**Excel Result**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Objective Function:** | |  |  | | **P-10** | | **P-20** | | |  | |
|  | |  | **Selling Price/Unit** | | **$786.00** | | **$781.00** | | |  | |
|  | |  | **Costs:** | |  | |  | | |  | |
| **Fabrication Cost/Hour** | | **$49.00** | **Fabrication** | | **$196.00** | | **$245.00** | | |  | |
| **Assembly Cost/Hour** | | **$51.00** | **Assembly** | | **$153.00** | | **$127.50** | | |  | |
|  | |  | **Material & Plating** | | **$131.00** | | **$127.00** | | |  | |
|  | |  | **Total Cost/Unit** | | **$480.00** | | **$499.50** | | |  | |
|  | |  | **Profit/Unit** | | **$306.00** | | **$281.50** | | |  | |
|  | |  |  | |  | |  | | |  | |
|  | |  | **Quantity Produced** | | **2000** | | **400** | | | **Total** | |
|  | |  | **Profit By Product** | | **$612,000.00** | | **$112,600.00** | | | **$724,600.00** | |
| **Constraints:** | |  |  | |  | |  | | |  | |
| **Labor/Unit** | | **P-10** | **P-20** | | **Used** | | **Available** | | |  | |
| **Fabrication Hours** | | **4** | **5** | | **10,000** | | **10,000** | | |  | |
| **Assembly Hours** | | **3** | **2.5** | | **7,000** | | **7,000** | | |  | |
|  |  | | | **Sensitivity Report** | |  | |  |  | |  | |  |
| Variable Cells |  | | |  | | **Final** | | **Reduced** | **Objective** | | **Allowable** | | **Allowable** |
|  | **Cell** | | | **Name** | | **Value** | | **Cost** | **Coefficient** | | **Increase** | | **Decrease** |
|  | $D$16 | | | Quantity Produced P-10 | | 2,000 | | 0 | 306 | | 31.8 | | 80.8 |
|  | $E$16 | | | Quantity Produced P-20 | | 400 | | 0 | 281.5 | | 101 | | 26.5 |
|  |  | | |  | |  | |  |  | |  | |  |
| Constraints |  | | |  | | **Final** | | **Shadow** | **Constraint** | | **Allowable** | | **Allowable** |
|  | **Cell** | | | **Name** | | **Value** | | **Price** | **R.H. Side** | | **Increase** | | **Decrease** |
|  | $D$20 | | | Fabrication Used | | 10,000 | | 15.9 | 10000 | | 4000 | | 666.66 |
|  | $D$21 | | | Assembly Used | | 7,000 | | 80.8 | 7000 | | 500 | | 2000 |

**Precision Auto Clone Consulting Report**

**Section 1: Production Scheduling**

A powerful and versatile technique called Linear Programming was utilized to determine that the profit maximizing production schedule for June is 2,000 units of P-10 and 400 units of P-20 which yields a profit of $724,600. This production schedule uses up all the available hours in both the Fabrication and the Assembly Work Centers. Linear programming is a mathematical technique that is used to find the optimal (maximum or minimum) alternative while remaining within a set of constraints. This application of Linear Programming at Precision Auto Clone is referred to as a “product mix problem”. In a product mix problem, the objective is to find the amount of each product to produce in some period that will achieve the highest profit while staying within the firm’s capacities for that period. The production alternatives in June are limited because there are only 10,000 hours of Fabrication time and 7,000 hours of Assembly time available. The product mix problem assumes that the revenues and costs of each product are known and constant in the period. The product mix problem also requires that the usage and cost of material and labor for each product are known and constant in the period. For a one month period, these assumptions seem reasonable.

Linear programming also determined that the marginal values of Fabrication and Assembly time are $15.90 and $80.80 per hour respectively. This means that each additional hour of Assembly time procured at its current cost ($51 per hour for regular time) would generate an additional profit of $80.80. Since the company is paying a 50% premium for overtime, the company would be paying $25.50 (half of $51) to get a benefit of $80.80. So each hour of overtime worked in the Assembly work center will generate $55.30 ($80.80 – $25.50) additional profit. This certainly makes economic sense. Precision Auto Clone should try to schedule up to but not more than 500 hours of Assembly time in June. It is not economically advisable to schedule Fabrication overtime because the overtime premium of 50% on $49 ($24.50 per hour) is greater than the marginal value of $15.90 per hour.

Lastly, the linear programming results indicate that optimal production schedule of 2,000 units of P-10 and 400 units of P-20 is unlikely to change due to increases or decreases in product revenues and/or costs in one month. As long as the profitability of P-10’s does not increase by more than $31.80 nor decrease by more than $80.80, the optimal production schedule remain unchanged. Similarly, as long as the profitability of P-20’s does not increase by more than $101 nor decrease by more than $26.50, the optimal production amounts remain unchanged.