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ENGR 560

04/29/2019

OH SHAY LA LA CO.  
Optimization Project

Oh Shay La La Optimization Problem

Currently, its Summer 2019 and the temperatures are very high this year. A well-established women’s clothing store, named Oh Shay La La Co., wants to maximize their daily revenue. Oh Shay La La Co. executives understand that there is seasonal clothing demand and constraints regarding machine usage times that may alter their production quantities. Oh Shay La La Co.’s financial department reaches out to their Sr. Lead Engineer, to find a way to create maximum revenue with the current demand and constraints.

Oh Shay La La Co. sells a variety of items such as Capris, Crop-Tops, Jackets, Jeans, Shorts, Skirts, Sweaters, Sweatshirts, T-Shirts (Long Sleeve), and T-Shirts (Short Sleeve) using the Bleaching Machine, the Carding Machine, the Dyeing Machine, the Scutching Machine, the Spinning Machine, the Thread Winding Machine, the Woolen Mill Machine, the Yarn Gassing Machine, and the Monogramming Machine. The maximum machining times available per day on using the Bleaching Machine, the Carding Machine, the Dyeing Machine, the Scutching Machine, the Spinning Machine, the Thread Winding Machine, the Woolen Mill Machine, the Yarn Gassing Machine, and the Monogramming Machine are respectively, 18,750; 2,000; 21,250; 16,000; 1,400; 15,000;1,423; 1,900; and 9,000 minutes.

In the summer time, the demand for summer clothing is much higher than the Spring, Fall, and Winter clothing. The group items that are in the highest demand are the Summer and Spring tops which include the following (listed in descending demand): Crop-Tops and T-shirts(Short Sleeve). The group of items with the 2nd highest demand are the Summer and Spring bottoms which include the following(listed in descending demand): Shorts, Skirts, and Capris. The group of items that have least demand are the Fall and Winter tops and bottoms which include the following (listed in descending demand): Jackets, Jeans, Sweaters, Sweatshirts, T-Shirts (Long Sleeve).

All clothing items use the Bleaching Machine, the Dyeing Machine, the Scutching Machine, the Thread Winding Machine. The Carding Machine, the Spinning Machine, the Woolen Mill Machine, and the Yarn Machine are used for producing items made from yarn and wool; items that use these machines are Jackets and Sweaters. The Monogramming machine is used to produce monogrammed fabric; the only items that require monogramming are the tops(Crop Tops, Jacket, Sweaters, Sweatshirts, T-Shirt(Long Sleeve), T-Shirt(Shirt Sleeve)). The Carding Machine, the Spinning Machine, the Woolen Mill Machine, the Yarn Machine, and the Monogramming machine have significantly less machining usage hours than the other machines due to cost.

Oh Shay La La Co.’s financial department provides the Sr. Lead Engineer with the time need to produce each item with each machine, the profit per unit, and the daily minimum and maximum amount of each item to be produced; this information is given by the table and equations on the next two page:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Items | Bleaching Machine (Time Req. (Minutes)) | Carding  Machine   (Time Req. (Minutes)) | Dyeing Machine (Time Req. (Minutes)) | Scutching Machine  (Time Req. (Minutes)) | Spinning Machine  (Time Req. (Minutes)) | Thread Winding Machine  (Time Req. (Minutes)) | Woolen Mill Machine (Time Req. (Minutes)) | Yarn Gassing Machine  (Time Req. (Minutes)) | Monogramming Machine  (Time Req. (Minutes)) | Profit per Unit  (dollars) |
| Capris | 15 | 0 | 20 | 5 | 0 | 7 | 0 | 0 | 0 | 55 |
| Crop-Tops | 5 | 0 | 30 | 5 | 0 | 11 | 0 | 0 | 20 | 125 |
| Jackets | 11 | 20 | 45 | 15 | 15 | 20 | 10 | 20 | 40 | 30 |
| Jeans | 16 | 0 | 40 | 32 | 0 | 13 | 0 | 0 | 0 | 45 |
| Shorts | 10 | 0 | 15 | 2 | 0 | 5 | 0 | 0 | 0 | 65 |
| Skirts | 10 | 0 | 16 | 3 | 0 | 4 | 0 | 0 | 0 | 60 |
| Sweaters | 12 | 40 | 46 | 20 | 35 | 22 | 30 | 30 | 35 | 20 |
| Sweatshirts | 8 | 00 | 40 | 10 | 0 | 20 | 0 | 0 | 40 | 23 |
| T-Shirts (Long Sleeve) | 7 | 0 | 37 | 8 | 0 | 14 | 0 | 0 | 20 | 50 |
| T-Shirts (Short Sleeve) | 6 | 0 | 35 | 6 | 0 | 12 | 0 | 0 | 20 | 100 |

Oh Shay La La Optimization Problem(Cont.)

Objective Function:

(1) Minimize:

Subject to:

Solution Explanation:

The Sr. Lead Engineer uses the given information and finds create maximum revenue with the current demand and constraints. The optimization problem asked for amount of each item(Capris, Crop-Tops, Jackets, Jeans, Shorts, Skirts, Sweaters, Sweatshirts, T-Shirts (Long Sleeve), and T-Shirts (Short Sleeve)) that would maximize daily profit. After considering all of the machines usage times and items constraints and the objective function (1), MATLAB determined that the amount of Capris, Crop-Tops, Jackets, Jeans, Shorts, Skirts, Sweaters, Sweatshirts, T-Shirts (Long Sleeve), and T-Shirts (Short Sleeve) that need to be produced daily would be respectively , The object function (1) will yield $63,381 after inputting . The results of the MATLAB program shows that Crop-Tops, T-Shirts (Short Sleeve), Shorts, Skirts, and Capris should be produced more than the other items; the results align with the summer consumer demand. Thanks to Oh Shay La La Co.’s Sr. Lead Engineer, the company is able to maximize its daily revenue.