

Enhancing Production, maximising Profitability

Today, a business needs to be more agile and responsive to fluctuations within the market. Effective performance management involves integrating planning, scheduling, production execution and ability to respond to change immediately. Here we take a look at how investment in Manufacturing Execution Systems (MES) software technology delivers more efficient data management, improved production execution and enhanced operational performance, enabling manufacturers to quickly turn data into profit.

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Delivering products that consistently meet customer expectations helps manufacturers remain competitive and achieve higher profitability. With a better understanding on how their operations are performing in real-time, companies can positively impact the bottom line with timely, informed decisions about production performance. Transforming data into meaningful business knowledge is vital to optimising production and maximising commercial potential. MES provides intelligence for optimising operations with rapid, accurate and transparent data in real-time. The first milestone is MES 1.0, which integrates the past to achieve more efficient data management. MES 2.0 is called the era of work process automation, which improves production execution. Last but not the least is MES 3.0, also called technology on the move, which brings about enhanced performance management.

MES 1.0: Integrating the past

MES first emerged in the process industries over 30 years ago when minicomputers had finally become affordable enough to be successfully used in these industries. The earliest applications were primarily data historians in the large continuous industries used for 'historising' time-series data for trending and later analysis.

At first, manufacturers, who were primarily batch-orientated, applied the same data historians that had gained acceptance in the continuous industries to the problems that they were facing. However, for those manufacturers the majority of their production is campaign-orientated with well-defined start and stop times. While time-series historians generally did provide some value in analysing production runs, the real analysis of production run campaigns turned out to be a complicated, labour-intensive process. It meant trying to track different types of information, potentially from different systems, which were all related to the same batch, not just time-series data, and then literally overlaying them on top of one another in order to provide the right context. Since this was a fairly intense process, engineers rarely performed this type of analysis, except maybe when a customer complained about the quality of a previous batch.

During the era of MES 1.0, other new technologies, such as scheduling, also emerged that further enhanced manufacturing profitability. Scheduling tools were developed that could provide a fully integrated environment between scheduling and plant operations, supporting collaborative production management. They were designed to align with the key industry business processes, providing manufacturers with the capabilities to make real-time

decisions and synchronise the plant & supply chain.

As MES software continued to evolve, the foundations to greater manufacturing profitability were being laid. During MES 1.0, an experienced engineer was usually required to interface with an MES system. Casual users either were intimidated or the training requirements were too steep. However, with the more recent advent of new technologies, it is now possible for casual users to take advantage of the power of an MES system. Some MES vendors are now providing 'Google-like' intelligent search to improve a user's ability to find information. Intelligent search capability within a MES system operates in a similar fashion as Google. In short, it selects the best match similar to the Google functionality.

Another recent innovation was the increasing use of Business Intelligence (BI), which changed the way manufacturers managed their business. Some years back, engineers manually downloaded from the historian into standard tools like Excel where they could perform any type of analysis they desired. Then improvements were made, so that any report produced during this process could be automatically distributed throughout the enterprise via *Microsoft SharePoint*. With more technological advances, changes in historian data now can automatically update spreadsheets, which then are disseminated automatically

throughout the enterprise via *SharePoint*. The net result of all these changes was the increased ability to have information at one's fingertips without the need for extensive and detailed training.

MES 2.0: The era of work process automation

Throughout the 1990s and into the new millennium, manufacturers recognised the importance of automated processes and workflow to allow for scalability and meet the increasing needs of the business. Simply relying on a data historian alone was not enough. Fundamentally, they needed the ability to manage all the different aspects of the production workflow and order management in a manufacturing facility. This included both the design and execution of standard operating procedures, work orders and production protocols supporting procedural and regulatory compliance. The design aspect would consist of defining the recipe and workflow to produce a given product. On the other hand, the execution aspect would dispatch the order to the appropriate operator terminal at execution time. The system would need to deliver complete traceability, an unalterable history, and automatic generation of audit trails and reports.

In addition, during MES 2.0, vendors started offering 'production context' technology that was more appropriately aimed at solving problems associated with production campaigns with a definitive start/end time. Fundamentally, this involved using any production marker, such as a batch number, lot number, or refinery blend type, and quickly gathering all the relevant information that describes a defined production period, regardless of the data source. Production context analysis, as it came to be known, allowed a user to seamlessly overlay all relevant data (eg historian data, ERP, lab, etc), so that they can visually determine areas for improvement or compare/contrast with similar, previous production periods. The data that provides contextualisation is all the process and event data that is necessary

to understand that production period. This technology allowed users to easily visually compare and contrast previous, similar production periods across units, process cells, areas and even multiple sites. In essence, the introduction of this technology allowed batch manufacturers to overcome the limitations that they had encountered in MES 1.0.

MES today enables manufacturers to quickly identify production performance problems, assess root causes and take corrective action. Production execution software introduced during MES 2.0 is now tightly integrated with data historian software from MES 1.0 to improve the manufacturing process, which automatically reaps positive returns on investment.

MES 3.0: Technology on the move

New smart products developed during the past decade have provided greater communication and collaboration functionalities, facilitating quicker decision making while operating on the move. Flexibility, ease of use and real-time data visualisation are significant benefits to users. This period of greater intelligence in technology has opened up new possibilities. The batch industry has a greater need today to streamline processes to improve operational performance and intelligently manage the huge quantities of data that process plants produce on an hour-by-hour and minute-by-minute basis.

BI empowers employees to perform with better flexibility as it helps improve access to manufacturing data at all organisational levels to drive quicker decisions. Event notifications coupled with mobile analysis tools enable faster adjustments to minimise the impact of production issues. This is vital in the process industries because there are many operations-based personnel who are not desk-bound and can benefit from access to real-time data, trends and alerts anytime & anywhere.

The prevalence of mobile devices is transforming the process industries. Mobile solutions empower decision-makers to have immediate access to

important data enabling them to make informed and quick decisions to improve profitability. Easy, digestible analysis of plant information even in remote locations helps industry leaders react to adverse changes and keep the operation performing to targets. The ability to access and analyse real-time plant data has enormous benefits. In the past, users needed to be in the control room or in front of a monitor to track and manage manufacturing performance. Mobile BI has proven to be more effective when users are provided with visualisation tools (eg charts, graphs, portals, etc).

Pillars of profitability

Over the past 30 years, MES technology has dramatically evolved to help manufacturers survive in today's highly competitive markets. Real-time data and decision support tools provide access to plant information to allow quick and timely responses to production issues that negatively influence efficiency, quality and regulatory compliance. MES is essentially the nucleus of the operation, which links all capabilities of the business. It is an integrated set of production activity and support software designed to harmonise and optimise the plant.

The bottom line is that effective production drives operational excellence enabling better and faster decisions. Software technology helps the batch industry achieve consistent performance across all assets. It also defines the importance of real-time business performance management: plan, execute, monitor and respond to change immediately across all time horizons. History has shown that MES has laid the foundations to help batch manufacturers across the globe strengthen their competitiveness and build upon the pillars of profitability. ■



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