Pharmaceutical Manufacturing Facility Design

ProModel
VISUALIZE ANALYZE OPTIMIZE VAO

Vertical

Manufacturing | **Pharmaceutical** | Healthcare | Portfolio | Logistics | Financial | Government | Business

Genre

Case Study | **Project Review** | White Paper | Technology Overview

Client

A major global consumer pharmaceutical firm

Situation

The firm was waiting for FDA approval of 2 new drugs. In order to be able to deliver the drugs to market as soon as possible, they had to design and build the new manufacturing facility during the approval stage. This put them in an extremely risky and costly position. They decided to minimize the risk as much as possible by engaging ProModel Corporation to help develop a simulation solution which they could use to do much of the planning and "what-if" analysis associated with this highly unpredictable situation.

Objectives

The overall client objective was split into two phases. The first phase was to design the facility and determine the long lead time equipment requirements such that it would be able to handle projected demand 10 years out into the future. The second phase, at a more detailed level, was to determine the best ways to run the plant in order to optimize throughput.

The first phase was essentially a one time project to generate the best facility design. This phase required the answers to high level questions such as:

- Which overall facility layout would best be able to handle maximum projected demand for 10 years into the future?
- Determine the right type, quantity, and placement of equipment for the long lead time equipment items that are essentially integrated with the construction of the facility.

Phase two provided a reusable solution which would help them determine how to optimize the plant from the initial opening as well as how to maintain optimal performance as demand and other variables changed over the years. Detailed objectives in phase two included:

- Identify the most effective staffing requirements and shift patterns.
- Discover the reliability obtainable for the major equipment cells.
- Eliminate manufacturing and packaging cell bottlenecks.
- Determine the number of totes required and the best material handling process
- Develop the production scheduling and sequencing strategy.

Solution

The solution included simulation models designed to help the company visualize and analyze the hypothetical plant performance (capacity, cycle times, and costs) by experimenting with parameters such as differing forecasts, variations in product introduction timing based on when and if the FDA approvals came through for each drug, the number of lots per campaign, setup and changeover scenarios, and different staffing/shift combinations.

The models were constructed to allow for easy experimentation with the following system variables:

- Equipment parameters and downtime
- Product volumes
- Lots per campaign
- Number of totes used in manufacturing
- Rejection rates
- Operation times/process rates
- Conveyor speeds and queue sizes

Results

Completion of this project provided the client with several advantages over more traditional facility design methodologies:

- A more robust, versatile facility design, able to handle a wide range of product demand scenarios
- The optimum type, size, and quantity of equipment
- More accurate prediction of the quantity, positions and cost of the required workforce resources
- Higher degree of confidence that maximum projected customer demand could be met for the next 10 years

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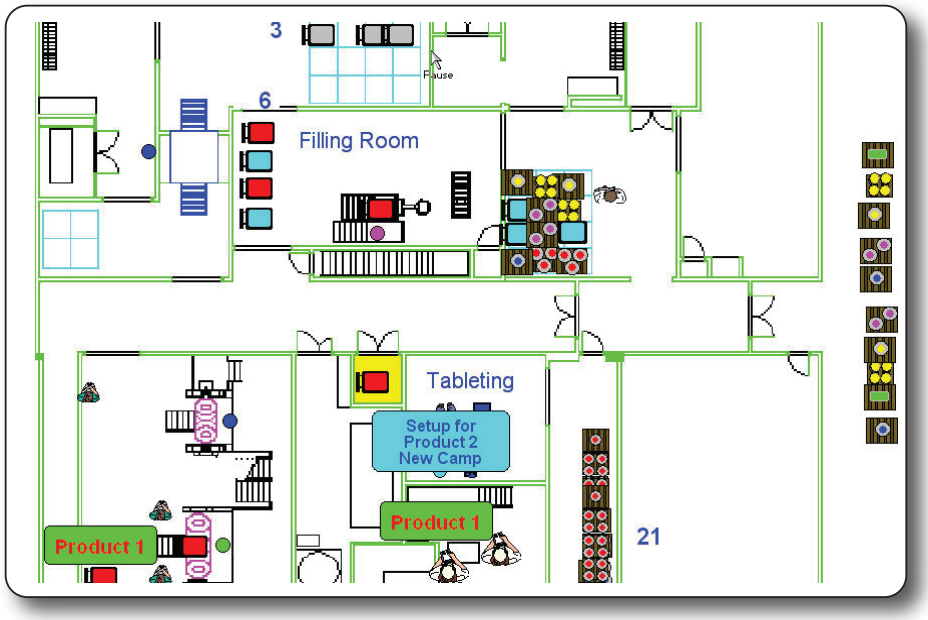
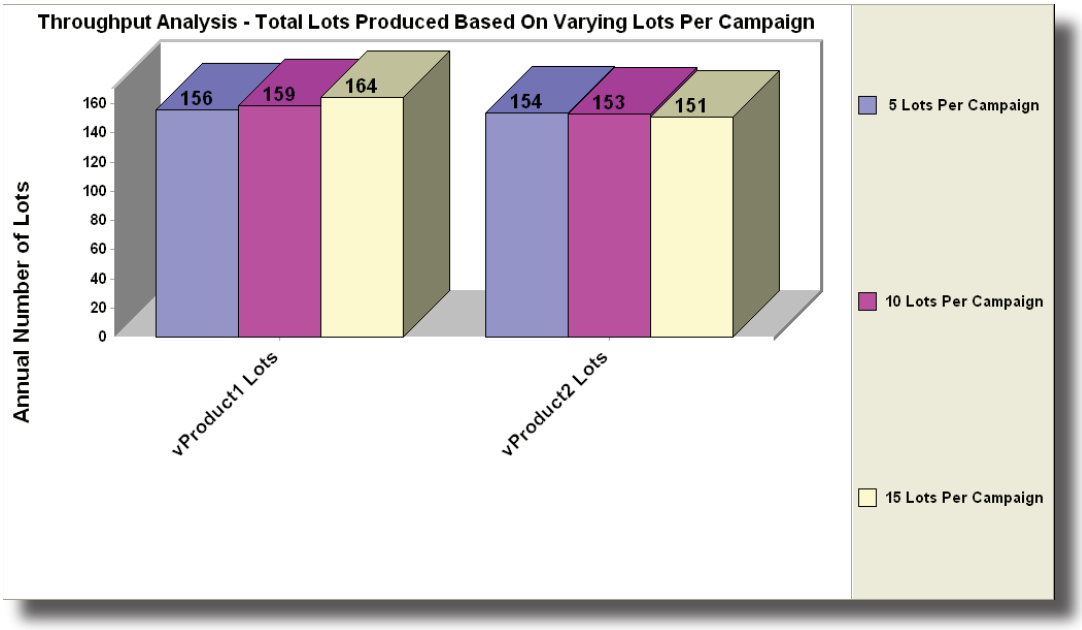
Results

The graphic below is an example of the animation used to help visualize and analyze the proposed new facility. This type of visualization helped with the design of the facility layout per the objectives in phase 1.



Once a proposed layout was developed, the client needed to determine if it could handle the maximum projected customer demand for the first ten years. The maximum annual customer demand for the first 10 years was projected to be 160 lots of Product 1, and 150 lots of product 2. In the example below, the client tested the ability of the proposed layout and scheduling strategy to meet the maximum projected demand by varying the number of lots per campaign.



In this case, an experiment was run with 5, 10, and 15 Lots per campaign. Only the 15 Lots per campaign scheduling strategy allowed them to meet maximum customer demand of 160 Lots of Product 1, while simultaneously being able to produce 150 Lots of Product 2.