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# We Don't Have an MES...

*Someone thrust this book into your hand with the comment, “Read this! It’s about MES.” So now, of course, you’re thinking, “Why should I? We follow a SAP-unless policy, so we don’t need a separate MES package.” But how exactly does that “unless” work? When is an ERP system sufficient for supporting activities on the shop floor, and what type of company is better served by a dedicated solution to provide information to factory personnel?*

## 1.1 Modern Countries, Primitive Factories

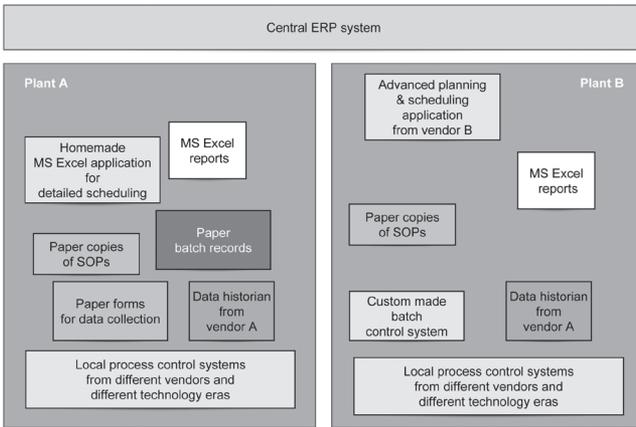
In recent decades, industrial companies have invested much time and money in machine and production line automation on one hand, and in ERP<sup>1</sup> systems on the other hand. Between these two automation layers lies another, usually called the **MES layer**.<sup>2</sup> MES concerns the activities that take place within a manufacturing department. These include preparatory activities, such as detailed production scheduling and recipe management, but also retrospective activities, such as data collection, reporting, and analysis.

In many factories, the situation can be called primitive in regard to these activities. They use MS Excel for their detailed scheduling and reports, and MS Word to manage operator instructions and recipes. When there are advanced applications available, these come from various vendors and are not integrated. Figure 1.1 shows a typical example of the kind of stand-alone applications that factories use.

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1 See the glossary for an explanation of acronyms used in this book.

2 For a more detailed explanation of the MES concept, see chapter 2.



**Figure 1.1 Typical example of the current level of automation in many factories**

This outdated situation leads to many problems. For example, on the management and supervisory level, one has no insight into the current production situation. If the production manager wants to determine the source of a problem, he or she must first walk over to local systems in order to pull up the data files, then import these into a spreadsheet, and then reconcile the data with each other; only then—perhaps—will the answer to the question be revealed. This process can sometimes consume more than two entire workdays. It’s impossible for the operator, supervisor, or plant manager to work proactively.

Management’s lack of insight into the actual production situation also becomes painfully clear when you zoom in on scheduling issues. True, the ERP system does create a production schedule, but it isn’t yet tailored to the actual capacity of the production lines, nor has it taken efficiency into account. That’s why in nearly every factory, you’ll find a scheduler who plans in Excel. These are people who carry around a great deal of knowledge in their heads. They really mustn’t ever get sick or go on vacation, and they feel tremendously valued. The production department is completely dependent on this person. In the meantime, the plant manager’s asking herself who’s *really* the boss.

Once the schedule's complete, the supervisor prints out the production orders on paper, and places them in the proper order at the work stations. It remains to be seen whether this intended order will actually be followed. (Believe it or not, I've seen one of these stacks fly into the air when a door opened.) Employees on the production line have no insight into the internal dependencies among orders, and innocently threaten promised delivery dates. Another disadvantage of the current situation is that the operators can't concentrate on their most important task, namely, controlling the process. Operators spend hours copying data over from one system to the other. This is time-consuming and error-prone, and it results in data becoming available to other departments and systems only much later.<sup>3</sup>

By using a variety of nonintegrated systems, the problem of master data also rears its head. For example, if the factory's going to start using materials from new suppliers in the production process, or if it introduces new recipes, you have to update the master data in all those stand-alone systems. This is a time-consuming and error-prone process. If the master data conflict with one another, this can in the worst case lead to ordering the wrong raw materials or manufacturing end products that don't meet the specifications.

Many factories are accustomed to reporting average raw material consumption and production results back to the office after each production run, instead of the actual pounds or gallons consumed and produced. As a result—and depending on the type of industry—one must count or measure inventories on a daily or monthly basis and correct the ERP system's administrative inventory. Which means these factories don't really have their processes under control. With a little bad luck, the inaccuracy of the administrative inventory can

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<sup>3</sup> But note that this situation also has an advantage, namely, that operators have more "feeling" for the process and for the correctness of the data as a result of their hands-on involvement. This is a point to consider in implementing an MES.

even cause production stops because the proper raw materials aren't available. I don't have to explain to you just how expensive an hour or two of downtime is.

*Come on, guys. This is the twenty-first century. There's got to be another way!*

## 1.2 ...But We Have SAP!

### 1.2.1 SAP Unless...

Among the companies for whom I consult, more than 80 percent use SAP. Moreover, for reasons of standardization and reuse of efforts, and to limit maintenance costs, many opt for a **SAP-unless policy**. So when the production manager knocks on IT's door and asks for a specific scheduling system, the IT manager says, "No need. SAP can do that." And if the production manager then asks for a recipe management application, his colleague answers, "SAP can do that, too." The production manager has to have a silken tongue if he then wants to convince IT that a plant dashboard really isn't the same thing as a data warehouse.

Unfortunately, the incomprehension within manufacturing companies' walls reaches even further. Consider controllers who don't see why plant managers want detailed numbers. *We see from the monthly numbers that there's too much waste. How much more does she want to know? Surely she already sees what she needs to do!* And sometimes you have engineers who are instinctively against using SAP on the work floor—*And then I guess you'll want SAP to control the PLCs, too!*—but they lack the authority, communicative skills, and power of persuasion to alter the SAP-unless policy. In the end, the individual with the biggest mouth, or the one highest in the pecking order, gets his way. Unfortunately, that's not necessarily the person with the expertise to make the best decision.

In addition to my work as a consultant, I write a monthly article for the Dutch trade magazine *Automatie*. In early 2005, I wanted to write a piece about the degree to which SAP is or isn't suitable for supporting processes within factory walls. Toward that end, I visited two companies in Belgium: Helvoet Pharma and Agfa-Gevaert. Helvoet Pharma had deliberately chosen a SAP implementation in the factory. In contrast, Agfa-Gevaert chose not to use blanket SAP, based on the results of an internal inquiry into the pros and cons of SAP on the shop floor.

### 1.2.2 From the Trenches: Helvoet Pharma Chose SAP for the Factory Floor

Helvoet Pharma delivers rubber closures and aluminum and plastic caps to the pharmaceutical industry worldwide. At company headquarters in Alken, Belgium, I spoke with Herman Braeken, IT manager at Helvoet Pharma, and Wim Huybrechts, sales manager at SAP Belgium.<sup>4</sup>

**HB:** We analyzed our automation needs some four years ago,<sup>5</sup> when SAP operated exclusively in the ERP market. We chose SAP for the ERP layer then, and for the SCADA layer, we chose Wonderware, with additional functionality for the MES layer. This way, we only needed to create an interface between SAP and the MES layer.

Our strategy is to choose integrated solutions with as few interfaces as possible. We want to be FDA-compliant, because we supply to the pharmaceutical industry. That means that every interface has to be validated, which incurs substantial costs. For the interface between SAP and the MES layer, we considered Enterprise Application Integration tools. Then,

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<sup>4</sup> Herman Braeken (IT Manager Helvoet Pharma) and Wim Huybrechts (Sales Manager SAP Belgium), interview with the author, 2005.

<sup>5</sup> This interview took place in early 2005.

suddenly, we heard that SAP had a module for the MES layer, the MO module. That was a big surprise for us.

**WH:** In 2004, SAP Belgium decided to throw the MO module into the spotlight. The module was almost ten years old, but it was rarely used because its user-friendliness left much to be desired. Over four years ago, SAP invested heavily in the development of the MO module, to breathe new life into it. Now it's on the rise. The solution has been heavily refined over the years, and the new developments can compete with specialized MES products.

A significant advantage, in particular for the pharmaceutical industry, is that all the functionality resides in one system, so that you have considerably fewer interfaces to validate. Electronic batch records are no longer spread across different systems. Moreover, the system is 21 CFR 11-compliant<sup>6</sup> and it can communicate with devices via OPC.

**HB:** Of course, every company has to analyze its own automation needs. The batch record features in SAP mesh well with Helvoet Pharma's needs. If you're willing to put in the effort, you can make it as detailed as you like. We've also experienced that OPC is possible using SAP. We've created a link between SAP and our scales, and these exchange information in two directions. In a later phase, we're going to link SAP to SCADA. For us, SAP is the only place left that contains master data. If we need a recipe, it's always sent from SAP to wherever it's needed.

**WH:** SAP isn't intended to control PLCs directly. It's common, however, to link SAP and SCADA systems together.

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<sup>6</sup> The FDA's 21 CFR Part 11 Rule on electronic records and signatures.

**HB:** In terms of stability, we've chosen to manage the SAP MO module centrally, in a redundant solution. We make three hundred batches a day with the mixer, so system availability is important. SAP runs at our site in Alken, and that's the central point for our other locations.

**WH:** You can also choose a decentralized solution. In that case, you put the SAP MO module on a separate server, possibly locally. In this situation, if the administrative system drops out, the production department doesn't come to a standstill.

**HB:** Our processes consist largely of manual labor. We've developed procedures so that the operators can always keep on working.

SAP is considered an expensive system, but that's relative. We already had SAP, so we didn't have to invest extra into hardware or software. We didn't have to buy a new package, and we didn't have to train people. The same people who first concentrated on the Sales and Distribution module now work on the other modules. Moreover, MES consultants aren't really cheaper than SAP consultants. There may be a slight difference compared with rates for SCADA or MES consultants, but not an appreciable one. And don't forget that consultant availability plays a role. A SAP consultant is easy to find, but just try to find someone who knows his way around WinCC!<sup>7</sup>

### **1.2.3. From the Trenches: Agfa-Gevaert Chose SAP Where Possible, a Separate MES System Where Necessary**

Agfa-Gevaert uses SAP worldwide. The Global Information and Communication Services department determines Agfa's IT strategy,

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<sup>7</sup> WinCC is Siemens' SCADA package.

and strives to put the production processes for all sites on one platform. This way, Agfa-Gevaert can put an end to its enormous number of separate systems and accompanying interfaces, whose maintenance costs a great deal of time and money. Agfa's starting point is thus: SAP, if possible.

During my trip to Belgium, I spoke with Marc Verhaegen, Manager of International Projects and IT Architect within Agfa-Gevaert's GICS / Manufacturing Services group.<sup>8</sup>

About two<sup>9</sup> years ago, we researched whether the strategy we had in mind was suitable for all our sites. To this end, we compared several of our locations in Europe. The degree of complexity in production processes was the determining factor in our decision whether to implement SAP alone, or to provide an extra MES system.

In Mortsel [Belgium], the processes turned out to be so complex that we couldn't manage them with SAP alone. In Mortsel, film for medical and graphical applications is manufactured in master rolls (up to sixty-seven inches wide and five miles long) in a continuous process with speeds of more than 330 yards per second. These rolls have to go through multiple production steps, coatings must be applied to one or both sides of the material, in the dark, and one roll can result in several rolls or vice versa. It's exceptionally important to be able to follow the genealogy of these rolls through the different production steps. A roll error that arises in a particular step of the production process is guaranteed to show up in a different place after the roll has undergone its last processing step. Error tracking is essential in order to be able

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<sup>8</sup> Marc Verhaegen (Manager of International Projects and IT Architect, Agfa-Gevaert, GICS / Manufacturing Services), interview with the author, 2005.

<sup>9</sup> This interview took place in early 2005.

to optimally cut the roll into end products. That way, we avoid wasting expensive raw materials, such as silver.

Moreover, it requires particular attention to get the rolls to the right work center at the right moment. We've solved this by constantly tracking the situation on the work floor, and feeding this back to the transport department via an integrated MES system. We've linked our process control systems using robust and user-friendly interfaces that support the operators' manual interventions. The detailed scheduling in our textiles department also requires a custom solution. Supporting all these complex issues with standard SAP R/3 is, in our view, impossible. And thus an MES system was the best solution for the Mortsel site.

The choice to use a separate MES system does have a few disadvantages. For example, you can't avoid double data storage. Certain information—like (semi)finished product inventory—arises in the MES layer. SAP needs these same data, but for completely different purposes, such as calculating the production price and creating financial reports. We've decided not to send all details from the MES to SAP, but to aggregate the data.

Interfaces are a constant concern, and data reconciliation is crucial. That's why we choose a single system wherever possible. At our sites in China and Leeds, we use SAP exclusively.

From our study, we drew the conclusion that—in our sector—links between SAP and process control systems, which are intended to drive processes, can be avoided. We've had some bad experiences with this within Agfa-Gevaert. In our opinion, environments with complex dynamic processes are

better supported by an MES system, because of its simple user interface, the required flexibility for data collection and data manipulation, and the specific automation and support needs characteristic of our industry. Requirements concerning a shop floor control system’s availability and independence can also argue in favor of a separate MES system.

At the moment, we aren’t ruling out a link between SAP and control systems, but only where non-time-critical data are concerned (such as canceling a production order), and always under the control of the workers on the floor.

**1.2.4 But What if SAP Can’t Provide a Suitable Solution?**

These interviews reveal that opinions are divided on the suitability of SAP for the MES layer. In any case, it’s best not to blindly follow a SAP-unless policy. Be on your guard as soon as the subject of automating typical MES activities comes up. The following table is a tool you can use<sup>10</sup> in deciding on a SAP-unless policy.

**Table 1.1** Considerations when choosing whether to follow a SAP-unless policy

| Greater likelihood that traditional ERP functionality is suitable for the MES layer | Lesser likelihood that traditional ERP functionality is suitable for the MES layer      |
|---|---|
| Simple processes, stable routings   | Complex processes, unstable routings  |
| Long production runs (days, weeks)  | Short runs (minutes, hours); many batches (for example, more than five batches per day) |
| One-to-one correspondence among production orders from office to factory            | Splitting or merging production orders in the factory                                   |
| Manual activities, driving and registering operator activities                      | Time-critical integration with the process control layer                                |

<sup>10</sup> The arguments here are largely derived from the Agfa-Gevaert study.

Beware!

The world is in motion. SAP and other traditional ERP vendors buy companies, thereby gaining access to applications developed as dedicated MES solutions. These applications can be worthy competitors to the MES solutions from other vendors. The boundary between *vendors* blurs. That's okay. The boundary between ERP *applications* and MES *applications*, however, should never fade. Why will become clear in the following chapters.

*You might have concluded that the processes in your factories are so complex that your central ERP system can't support them. You need a suitable solution. And MES vendors claim they can provide it. What is MES? And what functionality can you generally expect from an MES package?*