A Development of a Simulation Tool for Production Planning with Capacity-Booking at Specialty Store Retailer of Private Label Apparel Firms

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Abstract : In this paper, we suggest a simulation tool to make a decision of monthly production planning for maximizing a profit of Specialty store retailer of Private label Apparel (SPA) firms. Most of SPA firms are fabless and make outsourcing deals for productions with factories of their subcontractors. Every month, SPA firms make a booking for production lines and manpower in the factories. The booking is conducted a few months in advance based on a demand prediction and a monthly production planning at that time. However, the demand prediction is updated month by month, and the monthly production planning would change to meet the latest demand prediction. Then, SPA firms have to change the capacities initially booked within a certain range to suit to the monthly production planning. The booking system is called "capacity-booking". These days, though it is an issue for SPA firms to make precise monthly production planning, many firms are still conducting the production planning by empirical rules. In addition, it is also a challenge for SPA firms to match their products and factories with considering their demand predictabilities and regulation abilities. In this paper, we suggest a model for considering these two issues. An objective is to maximize a total profit of certain periods, which is sales minus costs of production, inventory, and capacity-booking penalty. To make a better monthly production planning at SPA firms, these points should be considered: demand predictabilities by random trends, previous and next month's production planning of the target month, and regulation abilities of the capacity-booking. To decide matching products and factories for outsourcing, it is important to consider seasonality, volume, and predictability of each product, production possibility, size, and regulation ability of each factory. SPA firms have to consider these constructions and decide orders with several factories per one product. We modeled these issues as a linear programming. To validate the model, an example of several computational experiments with a SPA firm is presented. We suppose four typical product groups: basic, seasonal (Spring / Summer), seasonal (Fall / Winter), and spot product. As a result of the experiments, a monthly production planning was provided. In the planning, demand predictabilities from random trend are reduced by producing products which are different product types. Moreover, priorities to produce are given to high-margin products. In conclusion, we developed a simulation tool to make a decision of monthly production planning which is useful when the production planning is set every month. We considered the features of capacity-booking, and matching of products and factories which have different features and conditions.

Keywords : capacity-booking, SPA, monthly production planning, linear programming