppingstone to Industry 5.0 in the future and has a hugely positive impact on production rates and execution, quality control, and Overall Equipment Effectiveness (OEE).

MES is not new, having been in use since the 1990s, but new uses for MES have emerged beyond simply organizing and executing the various production activities and work orders of the day on the shop floor alone. As the critical link between the ERP and the connected shopfloor, having MES also collect and deliver asset data up to the ERP and other connected systems radically transforms inventory, production, and quality control activities. This helps to deliver efficient and compliant work execution by digitally tracking and documenting the end-to-end manufacturing process. These systems capture each step of the transformation of raw materials into finished goods for documenting compliance, continuous improvement, and continuous supply chain transparency.

In today's data-driven world, decision makers now have access to real-time tools that enable them to make critical decisions throughout the supply chain process with unprecedented speed and accuracy. By leveraging instant data gathering and delivery, decision makers can quickly access the right information, allowing them to make informed decisions that would have previously taken much longer. This not only improves the efficiency of supply chain operations, but also enhances the ability of organizations to respond to changing market conditions and customer needs.

Opening up previously closed doors with vertical integration

Manufacturing Execution Systems (MES) play a critical role in achieving "vertical integration" by providing seamless access to data across every level of the manufacturing organization. By continuously feeding real-time data to dashboards, MES enables precise control at every stage of production, from the shop floor to the C-Suite. This empowers everyone in the organization, from supervisors to directors and quality systems personnel, with the actionable intelligence needed to make informed decisions. As a result, MES ensures that the entire manufacturing chain operates with maximum efficiency and effectiveness, leading to improved productivity, better quality outcomes, and enhanced customer satisfaction.

MES must work to the finest detail to meet A&D requirements

Achieving the high levels of quality and precision required in A&D manufacturing demands exceptional attention to detail, with stringent engineering tolerances built in for safety and mission effectiveness. To meet these demands, A&D MES support must be able to add additional decimal places to manufacturing quality control, with accuracy that goes beyond what is expected in many other industries.

The IFS Cloud solution is designed to meet these precise requirements, with a quality assurance system that is embedded within its non-conformance reporting, corrective and preventive action, and material review board. This ensures that every aspect of the manufacturing process is optimized for quality and precision, helping to reduce maintenance downtime and scrap and rework costs throughout the lifecycle of the product. By providing the highest levels of accuracy and process stability, IFS Cloud enables A&D manufacturers to achieve the standards necessary for successful operations.

A&D manufacturers must look beyond MES raw data for answers to complex questions

Having MES accessible as part of a core manufacturing solution offers significant benefits. First and foremost, separate MES is not conducive to providing the level of vertical reporting required in a modern manufacturing environment, nor is MES always able to provide the additional level of granularity and specificity necessary to operate in the A&D manufacturing sector. However, working with complex point solutions with heavily customized integrations to solve these issues and move information across an A&D manufacturing organization is time consuming to manage and risks soloing out data that would otherwise be critical to the overall production execution, quality control, and KPIs like OEE.
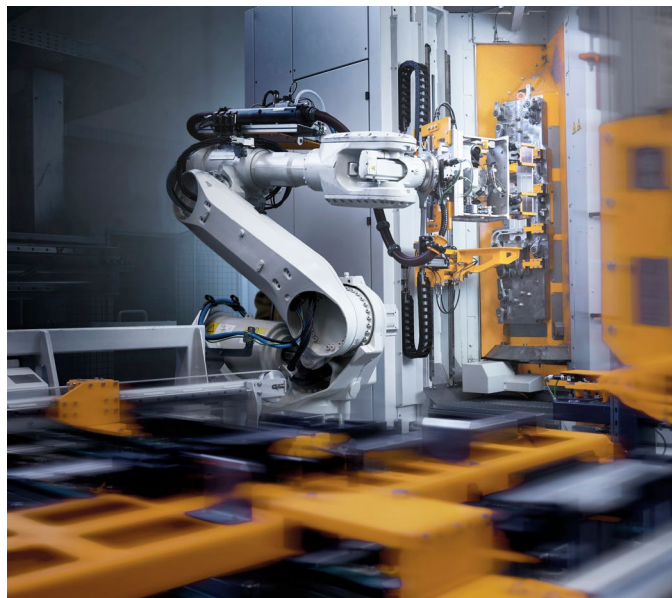
Never miss a beat with MES tracking capabilities

It's the MES that tracks the daily operation level of the shop floor. Software with built-in MES functionality provides the essential digital backbone between the proliferation of smart devices and machines and core manufacturing planning software, seamlessly integrating this technology with the higher-level software used to plan production. In this way, open interoperable MES solutions enable full traceability of parts, components, and projects—from design right through to engineering and production.

As a pre-requisite, MES functionality should enable CAD integration, robust, real-time data collection, and more sophisticated integrations through IoT and RESTful APIs, to name a few examples. MES also needs to support dispatching and shop floor operation, improved production management and tracking, and quality management processes. There is also the need to enable machine monitoring and performance & KPI reporting. A fully connected, all-in-one software solution is essential for modern manufacturing, including MES. Instead of searching for a separate MES and integrating it with other manufacturing solutions, a comprehensive solution that includes MES streamlines processes, reduces costs, and improves productivity.
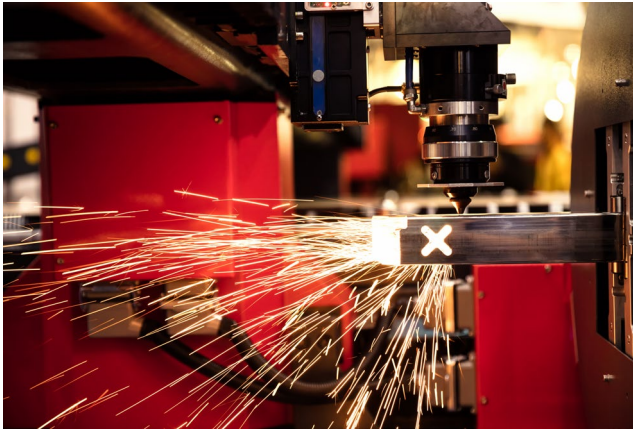
Gain intelligent insights and accelerate automation by taking MES to the next level

Once A&D manufacturers have established this connected base point in a single system, they can then exploit new and emerging automation functionalities that unlock further intelligent insights and accelerate automation efforts within their business practices. From an MES perspective, this should include streamlining to improve product quality control and performance and the use of artificial intelligence (AI) and historical data-driven work schedules and job completion time to improve accuracy for technical productivity.

With IFS Cloud you can track product production from raw material to finished goods using batch number tracking functionality. Through the combination of IoT data with AI/Machine Learning IFS Cloud can show manufacturers where production is slowing down along the supply chain and make comparisons to historical observations and transactions, all encapsulated within one system.

MES can help to ease Defense Contract Management complexity

Another common pain point for A&D manufacturers is working in the strict regulatory ecosystem associated with the supply chain for the U.S. Department of Defense, with stringent reporting requirements that are difficult to manage manually. A recent IFS and Aviation Week webinar highlighted that over 35% of A&D manufacturers find ever-tightening regulatory requirements to be one of the main pressure points within the industry.

Automated defense contract reporting benefits A&D manufacturers who employ an industry-specific ERP and MES with embedded defense contracting functionality, resulting in far fewer of the errors and delays previously encountered when manually managing defense contract reporting requirements. Through the integration of Wide Area Workflow (WAWF) and the invoicing, Receipt, Acceptance, and Property Transfer (iRAPT) Business suite, a purpose-built ERP with MES allows for automatic WAWF data to be uploaded to the government website, therefore reducing manual labor and accelerating payments. A shipping order, for example, would automatically go back to the ERP and then to the Defense Contract Management module for reporting and payment. Job done!

Within Defense Contract Management, the adoption of a streamlined approach between different operational areas of the business means A&D manufacturers can help get automated reports completed quickly with increased accuracy and ultimately, receive faster payment.

This is a priority for A&D manufacturers. When asked about the challenges they face due to the U.S. Defense procurement processes, just under half of webinar respondents said that the process of using the governments electronic subcontracting reporting systems (eSRS) was labor intensive and time consuming. With a properly configured ERP and MES, though, A&D manufacturers can now automate many of these processes.

Through improving defense contract management, A&D manufacturers can gain a range of key advantages. For example, the addition of an iRAPT enables them to oversee, review, and track invoices and contracts with greater ease. Classification of suppliers will also be improved for A&D manufacturers throughout the procurement process, with the additional ability to clearly calculate and set expenditure targets and automate reporting with an Electronic Subcontracting Reporting System (eSRS).

Defense manufacturers who improve their Defense Contract Management system in this way will grow in confidence knowing that they have the functionalities at their disposal to attain revenue opportunities within a sector experiencing a generational spike in global military spending.

Upskill employees and automate the factory floor

With MES we aren't talking about advanced robotics that are expensive, timely to implement, and require extensive change management within the A&D manufacturing organization. It's all about optimizing processes. A&D manufacturing, like many other industries, is experiencing a skilled labor shortage. According to Future Aviation Aerospace Workforce, the manufacturing industry needs 3.5M workers just for A&D by 2026. This is where a connected MES/ERP solution brings human capital benefits.

By improving processes with better feedback on MES data, instead of having to cut staff, A&D manufacturers can upskill employees for higher level work while the factory is automated. It's a win-win from a change management perspective, as it's easier to sell a process improvement rather than introducing an army of robots onto the factory floor, especially when automating unpleasant or even potentially dangerous tasks such as heavy lifting or working at heights.

This upskilling approach is reflected by McKinsey research that highlights: "As the A&D industry evolves, re-skilling will be central to positioning the workforce to accommodate this evolution."

Robots will not remove jobs but upskill employees with Industry 5.0

One of the main developments as part of the progress from Industry 4.0 to Industry 5.0 is the element of bringing back the 'human touch' to manufacturing and "giving automation a soul" as described by Clarify. The main focus of Industry 5.0 is to help empower employees and to improve their skillset. Here are some of the main developments recognizing the empowerment robotics and technology can bring to the human workforce:

- Employees will have robotics at their disposal to assist them on tasks.

- Virtual Reality (VR) and Augmented Reality (AR) can be used by A&D manufacturers to help with employee training and task execution.

- Improved working equipment and safety features to help enhance human capabilities with robotic tools and data connections.

MES is a sign of progress on the A&D 4.0 and Industry 5.0 journey

Getting MES right is a critical component of A&D 4.0–particularly given the unique requirements of the A&D industry. MES has to grow its capabilities and evolve. It has had to keep up with new and emerging trends just like the rest of the A&D manufacturing software stack does, and that includes connection to lower-level equipment and the ability to export data for analysis and decision making.

We can already see the power of MES to keep pace with future developments in A&D manufacturing and provide a perfect springboard for developments such as Industry 5.0.

For MES to drive improved production execution, quality control, and KPI management, it cannot sit in isolation from other manufacturing systems. MES must be an embedded part of a wider solution to enable manufacturers to unlock the benefits of A&D 4.0, vertical integration of manufacturing, and of course the inevitable arrival of Industry 5.0.

About IFS

IFS develops and delivers cloud enterprise software for companies around the world who manufacture and distribute goods, build and maintain assets, and manage service-focused operations. Within our single platform, our industry specific products are innately connected to a single data model and use embedded digital innovation so that our customers can be their best when it really matters to their customers – at the Moment of Service™. The industry expertise of our people and of our growing ecosystem, together with a commitment to deliver value at every single step, has made IFS a recognized leader and the most recommended supplier in our sector. Our global team of over 5,500 employees every day live our values of agility, trustworthiness and collaboration in how we support thousands of customers. Learn more about how our enterprise software solutions can help your business today at ifs.com

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