

IT Driven Business Process Automation in Metal Industry: Are We Doing Enough?

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1. Introduction

As business leaders, perhaps we often ask ourselves as to whether we are managing our industries in the best possible manner. Are the industries under our stewardship moving in the right direction? Are our businesses efficient enough to maintain and expand our competitive advantage?

These are some of the introspective questions that continue to intrigue us, and on occasions more often than not, conclusive answers continue to elude us. Exceptions apart, we usually tend to sweep aside such scenarios of obvious discomfiture and immerse ourselves into the routine and the mundane, mostly by choice, nurturing the hope that the future couldn't be worse than the present.

Isn't it a self defeating and potentially dangerous trend fraught with consequences of immense adversities as most of us, willy-nilly get busy in fighting the present hoping that the future will take care of itself? There are exceptions. But the irony is that the exceptions have become the rule – the order of the day and not other way round.

2. Factors

There are several factors that guide and shape the future of an enterprise. But the issues that have overriding influences on the efficiency of operations deserve careful attention. **Business Process Automation** is one such area that has a major impact on the efficient functioning of a manufacturing enterprise. The metals industry, dominated by steel in the Indian context, is a prime example where business process automation can have significant impact on the efficiency of its operations.

Today, the industrial scenario in general is in a state of flux. The metals industry is no exception. The ongoing economic despondency and volatility in the world economy has put the metals industry all over the world, including India, at a cross road. The road ahead is indeed challenging and arduous. The call of the hour is to shed, innovate and embrace; shed the shackles of conventions; innovate ideas and embrace the best of breed solutions in order to forge ahead in this competitive world.

Under such volatile situations the industry needs to respond in a mature and decisive manner focusing, inter alia, on improving the operational efficiency parameters by innovative means like adoption of appropriate technology, optimization of resources, and enhancement of customer satisfaction. The need of the hour would be to maximise, optimise and minimise areas which are germane to its operations, like

- Maximising of revenue through better usage of resources in terms of goods and services
- Optimising the processes of planning, purchase, production and distribution including the management of inventory.
- Minimising cost and process cycle times including wastage through better planning, execution and control

All these issues need to be addressed in a systemic and integrated manner with a shared vision and an execution platform which enables us to achieve these goals.

3. How to?

How to achieve these goals? The answer lies, to a great extent, on the automation and integration efforts at the business level viz. Purchase, Production, Sales, and Maintenance etc. The automation at the base level of the 3-tier automation hierarchy is taken care of primarily by the equipment suppliers themselves who provide dedicated systems to record, transfer and store relevant data in real-time at the shop floor level. The usefulness of such data is, however, usually confined within the equipments and individual unit operations. It is the automation of the top level business processes and its integration to the shop floor in a seamless manner, that leads to the development of an adaptable and efficient enterprise. This calls for careful analysis, blueprinting and implementation on the part of the business or industry owners to achieve the stated objectives.

The most important issue today is whether we are doing enough to understand, automate and integrate the business processes so as to evolve an integrated view of the manufacturing system for better management and control.

The answer to this question lies in our ability to understand what Business Process Automation is, and whether we are having adequate **IT infrastructure** to support the automation efforts. We also need to understand that such undertakings require collaboration and partnerships between different parties. Clarity of the roles played by the constituents like the Industry, the Solution Providers and other third-parties in terms of the

project, price, perception and performance is equally critical for success of such an endeavour.

4. Business Process Automation

Earlier, the metals industries' concept on automation was largely confined to the realm of the machinery identified with the shop floors of a manufacturing plant. But the time has changed. Today the word automation has a much larger connotation encompassing both the physical and the logical and commercial spaces within an organisation at the business level.

The concept of **Enterprise Resource Planning** or **ERP** is firmly established in the business and industry at large. It has dramatically altered the business face of a manufacturing enterprise. It has unleashed the power of automating and integrating the business processes through a common and unified data which has resulted in significant increase in consistency, repeatability, predictability and flexibility of enterprise operations. The integrated functioning of departments sharing a common and unified data has horizontalized organizations and removed vertical silos resulting in seamless functioning of the organizations. Common and unified data has resulted in, what we may call as the single version of the truth with far reaching strategic and operational impact for the firm; its customers, its employees and its partners.

In short ERP has brought in transformational changes in the visibility, consistency and accuracy of the process related data across the organisation. As a consequence the quality of decision making has improved significantly. The industry in the process, has learned to understand the power of ERP and is looking for ways to expand these gains by integrating various aspects of its operations from the shop-floor to the top-floor.

Information Technology

Information Technology has made rapid strides in recent times. Gone are the days of islands of brilliant but isolated computing. Today's IT enables integrated and unified functioning of complex business processes owing to phenomenal advancements in a number of areas like servers, networks, data centres and software systems.

Server power has increased exponentially with increased scalability and availability. With exponential drops in price performance ratios they have become increasingly affordable. **Networks** have become more powerful and versatile in terms of bandwidth, security, redundancy and monitoring capabilities. Networks along with mobility have indeed become the change agent for the development and spread of IT in the real world. **Data Centres** have become energy efficient, 'green, compact with extensive building

management systems to support the operations of the IT infrastructure in the most efficient and cost effective manner over a prolonged period of time.

Tying these all together is the advancement in software systems. Cloud computing, virtualization and service oriented architectures have the capability to realize complex business and transactional systems at a price-point which is extremely attractive.

All these developments have made the IT infrastructure robust yet flexible enough to support the continually expanding load of ERP based data processing of the companies.

5. Issue

While ERP vendors are dominating the top layer of commercial process automation applications and the equipment suppliers the process control activities at the shop floor level, the issue that still remains unanswered is whether we can achieve seamless integration from the shop-floor to the top-floor for an adaptable and transparent functioning of the organization. The answer lies in our ability to engineer and implement a middle layer which ties the higher level and lower levels of automation in a three-tier hierarchy, so to speak

6. Middle or MES Layer

Under the current scenario in operations management, the intensity is focused primarily on the two end layers viz. the top and the bottom in the 3-layer automation hierarchy,

It is important to understand that seamless and efficient functioning of a manufacturing enterprise requires that all the three layers in the automation hierarchy are adequately addressed. The significance of the complementary roles the adjacent layers play can hardly be overemphasised.

Manufacturing Execution System or MES is the engine which powers the middle layer in the 3-tier automation hierarchy. Unfortunately, lack of complete understanding of the need for MES is a barrier for the industry to achieve seamless enterprise integration and functioning. Just like the industry embraced ERP, it is time that they started seriously investing in MES systems to secure the future advantage for their firms. .

7. MES & Metals Manufacturing

Like any industry, companies in the metals sector too are facing increasing pressures in terms of delivery compliances, cost control, increased revenues

and the like. Shortening their end-to-end process cycle times, adhering to tight time schedules and enhancing their product qualities are the key elements which can help make these firms globally competitive

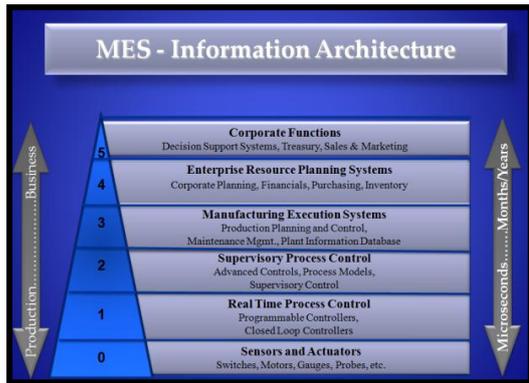
The production systems in metal industries like steel and aluminium are characterized by a set of complex processes and procedures. Relatively large diversity in its end product portfolio leads to a correspondingly large number of variations in the manufacturing processes giving rise to typical issues like:

- Large number of attributes and characteristics for the final and intermediate products;
- Mix of manufacturing steps including batch and discrete processes;
- Varying material attributes through multiple stages of production;
- Non-stable yields due to non-reproducible quality results.
- Complex and intricate routing of materials with varying consumption and yield parameters.
- Difficulty in synchronizing the activities of a large number of interdependent units including mills, casters, melt-shops the supporting auxiliaries.
- Inadequate facility to measure, track and monitor the multitude of process parameters in a limited time frame.
- Inherent challenge in the intelligent use of relatively large of volume of data and information in a meaningful manner.
- Bottlenecks in the interoperability of systems of diverse makes and specifications.

The industries in the metals sector have started looking for tools and systems to improve their own operational practices through integration of processes and enabling seamless flow of process related data across the enterprise in a real time sense.

While ERP covers many aspects of the enterprise wide activities at the business level, those related to planning, scheduling, tracking and optimization of production at the shop floor level are not yet adequately addressed by the existing ERP stacks. A separate layer of software in the MES domain is required which can address the shop level issues in a real time sense and supplement the efforts of having a unified visibility of events and processes across all levels starting from shop floor to 'top floor'.

MES promises to fulfil the functional and operational requirements related to the planning, scheduling, order execution, tracking and optimization of



resources at the shop levels of a multi-shop plant. It adopts an integrated approach that covers the entire life cycle starting from order booking to production execution to despatch of finished products over all the stages of processing including reheating, hot and cold rolling, slitting and annealing etc. The integration of the business and the shop floors systems provides the required agility and responsiveness to

the management enabling simultaneous accessibility to detailed information across all levels in a transparent, homogenous and timely manner.

8. IT & Manufacturing

Manufacturing is a set of complex processes that constitutes an important functional segment of a business enterprise, but for which all other segments like finance, marketing, human resources etc. tend to become irrelevant.

While there has been rapid progress in the penetration of automation at business level spearheaded by ERP and at the equipment level in the form of PLCs, RTUs, DCSs etc. the same cannot be said for the manufacturing activities like Planning & Scheduling, Resource Optimization, Material Tracking, Quality, Maintenance and Performance Management issues in an integrated and efficient manner. Without a system to orchestrate the production related activities, the full potential of a plant is likely to remain underexploited.

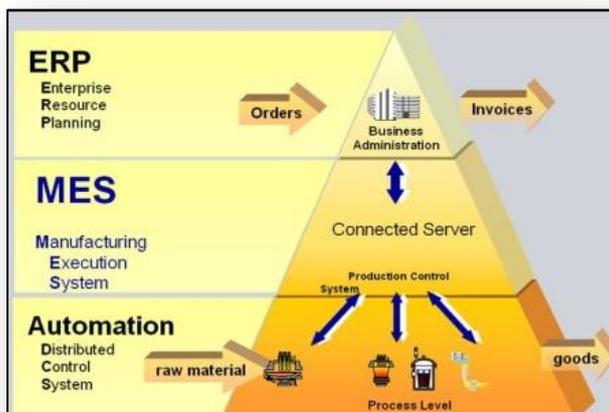
9. Manufacturing Execution System (MES)

MES is a collection of **software systems** built around a set of mathematical algorithms to automate some of the key operational areas like Planning & Scheduling, Performance Monitoring and Resource Optimization etc. MES is viewed as the 'missing' link in the automation chain that binds an industrial enterprise into a unified information backbone allowing an integrated view of its processes including the usages of the resources with full visibility and traceability.

At a more practical level, an MES is the formulation of shop level production procedures, knowledge and experience, captured in a computer-operable system. These formulations or the methods control the execution of the

manufacturing processes — synchronizing resource allocation, order selection, material movement and production processes from release of production order to final shipment through a series of product transformation phases. MES functions as the backbone for all shop level automation and information management activities as well.

MES sits in between the layers of ERP at the top and the process automation at the bottom. A visual framework on the position of MES at the multi-tier automation hierarchy is illustrated below.



Thus the ‘missing’ MES sitting at level 2 completes the automation chain, opening up the possibility of developing an **Information Backbone** of the manufacturing enterprise.

With MES making rapid strides, the much sought after Information Backbone linking all levels of business and production activities

holds out the promise of full integration with complete visibility of processes and resources in the form of inventory of materials, productivity and utilisation of the capital assets, status of customer orders etc. MES, when properly conceived and implemented at the production environment involving the shops and mills of a manufacturing plant contributes significantly in improving the company’s bottom-line by cutting costs, avoiding wastages and improving profit margin through greater customer satisfaction.

It is no wonder that the business and industry in OECD countries are embracing MES at an accelerated pace. It is time that the Indian industries too rapidly invest and adopt MES systems to move up the value chain.

What MES does specifically

One may wonder at this stage on how MES achieves its stated benefits in a production environment. MES attains its stated goals and objectives in the following manner -

- Providing planning, material allocation and scheduling tools to optimize use of productive resources
- Providing dynamic re-scheduling capability to respond to production and/or quality issues.

- Reporting of real time data on the status of various resources and their utilization in an accurate manner.
- Reporting of production, productivity and quality information in a timely and accurate manner with necessary aggregation and de-aggregation.
- Greater utilization of operational assets through optimization and monitoring.
- Reducing non-value added activities of the production personnel.
- Providing critical information along with alarms on the production processes.
- Improving delivery performance by keeping track of delivery schedules through continuous order tracking.
- Providing status of the operational assets on a real-time basis.
- Establishing link between production planning, inventory, resource availability, manufacturing execution and dispatch functions on real-time basis.
- Elimination of multiple data entry.
- Building a plant wide database and information backbone integrating all levels of functional hierarchy.
- Provisioning for plant-wide data sharing through a common Information backbone.
- Better visibility of the production and its supporting processes.

10. MES Acceptance

All said and done the acceptance level of MES by the Indian metals sector has been rather muted. The obvious question is that if MES is so promising and powerful then why is it struggling to get a foothold, let alone make an impact, in the manufacturing industry scene in India? This indeed is an issue that merits serious introspection by the industry.

While the global metals industry has reaped rich benefits by endearing and absorbing the concept and logic of MES driven operations management, the response from Indian industry is at best mixed. Apparently they are yet to cross the initial stage of evaluating the probity of the new concept. The reasons for such lukewarm response from India have their origins in the characteristics being exhibited both

by the owners of the industries as buyers and the solution providers as suppliers as defined below –

MES Perceptions - Present

Buyers (Industry Owners)	Suppliers (Solution Providers)
Limited awareness about the potential power of MES	No customer education and awareness build-up program in place
Propensity to adhere to the current and the routine	Absence of country specific pricing policy
Unwillingness to face and accept change and challenge	Meagre presence of the solution providers in India

11. MES – A Call to Action

The Indian manufacturing sector is currently in a stage, where it is absolutely necessary to improve it's competitiveness. This is particularly true for the capital intensive and energy hungry metals sector where legacy operational systems and practices have become inefficient and inflexible in a fiercely competitive global landscape. The following table outlines a few perspectives for accelerating the pace of adoption of MES in the metals sector in India.

Buyers (Industry Owners)	Suppliers (Solution Providers)
Acquire knowledge on MES by interacting with the experts, service providers etc.	Initiate awareness campaigns on MES through seminars, prototypes, demonstration-cum-training labs etc.
Prepare the organisation to welcome MES and face the challenges of implementing the same	Make country specific pricing strategies based on local conditions and ground realities
Insist on the equipment suppliers to make their supplied systems MES ready	Develop local expertise capable of implementing and sustaining MES projects through suitable tie-ups on knowledge sharing etc.

It is time that the industry started evaluating and investing in these operational systems aggressively. A plan of action which engages the customer with the MES consultants, the thought leaders , the vendors and the system integrators is necessary to make this a successful industry and nation-wide endeavour.

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