Production Scheduling Implementation Made Easyier

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Production scheduling is not a trivial task.

So although the title of this paper may *read* like one of those "idiot's guides," its purpose actually is to convey several thought-provoking, proven ideas to help you jumpstart your own production scheduling implementation, while minimizing the stress typically associated with such an endeavor.

Based on our experience implementing numerous scheduling solutions over the years we have determined that a little pre-work, some piloting, and fundamental attention to business processes goes a long way toward speeding a scheduling solution implementation.

In fact, this straightforward approach can often cut implementation times by half, as well as the corresponding time to benefit. In light of the clear potential for such rewards, we compiled a checklist of tips to help speed your own implementation and to ensure the overall success of your project.

Before we get started...

It's important to note that our checklist is based on several key assumptions:

1. That you'll have enough lead time — from the date when your organization commits to purchasing a scheduling solution until the time it arrives on site — to address some of the following suggestions
2. That you'll have enough resources to address the following suggestions
3. That the implementation work is supported, in part, by implementation consultants with mental toolboxes full of scheduling examples

Now that we've addressed the ground rules, consider these tips:

- **Lists — They're not just for shopping.**
  One way to streamline the implementation process is by compiling an easy-to-use list of critical data components. Schedulers require:
  - Resource Names (production lines)
  - Items on Resources (which products run on which lines)
  - Item Preferencing (where does an item run best)
  - Product Names (item names, SKUs, etc; it usually helps to have both the number and the description; the "exactness" of item naming should come from ERP master data if possible)
  - Preferred Sequencing on Resources (what items run in what order; include any changeovers associated with these sequences — both for the "preferred sequence" as well as "non-preferred sequences")
  - Machine Performances: MTTF, MTBF, scrap (list these by

product and by resource, since many resources perform better with different products), etc.
- Scheduling Rules (e.g., Make this product on this line and only on days of the week that end in the letter Y.)
- Line-to-Line Rules (e.g., If vanilla is running on Line 1 then it also *must* run on Line 2; however, if chocolate is running on Line 1, then Line 2 *may* run vanilla *or* chocolate at the same time.)

The best medium for collecting this information is MS-Excel. Most systems require some list loading, and Excel is an easy-to-use tool for uploading/downloading such data. And where will you find this data? Everywhere: in binders, in systems, taped up on office walls, or retained in people's minds as "tribal" knowledge. Especially important to capture are preferencing and sequencing rules, since these are the real tribal knowledge that most scheduling systems promise to capture.

- **Begin collecting changeover data early.** Scheduling tools require changeover data to be effective, and most estimates for changeover "rules of thumb" have a lot of "slop" in them, which leads to underutilization of production lines and lost efficiency. So, what's the best way to collect the data? Simply create a tally sheet for use in the control room or on the production line to capture important details like:
  - From Product/To Product
  - Labor Hours
  - Machine Downtime Hours
  - Cleanout Materials Used
  - Wasted Material — Typically bleed-off type materials at both ends of the product run and start-up
  - Production Lead Name (Some production leads have a knack for changeovers.)
  - Changeover Characteristics (e.g., from light to dark, same to same, allergen to nonallergen, thick- to thin-gauge, etc.)

  Collect this data for about a month or two, then calculate simple averages to determine a reasonable changeover duration. More often than not, schedulers are surprised by the results of this tally sheet analysis, since there are almost always items that changeover either much more quickly or much slower than expected. Capturing time and materials used/wasted data helps capture the total cost of the changeover, and not just the time associated with the changeover.

  One other quick tip: while you are collecting this data take notice of any quick changeover improvement opportunities. Can some changeover tasks be externalized? Can anything be "jigged up" by introducing SMED (single-minute exchange of dies)

or similar quick-change concepts during a scheduling implementation to further enable the process?

- **Start collecting rate data (the rate at which product is made).** Much like changeover data, rate data is also subject to fudging. The "real rate" is often hard to determine because it differs from the financial rate presented during budget conversations and used for variance calculations. The "name plate" rate, often called the theoretical rate is also of questionable utility since it is generally unachievable.

  Name plate rates are sort of like the gas mileage estimates on new car stickers; neither are particularly effective as realistic estimates. Again, the best way to get rate data is to create a tally sheet to collect:
  - Start Times
  - Stop Times
  - Output Units (a quality)
  - Scrap Units (non-salable without rework)
  - Date, Time, Shift, Operator (often collected to see if there are differences associated with these independent variables)

  Just as with changeover durations, actual machine output rates are often surprising to many line operators and schedulers. As might be expected there is most often a linear improvement in rate depending on batch size or run duration. Typically, the longer a product runs the better it runs. Interpret this data carefully.

- **Production lines run 24/7/365 — *NOT!*** To schedule properly, you need to determine the number of hours available during the year. This involves collecting holiday schedules, PM schedules, plant shutdowns, slow output cycles due to environmental conditions (typically temperature), expected productivity lifts from seasonal labor, and sometimes vacation schedules.

  All of this data is an input into the "calendar" in most scheduling solutions, thus the more effort you put into determining available time, the better you'll be able to manage all resources during the course of a year. For example, companies that rely on the natural environment as a heat sink (i.e., cooling towers, evaporation and distillation tanks, etc.) often experience materially significant differences in winter/summer run rates.

- **Get a plant drawing.** When we say "plant drawing" we mean an architectural layout of your production plant, not a Van Gogh sunflower painting.

  Architectural drawings (also called plat layouts) are invaluable tools for helping both internal

stakeholders and external implementation consultants visualize product/process flows and minimize confusion when discussing/designing scheduling models. They're also helpful for envisioning configuration issues and dependent demand flow between operations within a plant — particularly in multi-stage operations.

Make sure you include discussions about inventory storage locations within the flow and hold- or cure-times for inventory in locations, since these are critical time-constraint inputs for the scheduling tool.

- **"How would I rate MY OWN schedules? Definitely an A+... definitely."**
  Although it can be tough to cast a critical eye upon one's own work, the scheduling implementation process is best served by evaluating historical copies of both "great" schedules and the not so great. The point is not to cast blame but rather to learn from past mistakes; and if you're employing an external implementation consultant, the goal is also to help that person learn your schedule "presentation" format.

  In terms of lessons learned from our own experience, we normally ask schedulers to grade their schedules *and* to provide information about historic "actuals" related to them.

  The goal is to determine whether Production over- or under-produced to schedule, took more or less time to make the product, or to changeover. We also look for off-the-page changes — did the production supervisor change the line resourcing or sequencing and if so, why?

  There's actually quite a lot to be learned from reviewing historical schedules. And this exercise is all part of trying to capture otherwise elusive, often undocumented tribal knowledge.

- **The art of simplicity is a puzzle of complexity.**
  In order to understand the complexity of a process you must first document it.

  For example, single-stage operations are easy enough to schedule right? Until, of course, you consider that resourcing is shared — tooling, people, etc. — or until you realize that line-to-line preferences come into play. And how do you *really* schedule multi-stage operations like a make/pack or a make-to-convert operation? Do you backward schedule, forward schedule, or both? And do the rules change depending on product mix?

  At first glance, your production process may seem quite simple, until you document it. Only then do you begin to realize the extent of — and understand the

complexity of — all the various rules that you've kept ordered in your own mind over the years.

Once again, this step is an exercise in capturing the tribal knowledge that is so important to organizational processes. And taking time to better grasp your current scheduling process — even if you only create a crude process-flow diagram — will trim days off your implementation. So the more detailed the flow the better.

- **Be your own best "Jonah."** During production scheduling implementations, many consultants will often buy multiple copies of *The Goal* by Eli Goldratt and hand them out to all members of the production staff. The purpose, simply stated, is to identify your own constraints and de-bottleneck your own process.

  Simple de-bottlenecking does two things — it helps you understand the constraints in your process and consider ways to optimize them; it also stimulates thinking about potential "floating" bottlenecks. The more you bear such thoughts in mind throughout the implementation process the quicker you'll complete the task and the more sophisticated your end solution will be. And remember, the best way to pinpoint bottlenecks in a multi-stage operation is simple: just look for where the inventory builds up.

- **Determine your scheduling frequency and horizon.** Stop and think about this for a moment. How often do you schedule? Do you have weekly campaigns that you run? Do you run daily campaigns? In our experience, it is not uncommon to have a plant *formally* schedule once per week and then informally reschedule during the week. A primary benefit of many scheduling tools is not merely their ability to produce an initial schedule but rather their ability to perform rescheduling. Rescheduling, however, brings with it additional complexity — since it requires the in-week status of production tasks to be updated. As you think about your scheduling frequency and horizon, you need to ask yourself how often you currently schedule, how often you reschedule, why you reschedule, and how often you would like to schedule.

- **Get your data ready.** What types of data are required by scheduling systems? Typically inventory, order, forecast, and production. And if you intend to reschedule often you'll need to update this data often as well. If you only update production and inventory data once a week, then you can really only schedule once a week. Make sure your IT department is aware not only of this pending need for data downloads (typically in a specific

format) but also of the need for latency or timeliness of the data. Data availability can be a constraint on the scheduling process, so *make sure* you complete this legwork prior to buying your software solution. Too often business leaders purchase scheduling software without any consideration of whether it can be supported by their data. Heed this lesson so you don't repeat their failures.

- **Think "small."**
  Some consultants are enamored with "solving the big problem" right out of the gate, but in doing so they overlook and miss the benefits of smaller pilot solutions. We recommend using your new scheduling application to model a single production "line" first (a line many be a multi-stage operation) and then gradually expand the scope of the tool.

  There are many issues to consider when deciding which line to pilot. For example, some implementers try to model the simplest lines first, while others target a bottleneck only; still others strive to solve the toughest problem, and some select the problem that, if solved, offers the greatest value to the organization. Limiting the "problem" is a risk-averse position that can yield small wins and thereby build internal confidence in the process, while simultaneously providing a list of "gotchas" that are manageable due to the simplicity of the model.

  If you add a list of gotchas to a complex production flow and schedule solve, everyone gets overwhelmed quickly. Typical gotchas include:
  - Missing transactional or master data
  - Incorrect transactional or master data
  - Timing issues (latency) of data
  - Missing rules, tribal knowledge
  - Erroneous rate data or changeover data

- **Begin with the end in mind... FINALLY!**
  This is the most important issue to bear in mind. It's also the one that requires the greatest deal of preparation/education because it sets the tone for the project, it sets the objectives for financial return, and it sets the expectations of the software application — more by addressing what the application "cannot do" rather than addressing what it "can do."

  Regardless of what any salesperson says, scheduling applications will not — repeat, **WILL NOT** — optimize the world.

  In order to implement an effective scheduling solution you must first establish your ultimate goal for the software. Since most production scheduling models have flexibility to change "strategies," ask yourself

what you're attempting to achieve with the tool. Some models can be set up to prefer optimal sequencing and changeover minimization; others work to "solve" for customer service and will accept "bad" changeovers if a service need arises. Still others simply work to fill to a planned inventory level.

The goal of the software should match your business goal, and that means you must determine what the best strategy is for your organization.

Consider this lesson from the trenches.

When our consultants walk into production plants they often challenge each other to guess which desk belongs to the scheduler, and they're correct about 75% of the time. Their secret: spotting the desks with the most stacked papers, the most notes pinned to the walls, and the most binders in nearby cabinets.

Production scheduling is a data- and rule-intensive operation. Speeding up your implementation is primarily a matter of taking time up front to nail down the available data and rules *before* you get started.

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