Integrated scheduling solutions

Chris Collins, Managing Director and Chief Executive Officer at Synchro ERP, has designed and created software solutions within the metal casting industry for the past 25 years, witnessing hundreds of companies and their often innovative approaches to scheduling. He is aware of the pitfalls associated with the never ending balancing act that is scheduling. Dependent on available resources, range of products and complexity of manufacturing, scheduling can be as easy as 10 minutes' shuffling work instructions or days of painstaking analysis and prioritisation.

The need to balance resource against requirement has been around as long as the need to profit from other companies' inability to do so. Add to this a drive for increased product quality as well as machine uptime and a potent recipe is created that has pushed forward the limits of how and what we are willing to optimise in the manufacturing process.

Resource

Understanding company resources and the ability to apportion them efficiently across requirement is at the core of good scheduling. Correctly identifying consumed resources is the first step towards this aim. At its basic level, materials, machines and manpower are as far as most organisations get. However, with the ever-present pressure of competition and the never ceasing tide of progress, more and more companies are now looking into darker recesses for overlooked waste and potential resource gaps to see what can be salvaged by in-depth control of hidden resource usage and dependence.

Requirement

Customers have, of course, always been demanding both on cost and quality but the drive forward by manufactures to provide a quality product at less cost to gain competitive advantage has bolstered this demand even further. In addition, the social impact of information technology and the visibility of corporate culpability have further driven the need for quality and (as importantly) source traceability.

Screen shot of integrating tooling.

In this self-perpetuating dance of continuous improvement and increasing demand, the relationship between customer and supplier reaches a natural equilibrium that is only broken by changes in resource provision, social perspective or technological progress. Ultimately, this is why so much importance is placed on scheduling, by exposing demand and controlling resource.

Technological effect

Everyone is aware of the pace to which technology has changed but how these technologies are used, particularly with respect to scheduling, needs

Screen shot of production planning.

restless attention, searching for advantages that can be taken either in the office or on the shop floor. Many companies limit their use of technology to self-designed spread sheets or 'all-purpose' scheduling tools, without thinking about the advantages that may be taken in resource/machine monitoring, hand-held data collection and forward procurement analysis.

Many of the advanced scheduling tools available today are more than capable of handling the requirements presented to them but herein is one of the many issues faced. Our use of these tools is often restricted by the generic nature of their interface. Sometimes, through not asking the right questions or concentrating just on bottlenecks, advantages are lost that more tailored solutions pick up.

Accurate and industry specific scheduling tools are a definite advantage in this area, more because of the nature of their integration to all aspects of a business than the differing advantages attributed to various scheduling models they utilise. Whether a finite or infinite capacity model is used, both rely on an accurate resource model for constraining capacity. There may be the materials, machinery and manpower in place to complete a job on-time and in budget but what about the consumables required to undertake that critical pre-planned maintenance on an essential piece of equipment that simply was not considered? Or the assumption of availability of a piece of tooling that, due to lack of tracking, has suddenly disappeared? Customer contracts can be won or lost on such small details. And yet many companies still believe in scheduling just bottlenecks and everything else will 'sort itself out'.

Scheduling prerequisites

So, what is needed in terms of information? Well surprisingly, not that much. More important is the quality and timeliness of the information which is actually used in the scheduling model. Many companies already have good information but because it is stored in separate places, it tends only to be used locally and its value to scheduling is completely overlooked. Data integration is required. Centralising company-specific data in one place, even if at first some aspects of it seem to be of little relevance to others is one of the most useful exercises that a company can perform. In the example described earlier, how much easier would it have been if the purchasing requirements of the planned equipment maintenance had been predicted in advance because the equipment usage was being monitored within the production schedules? Or that the missing tooling that halted a job had been highlighted due to a clash of usage on another job? Good scheduling cannot create resource but it can identify problems well in advance to enable informed decision making.

Data flow and timeliness

For scheduling, late data is mostly useless data (with the exception of timing data for historical and costing purposes). In today's world, there is little excuse for this. Automated machine monitoring, barcoding, a multitude of sensors, RFID tags and simple hand-held (even shop floor hardened) tablets. All of these items can assist in the flow and timeliness of data.

Many companies still rely on a paper trail back to the office or the urgent phone call when something goes terribly wrong but getting accurate information back quickly means decisions can be made quickly and fed back into the production loop early on, saving time and money in addition to providing valuable data for future production. Discovering at the last minute tooling that is too poor to use or getting a phone call from an operator you are dependent on telling you his wife has just gone into labour is not something that can be predicted but it

is possible to factor the effect into a forward production load, purchasing needs and advance customer notification.

First steps, resources and constraints

Identifying resources, measuring and monitoring the constraining effect of capacities, are both essential elements in providing a scheduling model with up-to-date information; emphasised here are 'monitoring and 'up-to-date'. Having initially identified constraints for existing manufacturing requirement, many companies consider the job done. This is a faulty assumption on two levels. Firstly, resources are rarely static and need to be monitored (with the possible exception of floor or oven space), machine efficiency will alter, operator availability will not always be predictable, while quality and quantity of supply are not consistent. Secondly, unless the same product is manufactured day in, day out, manufacturing requirements will change, introducing different processes, using other materials and requiring new skills. These points may seem obvious but many companies branch out into different areas and expect their existing scheduling model to cope (if they have even thought about it).

Whenever a change occurs, at the process level or machine level with different maintenance requirements, or a brand new product requiring new materials and tooling, it should pass through a series of checks to make sure its manufacturing progress and use of resource is correctly monitored and reflected in the scheduling model.

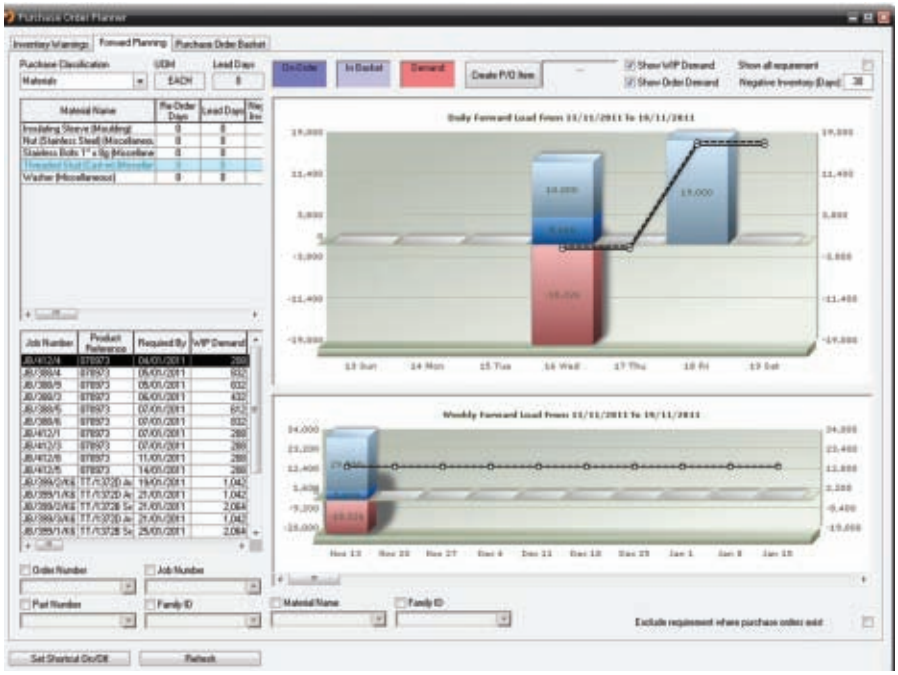
Data collection

The use of technology to deliver timely and accurate information was touched upon earlier. First, it is necessary to understand that shop floor data is bi-directional in nature. Information sent to the shop floor not only indicates the work that needs to be achieved, how and in what priority. It also communicates changes in resource usage and maintenance procedures.

Data received from the shop floor should indicate job progress, the introduction of scrap and rework, resource alterations (including changes in stock and tooling usage), completion of planned maintenance and full reporting of unplanned maintenance (breakdowns). Anything in fact, that will affect the scheduling model and its ability to provide a company with an accurate snapshot to assist in the decision making required to determine current and future production planning.

Data management and validation

It is important to note that data handling procedures are almost as important as the data itself and are often overlooked. Technology may enable more timely access to a changing situation but if the data being reported is faulty, it is possible to make incorrect choices faster. Faulty machines can be fixed, sensors replaced but operators will still make mistakes. It is important that either a buffer zone exists for data validation or the ability is afforded to back out of situations created by faulty recording. If using an industry specific and fully integrated software application, this will be mostly taken care of. If, however, the data is being interpreted manually or it is being injected into spread sheets or third party software, data handling procedures should be reviewed to ensure validation and recovery are both viable.



Screen shot of purchase planning.

Timing

The use of timing information plays a crucial role in scheduling. The collection of timing information and the effect on resources could be the subject of an entire discussion in its own right. Broadly speaking, companies use estimated, standard or actual timing information. Actual time is time recorded on the shop floor and usually massaged to take out the top and bottom 10% of errant data. Estimated and standard times are usually internally derived (best guess) or obtained by published industry standards.

A company's preferred option is usually dependent on the reason behind the scheduling. If consistency of costing is a driving factor, companies generally prefer to use standard times (or simply they do not monitor actual times). Actual timing information can vary in accuracy, with some companies going to the trouble of measuring average throughput of a process for a specific product down to the second, including setup and change over times, while others (usually with valuable experience from the shop floor) will only have a rough idea of daily throughput. Some industry specific solutions can handle all of these situations at the same time, allowing a company to grow, analyse historical data and slowly improve its scheduling model over time.

Shared resource and job combining

One of the major issues with most scheduling models is the correct use of tooling or other resources when combining or batching manufacturing requirement to share the same tools or group of resources. If a company has to deal with stack/rack moulding or has to organise multiple jobs to share the same tool, some of the issues involved here will be readily understood. Traditionally, because each manufacturing job is judged separately in terms of resource requirement (even if batched together) or that the resources it consumes are seen as exclusive used within its processes, the delivery of resource options to the scheduling model is restricted and the effect on capacity is usually over estimated. This creates an inaccurate production plan, wasting potentially valuable resource.

This is another point that underlines the importance of industry specific scheduling solutions.

Understanding the relationship between manufacturing requirement and resource usage (especially at a shared resource level) enables scheduling to combine the use of tools and associated resources. This enables accurate visibility by understanding the effect not only on production batch sizes and resource availability but also on forward planning and timing of additional resource procurement.

Advantage

Most people see scheduling as a means to an end. There is a need to manage resource, while filling requirement in the most cost-effective manner. Look into the advantages post-scheduling data can deliver, however and a whole world of information will be found just sitting there. Having accurate, or at least often updated semi-accurate, scheduling provides a forward view on tooling usage, equipment maintenance, operator requirement (extending to shift or even vacation planning), purchasing, storage, subcontractor provision, advance customer and supplier notification and of course, much more.

Conclusion

Ensure all resources and their capacities are identified and kept up-to-date. Drill down into production requirements and identify production and non-production related dependencies. Make sure data is timely and valid (and use it). Take advantage of technology and never stop reviewing the scheduling model. Holding information under one roof is an important step to accurate and useful scheduling. If a company is not using an industry specific solution that ties data together and understands its production requirements and the relationships between resources, that company's choices should be reviewed.

Remember, fully integrated and industry specific software systems can be cost-effective, flexible and offer invaluable guidance in how to direct and shape a company's valuable data. Accurate scheduling stands at the centre of ERP (enterprise resource planning) but guidance is only half the story. Ultimately, a company's successes are derived from its ability to grow and evolve and evolution needs change.

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