The Story Behind the Data

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Making sense of vast volumes of production data is at the core of asset optimization efforts, but these challenges are not trivial. Users report that it still takes about half of the analysis cycle time just to gather relevant data and up to 50% of that time is spent trying to extract and align that data from different systems.

To fix a problem, you need to be able to understand it at the root-cause level. Only then can you make the right decisions to correct the issues. Users are challenged when trying to efficiently use all available data and information to improve the speed and efficacy of production analysis. The data can tell us the story if we organize it in a way that provides context for the analysis. Context comes from capturing the reasons for movement in the data. For refineries and chemical plants, that context comes from merging process time-series data with product characteristics, alarm data, operator and engineering comments and, in some cases, even reaching into maintenance systems and the ERP.

These challenges are very different from the goals of manufacturing execution systems (MES) when they were first deployed in the 90's. While MES has always provided data management and integrated with plant control systems, their original architectures did not encompass such a broad set of integration points with other enterprise systems. Moreover, the analytical practices and technologies are quite different than they were in the 90's. The jury is still out as to whether the gap in capabilities can be "bolted on" to these systems, otherwise more significant remediation will be required.
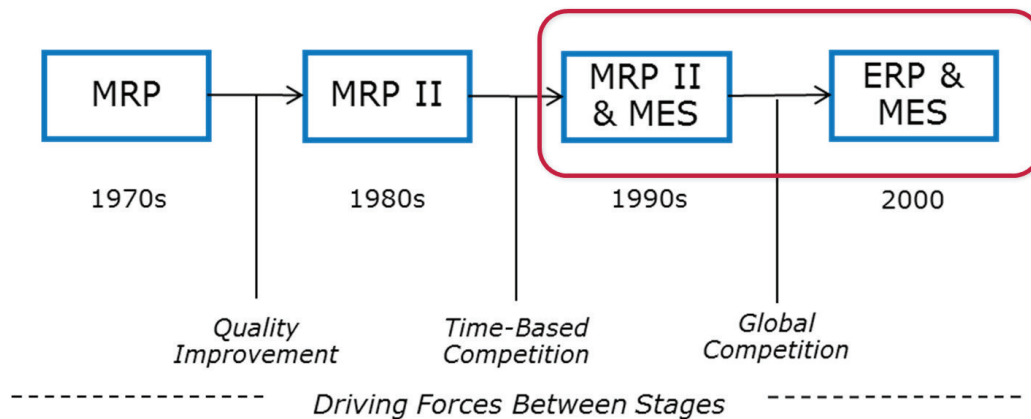

Figure 1: Evolution of Manufacturing Execution Systems

The way that information is produced and consumed has also changed significantly since early MES. The workflows of planning, scheduling and plant operations are more intertwined now than ever before. Our workforce is more mobile than ever and being disconnected from the plant while traveling is a big concern for managers and subject-matter experts serving multiple facilities.
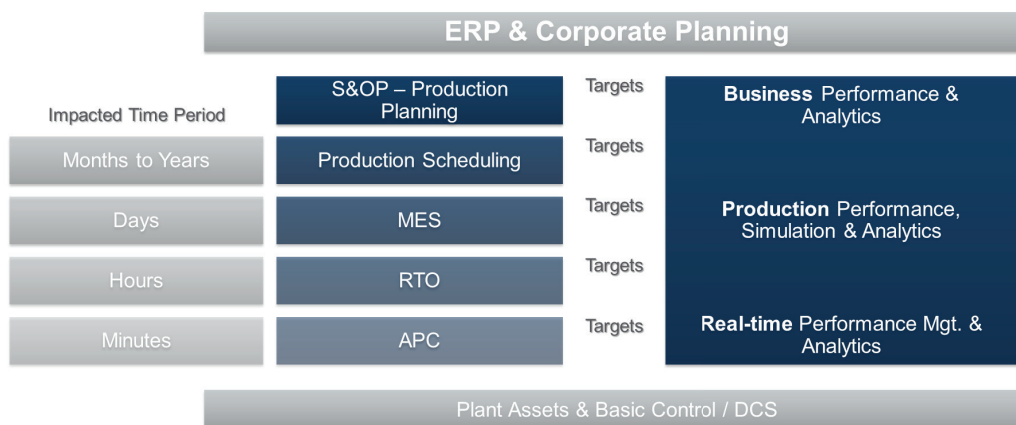
Figure 2: Manufacturing operations—interlocked decisions

Our systems and work processes must be transformed to integrate the full range of data and to harness that data to provide real-time business performance management to optimally plan, execute, monitor and respond quickly to problems and opportunities. Information must be relevant, timely and shareable to drive effective collaboration. By having comprehensive data presented in a clear, easy-to-understand manner, process manufacturers can efficiently manage the day-to-day challenges of plant operations to maximize profits.

Gathering the Right Data

The chemicals industry has a unique challenge in that the upstream part of the business tends to consist primarily of continuous processes, but the closer you move to the final product, the more batch-oriented the processes become. Data management and discovery tools must address the needs of both.

Today's leading chemical and energy companies are global enterprises. With facilities located in many different parts of the world, it can be difficult for users to find the appropriate data. Data discovery is extremely important due to the sheer number of instruments and other data sources that are common in production facilities. The scope and scale of data being generated is truly a "big data" problem. Data discovery tools can make it easier for users to find the data anywhere in the enterprise—especially for those unfamiliar with its structure.

Data Discovery

Data discovery addresses the common challenge of trying to quickly find the most relevant production information. Users need to search multiple sources of data, identify and analyze the key issues and relate it to the physical asset of the plant. Master data management can be used to deliver asset-centric, diagnostic-centric or S95-based data hierarchies that aid data discovery. Analytics products are also leveraging embedded search technology to help users find data anywhere in the enterprise. This capability can also help increase the efficiency of subject-matter experts.

Extracting the Information

Modern manufacturing is like an ecosystem of interconnected software and hardware that helps chemical and petrochemical companies optimize plants and achieve operational excellence. As businesses generate increasingly vast amounts of data, efficient decision-support solutions are needed to make sense of vital information and ensure operations can adapt quickly to dynamic conditions.

Context is Crucial

Harnessing data analytics to support faster and better decisions will drive production to deliver products to the highest standards. Those analytics can become even more effective as we include ancillary information in the analysis. That ancillary information often takes the form of unstructured data like engineer and operator comments. While the common practice today is to maintain traditional logbooks, new approaches offer hope of including unstructured data in analyses that will help isolate problems more quickly. That unstructured data can be useful in identifying corrective actions from previous, similar events to increase the speed of problem resolution.

Taking Effective Action

The goal of visualization and analysis is to synthesize actionable information. Automated MES/MOM decision-support capabilities allow manufacturers to make corrective decisions faster to achieve operational efficiencies and deliver greater productivity. Bridging the gap between the MES architecture of the 90's and the needs of today will provide users with vital, task-specific information, allowing staff to dynamically keep up-to-date with operational challenges, anytime and anywhere.

One of those gaps is in the way analytics are used. The bulk of analysis is after-the-fact reporting and diagnostic in nature. Those approaches are being supplanted with predictive and prescriptive analytics to further decrease the response time for process problems. Early experience suggests those analytic techniques work best when they are an integral part of the workflows.
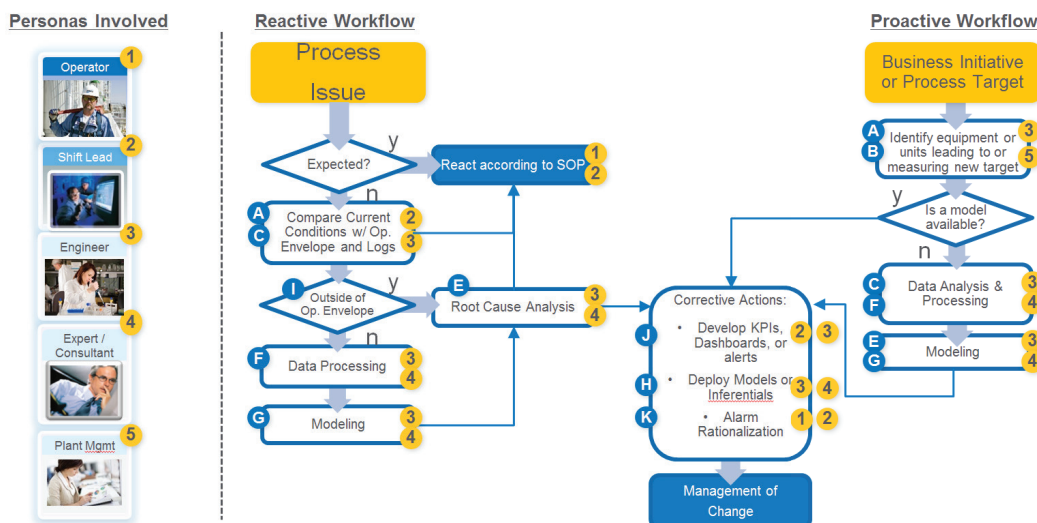

Figure 3: A common workflow for resolving production problems

Deployment

Visualization tools are the interface between the users and the data. Traditionally, these have been thick-client desktop tools. However, recent visualization products have embraced HTML5 to deliver web interfaces, thereby eliminating deployment and maintenance costs for desktop software. With potentially thousands of users in a given company, that can result in significant savings in time and effort, as well as eliminating cyber security vulnerabilities that exploit add-in software.

Summary

Rich context and analytics capabilities help drive greater collaboration across the enterprise by enabling best practices for faster decision-making. The chemical and petrochemical companies that take advantage of the power of data visualization and analytics will ensure the story behind the data has a profitable ending.

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