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L.K. Production Plan for the Upcoming Fiscal Year

The following report provides a summary of our proposed production plan for L.K. lawn mower company for the upcoming fiscal year. This report will identify the resource allocation, the inventory levels, the production levels for each product and month for the upcoming fiscal year.

The needs of L.K. to have a formal aggregate planning model based on the available data is summarized below, where the actual model is a detailed mathematical formulation.

The Model Will:

- Minimize Total Production Cost
- Such that production and inventory levels meet the forecasted sales
- Such that the workforce levels can only change by firing or hiring workers
- Such that your production capacity is limited by your workforce level
- Such that the workforce levels stay within a given range of 20 workers
- Such that their is a safety stock of 2000 units per product to satisfy unexpected sales, instead of backordering unexpected sales

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Figure 1 below shows how our proposed plan achieves minimum production cost for the upcoming fiscal year. A workforce of 152 - 172 production employees throughout the year is required to achieve this cost. It is important to note that if last year's workforce range of 72 to 92 production workers was used, it would be impossible to meet the forecasted sales for next year. The proposal to increase the workforce over 100% includes hiring and firing costs, so despite a drastic increase in workforce, it is expected to provide a better production plan than before.

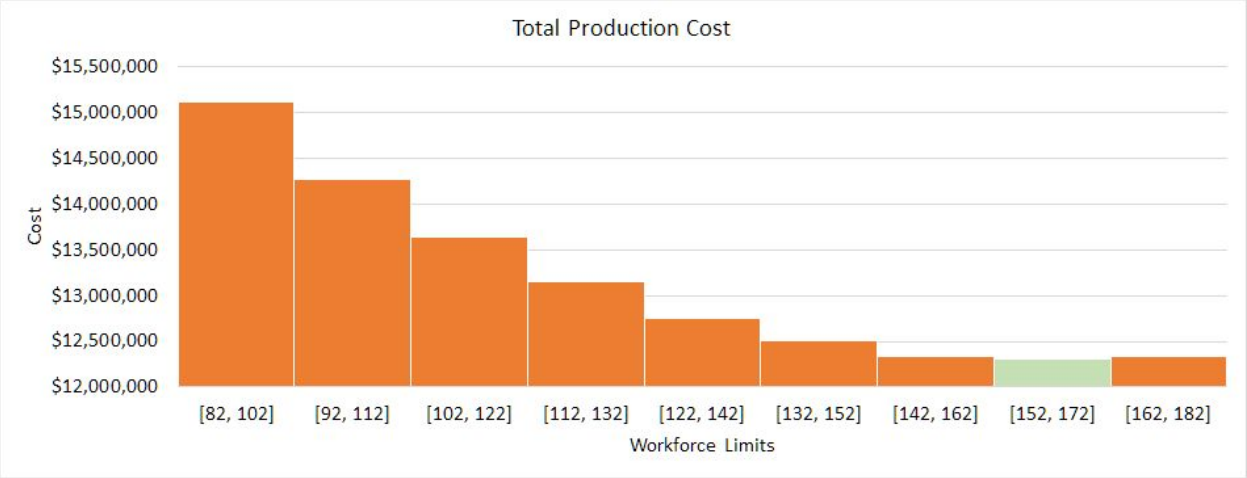

Figure 1: Minimum Cost and Level Workforce

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Figure 2 below shows how L.K. needs to update their workforce levels to meet forecasted sales at the minimal cost given in Figure 1. This level workforce plan was designed to have a range of 20 workers, the same as this year's workforce range.

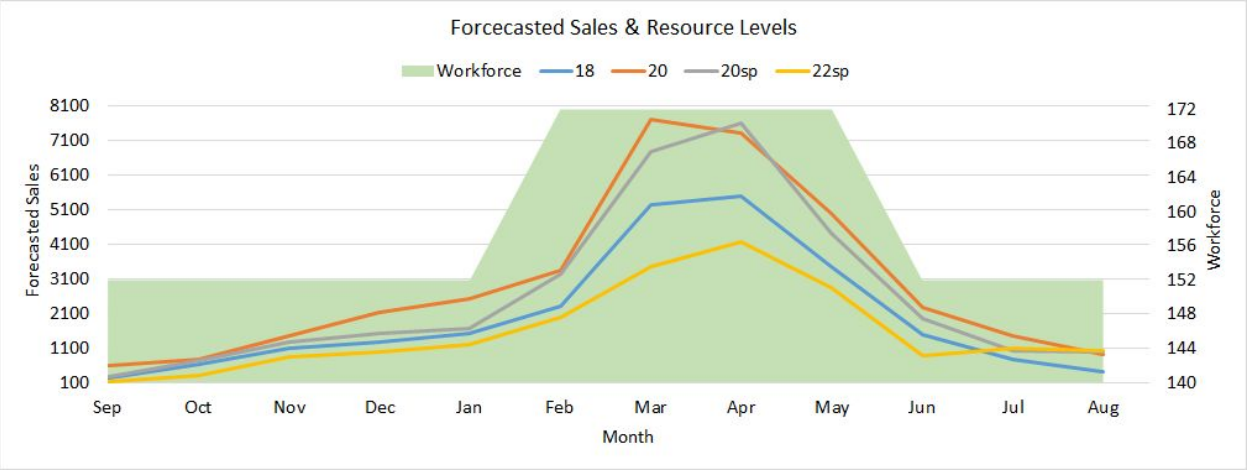

Figure 2: Resource Allocation

Figure 3 below shows the quantity of each product that must be made in regular time (RT), over time (OT), as well as their inventory levels for the upcoming fiscal year.

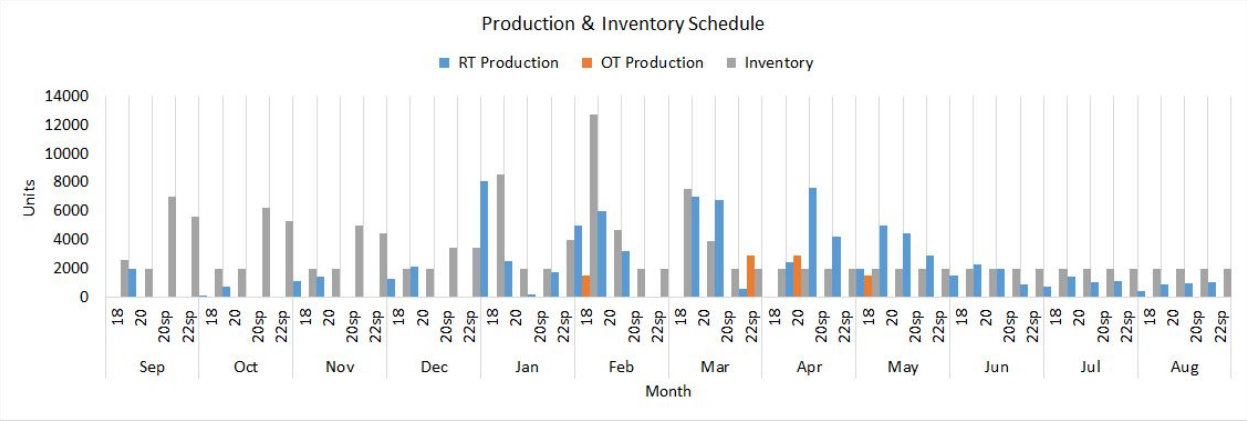

Figure 3: Production Details

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Figures 4 and 5 below represent the robustness of this proposed plan with respect to the critical metrics of interest. These metrics are production cost, demand, and holding cost. The ranges in these figures indicate how much production cost, and demand levels can deviate without changing the resource allocation and production details in Figures 2 and 3. The total production cost will increase/decrease but the schedule remains the same. The holding cost is allowed to be any value for most months for all products, except January through March. If the holding cost was to be different than our expected value of $32.01 per unit during January through March then this production schedule would have to be changed.

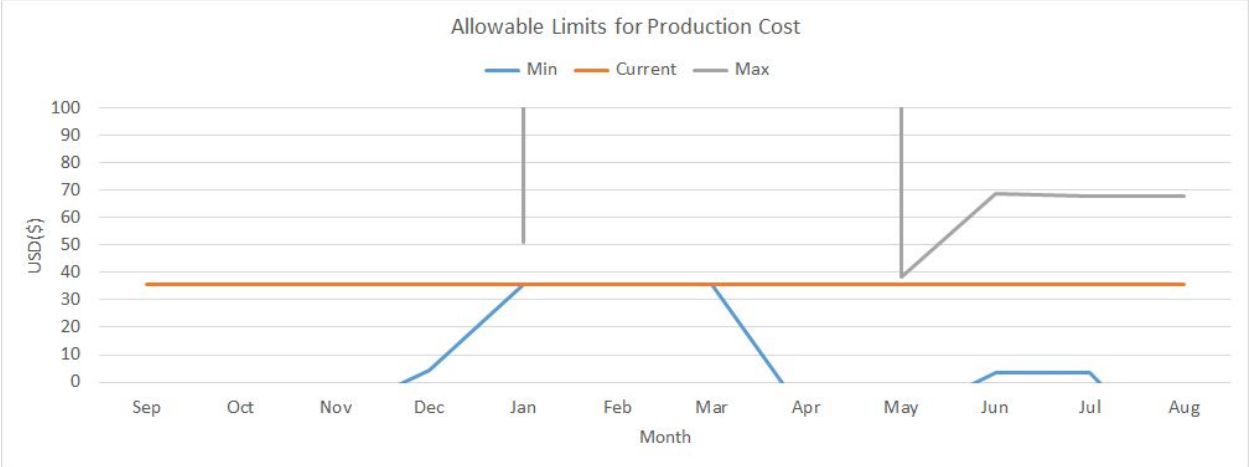

Figure 4: Production Cost Range

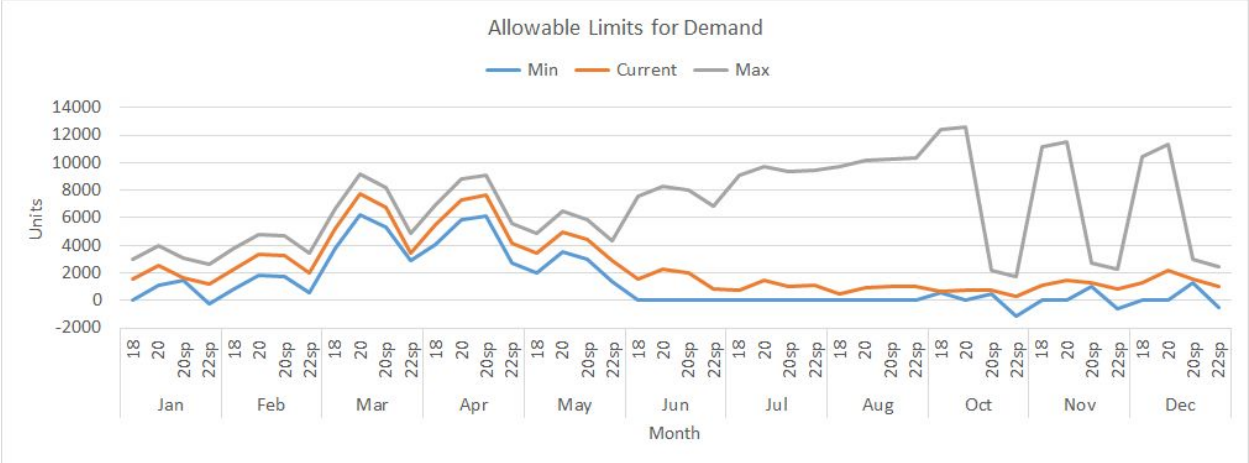

Figure 5: Demand Range

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There are two important changes that we suggest to bring down the production costs. These are the production worker range, and the minimum safety stock level. As seen in Figure 1, as we increase the worker range, there is a significant reduction seen in the production cost. We suggest an optimal range of 152 to 172 production employees to have the minimum cost possible. We also see that having a safety stock of 2000 units is over cautious given that the forecast for the past 2 years has had a maximum error of 2.2%. Thus, we suggest safety stock levels shown below in Table 2, which are 2.2% of the forecasted total sales per product, to further reduce the total production cost by nearly two million dollars shown in Table 1.

Table 1: Reducing Total Production Cost

	2000 Unit Safety Stock	2.2% Saftey Stock
Total Production Cost	$ 12,306,270.71	$ 10,421,808.18

Table 2: Proposed Safety Stock

2.2% Safety Stock	
18	518
20	767
20sp	680
22sp	411

Although we consider our plan to be quite robust, there may be room for changes. This is due to the fact that the assumptions made (discussed in Appendix) may be inconsistent with the production practices. Also, as the data obtained has some ambiguity due to averaging, we may have a different plan if more specific and detailed information is obtained from the accounting department regarding the data for the model. However, given the data we consider this to be the optimal plan that LK should have for next year's production.

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Appendix:

The Data:

The given cost of capital, direct cost of storage, and obsolescence percentages were assumed to be annualized, therefore they were converted to monthly percentages for modeling purposes.

Table 3: Justification for Model Coefficients

Coefficient	Value	Unit of Measure	Justification
Production Cost	35.5	$/Unit	Average COSG / This years total production
Demand	See Figure 2		This years sales * expected increase from forecast
Holding Cost	32.01	$/Unit	SUM(Capital%, Direct%,Obsolescence%)*Average Material Cost + Direct Labor Cost
Regular Time Cost	1828.49	$/Employee/Month	Regular Time Labor Cost * Regular Time Productivity
Over Time Cost	561.68	$/Employee/Month	Over Time Labor Cost * Over Time Productivity
Hiring Cost	800	$/Employee	Given
Firing Cost	1500	$/Employee	Given
Regular Time Productivity	1/83	Unit/Employee/Month	Given
Over Time Productivity	1/17	Unit/Employee/Month	Given
Employee Range	See Figure 1		Iterative testing
Safety Stock	See Table 2		Assuming an error of 2.2% on the forecasted sales (same as last years error)

Assumptions:

- Regular time is Monday through Friday.
- Over time is Saturday.
- The given percentages were annual, so we converted them to monthly.
- The monthly percentages are used on the given average material cost to determine holding cost.
    - Material handling cost per unit is given and then added to the holding cost.
- Product cost per unit is based on this years COSG and total production.
- The monthly demand for next year is a multiple of this years monthly sales, where the multiple comes from the expected total increase in the forecasted sales.
- The workforce ranges were tested iteratively, perhaps a different range of 20 workers would achieve a slightly lower total production cost.