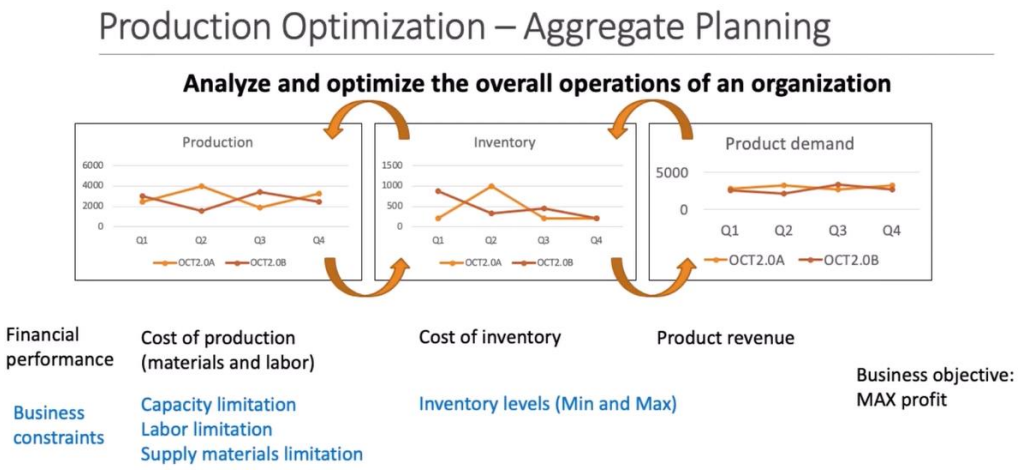
M7L7a. Optimization Business Case

Slide #1

Let me illustrate the production and inventory level optimization with a business case.

Slide #2



The business context is the same as the business case in the production business optimization case.

Your company makes two types of laser optics units for optical coherence tomography machines in its Houston plant.

Your sales department provides the quarterly demand forecast of both products, OCT 2.0A and OCT 2.0B.

We need to decide their quarterly production and inventory levels, respectively, based on demand projection to maximize the operation profit.

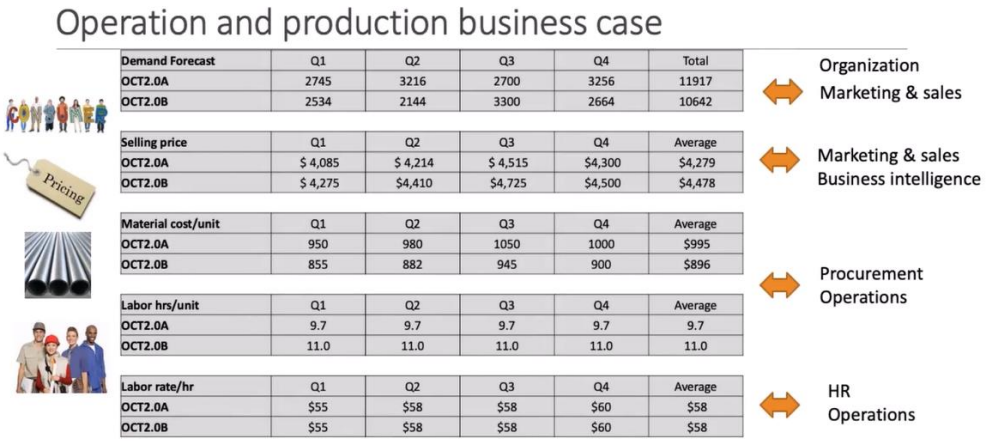
Production cost includes both materials and labor cost items.

We will also consider the cost of inventory in your analysis.

The revenue is a function of the projected quarterly demand and unit price of the product.

The three business constraints are the plant capacity, labor, and supply materials limitation in each quarter.

Slide #3



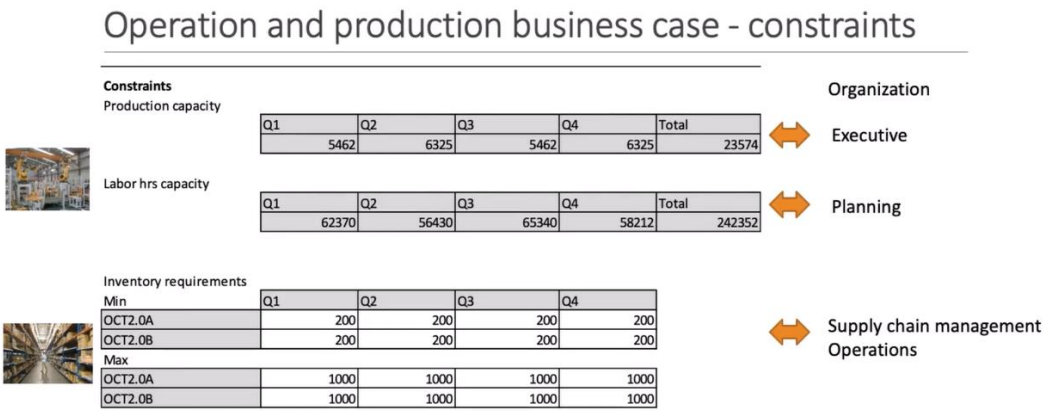
The business data are presented in these tables. First, your sales and marketing group provides the demand forecasts of OCT 2.0A and OCT 2.0B in each quarter of next year. For example, they project the demand for OCT 2.0A and OCT 2.0B of 2,745 units and 2,534 units respectively in the first quarter of next year.

Your sales and marketing group also provides the projected selling price of each model based on their market intelligence studies. For instance, the price of OCT 2.0A will be $4,085, while OCT 2.0B will be $4,275.

Your marketing departments offer different levels of discount according to the seasonal demands, while the full price of each model remains the same in the next year. Also, your procurement group projects the quarterly cost of raw materials.

The cost of raw materials is consistent with the demands of the machines. Required labor time per unit remains the same across the year, while the hourly rate increases along the quarter. This trend is consistent with a normal compensation adjustment schedule.

Slide #4

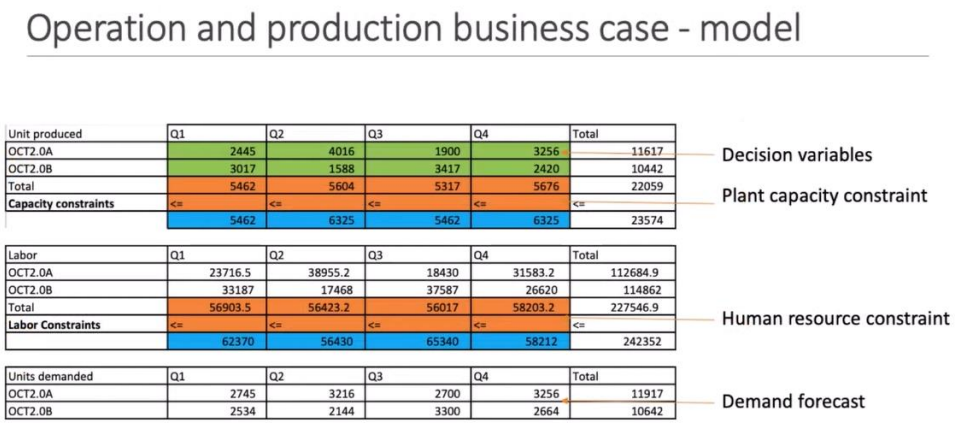


The business constraints are, first, the production capacity in each quarter fluctuates slightly as planned maintenance in first and third quarters takes out some production capacity.

The labor hours also fluctuate in different quarters according to normal employee turnover patterns.

The inventory requirements include minimum and maximum inventory levels in each quarter.

Slide #5

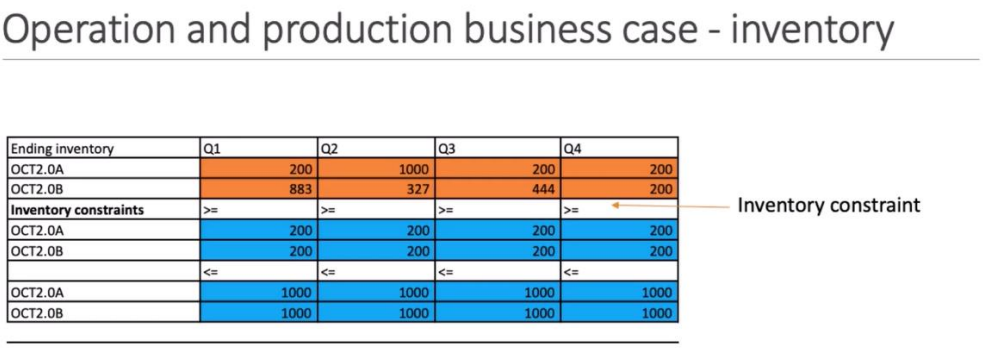


The decision variables are the production levels of OCT 2.0A and OCT 2.0B in each quarter.

The total number of units to be made in each quarter is limited by the production capacity of the plant and human resource availability.

Both constraints are included in the model.

Slide #6

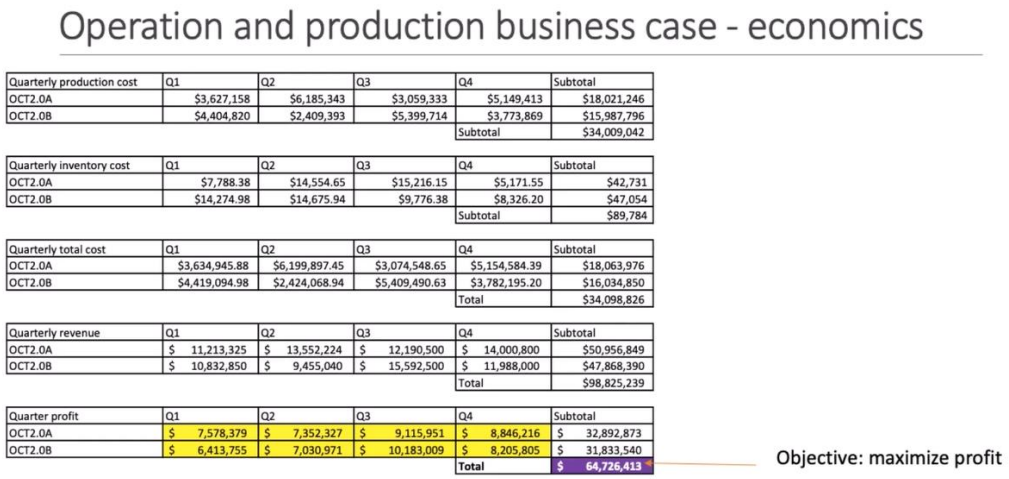


Most of the produced laser units will be sold and shipped to customers and the remaining will be placed in the warehouse as inventories.

The lower and upper limits of inventory are 200 units and 1,000 units for each model.

The calculation of the inventory constraints is shown in this table.

Slide #7



This table calculates the production and inventory economics, which includes the production cost, inventory cost, and revenue in each quarter.

Total revenue, less total cost, is the operation profit.

Note that the fixed management cost and financial activity cost is not part of the operational optimization model.

The decision objective is to maximize the annual operation profit.