

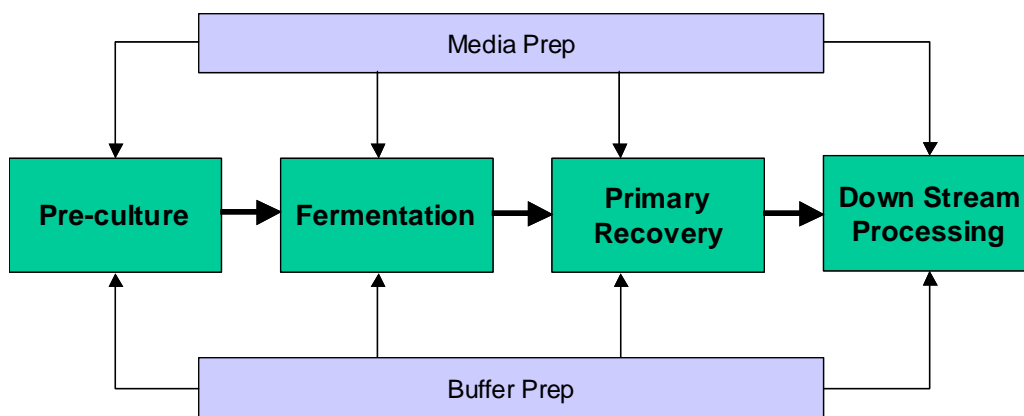
Factory Physics® Case Study:

Increasing Throughput for a Bio-pharmaceutical Plant

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A bio-pharmaceutical company was planning to do a significant facility expansion to increase their throughput. They asked Factory Physics, Inc. to assess the plan and to look for opportunities to increase throughput without costly capital expenditures. The market for the plants two products was larger than their current output. Any throughput gains would be an immediate boost in revenues. The question was how much would the expansion cost and would they be able to meet targeted shipments for the upcoming year.

As depicted in the figure below, the manufacturing process consisted of four major steps: (1) Pre-culture, (2) Fermentation, (3) Primary Recovery and (4) Down Stream Processing. “Feeder” processes that prepared various media and buffers supply each step. The first step in the analysis involved developing an “as-is” capacity model to determine the bottleneck process. Everyone agreed that the bottleneck was at Primary Recovery. The constraining resources were not the tools and equipment themselves, but the labor needed to support them. Furthermore, labor would continue to be a constraint due to education and skill requirements. It became clear that Primary Recovery was a rather unstable process and as such, not a good place for the bottleneck. This was also the one of the main reasons that the plant needed a very complex scheduling process to ensure that they met production quotas.



Then a “to-be” capacity model was developed to determine where the bottleneck would be after the proposed expansion. Again, the bottleneck was Primary Recovery, but in addition the Fermentation step would become more and more complex to schedule and control as additional equipment was added. In fact, the plant had recently tried to implement an Advanced Planning

and Optimization (APO) system in an effort to improve the scheduling process. With cycle times measured in months and a straightforward two level bill of materials, it seemed to be an environment ideally suited to work with one of these tools. However, in addition to requiring significant time and effort to update, the APO system was taking two to three hours to process a new schedule. The process extracted data from the ERP system and then attempted to “fix” the MRP output. Unfortunately, by the time the schedule was ready, the condition in the plant had changed and the schedule was no longer accurate. Management was debating whether to continue to invest money and time into making the APO system work, or abandoning it altogether and look for another solution.

Strategically, the capacity expansion would require a huge outlay of capital. Given the risks of not getting it right, FPI developed a discrete-event Monte Carlo simulation tool to more accurately model the facility using Factory Physics principles. The resulting analysis confirmed concerns that the system would become extremely unstable if Primary Recovery stayed as the gating process. Moving the bottleneck to Fermentation changed the problem from an extremely difficult scheduling process to a more robust and simpler method of sequencing orders. It was decided that the bottleneck should move to Fermentation and that the company needed to redesign the expansion to make this happen.

In addition, the model also included the “feeder” processes that prepared various media and buffers for the main flow. With this analysis the company was able to determine the number of stations required to prevent excessive queuing and to meet response time requirements. It was also clear that the buffer stocks and existing capacity could be further optimized to ensure best possible performance.

The company now uses the FPI designed simulation model to analyze their production system on a regular basis. It will continue to be used to ensure that the plant meets daily production quotas with optimal capacity buffers.

Results –

- **Additional millions of dollars in annual revenue** through improved throughput with existing capacity.
- **Millions of dollars in savings** through delay of capital expenditures
- **Improved performance, simplified management of scheduling, without the use of expensive and overly complex IT systems.**

For more information about Factory Physics principles and applications, visit our websites at www.factoryphysics.com or www.leanphysics.com or contact:

Ed Pound

Factory Physics, Inc.

email: pound@factoryphysics.com

phone: 630-870-1163

or, send an email to info@factoryphysics.com