Production planning and scheduling lies at the heart of pharmaceutical manufacturing, but its main impact tends to be at a shop-floor level; for a growing number of pharmaceutical companies, however, the benefits here are dwarfed by the huge savings achievable at the top level. By re-connecting the shop floor to the top floor, it is possible to get the best of both worlds.

With the complex world of pharmaceutical manufacturing increasingly being driven by company- or group-wide key performance indicators (KPIs), it’s easy for a loose connection to develop between long-term corporate aims and the daily individual processes on which such KPIs depend. Yet some of these daily processes or disciplines can be pivotal to the success of the entire business. Production planning and scheduling is a prime example of this. The hourly and daily production ‘shop-floor’ challenges involved in getting the right order to the right customer – on time and every time – are many, varied and complex. However, at a ‘top-floor’ level, production planning and scheduling also affects supply chain effectiveness, influences overall plant production capacity levels and can even be the determining factor in major infrastructure relocations or investments.

Benefits on the Shop Floor

The shop-floor value of well executed production planning and scheduling can be seen by examining the changes made by one of the largest global pharmaceutical companies in its biopharmaceutical vaccine production facility. Vaccine production is characterised by complex processes involving a number of intermediate solutions with multiple stages and products vying for the same space and resources in the manufacturing plant. It requires hundreds of discrete activities to be performed, solutions to be made and cleaning sessions that must be carried out on bioreactors, columns and filtration systems – all in a round the clock environment that involves 200 people.

Overcoming these challenges was traditionally the task of a team of seven full-time planners that met daily, armed with a collection of Excel spreadsheets. Each had an intimate knowledge of specific parts of the production process, involving many hundreds of discrete solutions and activities. However, due to this complexity, the rolling planning horizon of the combined plan could only extend to a week ahead, and could only be updated daily to accommodate all the unforeseen events that had happened in the previous 24 hours.

Not only did this process take a whole morning each day, but the resulting individual plans lacked any coordinated visibility at a plant or individual resource level. It was also not uncommon for electrical engineers, mechanical engineers and equipment to turn up for planned maintenance, only to learn that the schedule had changed and production was in progress.

Recognising the considerable potential for improvement, the company invested in a state-of-the-art planning and scheduling solution, and quickly reported that the planning and scheduling process was now much smoother and more effective. The system implementation was also smooth, with a planned six week parallel run being dropped after only a few days due to the positive reactions from users. Today, using fewer planners, the daily rolling planning horizon has improved by 400 per cent to four weeks, with the planning process only taking an hour each day to complete instead of a whole morning.

A company director described the changes as “revolutionary”.

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in the facility now has access to the plan – from shift managers and supervisors, to shift engineers and engineering planners. Giant touch-screen smart boards are situated on the floor, while user screens provide access around the plant; together, these provide a real-time ‘single version of the truth’ available to everyone, in an environment where processes take place in multiple rooms. For the plant director, this visibility has been “the single biggest win” with this alone “fully justifying the system.” Further benefits include significantly smoother shift changeovers, and the ability to fully integrate maintenance activities determined by the company’s business management system into the daily plan.

**Overlap between the Shop Floor and the Top Floor**

A look at another real-world example shows how getting production planning and scheduling right benefits not only the shop floor but also the top floor, and how these areas overlap. The production team of a major international pharmaceutical company responsible for a group of self-medicating products within a specific plant was faced with the challenge of increasing manufacturing productivity – in other words, making better use of the company’s existing resources and optimising capacity. In the highly competitive world of pharmaceutical manufacturing, even modest increases here can have sizeable benefits across the entire company.

Because this company had already invested in a state-of-the-art production planning and scheduling solution, it was able to use this to help meet the challenge. This was because the system already contained all the extensive expertise of the planners, together with their intimate understanding of the way the plant worked, the way product moved through it and the complex conflicts that exist with shared equipment and sequencing.

By working closely with the supplying vendor, the system was enhanced to become a modelling tool capable of exploring ways to optimise use of the facility. It was consequently able to identify bottlenecks, to apply fixes to these and to build ‘what if’ scenarios in a true modelling sense. As a company director associated with the project commented: “We then embarked on carefully chosen projects in which we already felt a high level of confidence using our system in a day-to-day scheduling role. We knew they would work.”

After having just completed a 12-month programme of removing bottlenecks and optimising the plant, the company has already achieved a 20 per cent faster throughput. It is now going into 2012 with higher capacity using exactly the same resources – something that would have been impossible using traditional spreadsheet-type planning and scheduling tools.

**Understanding the Present to Plan for the Future**

The company’s greatest top-floor use of its shop-floor planning and scheduling system came when, like many other multinational pharmaceutical companies, it faced the challenge of consolidating its manufacturing into a smaller number of facilities. The product in question had a number of sub-types that were being manufactured at different sites on different continents – yet the company was faced with the reality that it was not possible to accommodate these sub-types into existing facilities. The only alternative was to completely re-build and re-commission an existing suite, and turn this into two separate facilities.

The company had to answer two fundamental questions: first, ‘what would operations look like on a day to day basis over a number of years?’ and second, ‘what would a realistic resource and capacity plan look like?’

Once again, a system usually associated with the shop-floor world proved invaluable in answering these top-floor questions. Not only has the company been able to model requirements for the next five years, but it has also been able to visualise a range of different product mixes in order to arrive at a realistic plan of action. The director responsible for the project had extensive experience of addressing these challenges and was understandably very positive about the results achieved:

“Traditionally, spreadsheets such as Excel have been used to plan such activities,
Being able to accurately model many years in advance is clearly advantageous, but pharmaceutical manufacturing is a dynamic and ever-evolving activity that has to be able to quickly react to change. Typically using a common server to provide an element of shared functionality. The difficulty with such an approach is that it is limited essentially to a chart comprising coloured squares. By using our production planning and scheduling system, it is possible for us to drill down to hours, minutes and seconds, rather than being restricted to crude day or half-day blocks. Equally important, we have been able to apply ‘what if’ scenarios, particularly around capacity-related numbers. It is in the nature of forecasting that the further you move into the future, the less valid the numbers become. With our system, we have been able to look at what the forecasters have been saying, and then apply a range of variations. Using spreadsheets, it would take days to accommodate secondary or parallel processes, figure what a schedule might look like, while another team separately figures our recruitment needs – everyone speculating from their own spreadsheets. Our system has given us the clarity of vision we need."

Planning for Ongoing Future Change – Now

Being able to accurately model many years in advance is clearly advantageous, but pharmaceutical manufacturing is a dynamic and ever-evolving activity that has to be able to quickly react to change. Companies need to plan work now for drugs that may go to market a long way into the future. For example, new products may require new resources and accurate planning of the installation of the right equipment at the right locations is fundamental in ensuring a company’s ability to start manufacturing the product at the right time. This is particularly important for companies with complex, high-value production in high-cost manufacturing facilities. Based on estimated market demand, plant production capability, capacity and cost, such companies can then employ the same software used on the shop floor for day-to-day production scheduling to address top-floor business issues like optimising the supply chain to ensure achievement of demand at minimum cost.

Bridging the IT System Gap

Another top-floor benefit of such systems is the ability to serve as a connecting bridge with existing IT investment, which can often be highly expensive and/or highly customised. Take the example of a biotech pharmaceutical manufacturer with a number of validated cGMP systems including SAP, a LIMS and a bespoke ‘weigh and dispense’ system. These were all used to support manufacturing, but each shared a common limitation of having no finite capacity production scheduling functionality. While they supported the tracking and current status of material and operations through the manufacturing process, they were unable to deal with constraints such as the allocation of trained personnel and specific items of plant equipment. Nor did they take cycle times into consideration, which meant it wasn’t possible to plan accurately or execute a schedule in a timely manner. The answer lay in the company using its existing production planning and scheduling solution to bridge the gap between its existing IT systems in order to generate feasible and robust schedules in a timely manner that supervisors and managers could use to help expedite their respective tasks. By doing so, the company was effectively enabling and enhancing the capabilities of its existing IT investment and – looking forward – it anticipates that integrated finite schedules will improve its variability and aid overall cycle-time improvements.

A Win-Win Outcome

Production planning and scheduling lies at the heart of pharmaceutical manufacturing and, even when given the recognition it deserves, this tends to be at a shop-floor level. However, for a growing number of pharmaceutical companies, the benefits achievable here are dwarfed by a huge potential for savings at the top level. And, by re-connecting the worlds of the shop floor to the top floor, they demonstrate that it really is possible to get the best of both. Which can only be better for you, as well as your customers.