DEVELOPMENT AND POSSIBILITIES OF DEMAND FORECASTING OF THE BEVERAGE CANS REFLECTING THE CONSUMPTION OF SELECTED BEVERAGE CANS FROM THE MANUFACTURER'S POINT OF VIEW

[1]Peter KAČMÁRY, [2]Adrián DAŇKO

[1]Technical University of Košice, Faculty BERG, Institute of Logistics, Košice, Slovakia, EU, peter.kacmary@tuke.sk

[2]Garrett Motion Slovakia s.r.o, Záborské, Slovakia, EU, adrian.danko@gmail.com

Abstract

This paper shows the evolution of the demand for beverage cans, which reflects real sales of beverages in the Eastern European region. The aim of the paper is to select appropriate forecasting methods for this type of production and consumption. The basic problem arises from the procurement of materials for the production of beverage cans and the planning of shipments. The introductory part is devoted to the description of the issue from the perspective of the manufacturer of beverage cans, methods of forecasting and sales analysis. Based on time series analysis, the methods used for seasonal consumption estimation were used: Holt-Winters method, Seasonal indexes and SARIMA. The results were used as input for planning in the PUSH system, in the company that produces beverage cans. Thus, on the basis of the monthly forecast results, transport and production capacities and material inputs for customer orders are secured.

Keywords: Forecast, planning, beverages, beverage cans, batch

1.   INTRODUCTION

Forecasting is integral part of decision-making activities at the level of an enterprise management. Management sets goals and objectives, tries to predict the evolution of external factors, then selects actions and activities that, it hopes, will result in achieving the determined aims. The need for forecasting is increasing as a management tries to reduce its dependence on circumstances and becomes more scientific when it exists in a certain environment. Since each enterprise area is related to all others, a good or bad forecast can affect the entire enterprise [1,2]. Areas, where forecasting plays a key role, are:

1)   Planning: Efficient use of resources requires planning of production, transportation, purchasing, personnel, etc. Forecasts at the level of demand for product, material, labour, financing or other services are the basic input into planning [3].

2)   Acquisition of resources: From the moment of need to the acquisition of raw materials, the hiring of personnel or the purchase of machinery and equipment, it can range from a few days to several months. The task of forecasting is to determine these requirements well in advance of the actual need.

3)   Setting stock requirements: all organizations need to determine what resources they want to have at disposal in the long term. Such decisions are dependent on market opportunities, environmental factors, and on their own financial, personnel, manufacturing and technological resources. All this requires accurate forecasts and managers who will be able to interpret forecasts and make appropriate decisions [4-6].

Of course, there are many other areas that require forecasting, but the previous three categories of areas are typical of short, medium and long-term forecasting requirements in today's enterprises [7]. This range of needs requires often various unique approaches to forecasting in uncertain events and ultimately its own forecasting system. Therefore, enterprise management requires to have the knowledge and skills in at least the following four areas [7]:

- Identification and defining the problem of forecasting;

- Procedures setting for selecting the appropriate method for a specific situation;

- Application of a range of forecasting methods for a specific situations;

- Organizational support for the application and use of formalized forecasting methods.

The forecasting system of an enterprise must have links between the forecasts of individual management areas. These links cannot be ignored, if the forecast is to be successful, because there is a high degree of dependence among the forecasts of different divisions or departments [8]. For example, forecast errors in forecasted sales can trigger a variety of responses that affect production plans, budget forecasts, inventory levels, price, etc. This will in turn affect the level of sales, operating costs and cash flows [9-11].

This paper analyzes the market situation from the point of view of cans beverage produces. The aim of the paper is to outline the development of demand using forecasting methods in order to optimize planning in the company CB Slovakia s.r.o. Practical experience suggests that sales fluctuate in seasonal rhythm and this causes problems in purchasing of materials for production and transportation planning as they force the manufacturer into regular batches. For this reason, CB Slovakia s.r.o. cooperated in the analysis, evaluation and preparation of the forecast for the development of demand for the following period(s).

In the logistics department at CB Slovakia s.r.o., there was no clear seasonality or cyclicality of orders from customers known for which the company produces beverage cans. This means that the logistics department did not have sufficient information on demand fluctuations, and so the department was unable to respond in time and prepare production capacities for periods of higher demand, when orders were not fulfilled and vice versa, too large stocks were created in periods of low demand for products. CB Slovakia exports its products mainly to customers in Central and Eastern Europe and the United Kingdom. The shares of individual customer orders can be seen in **Figure 1** [12].
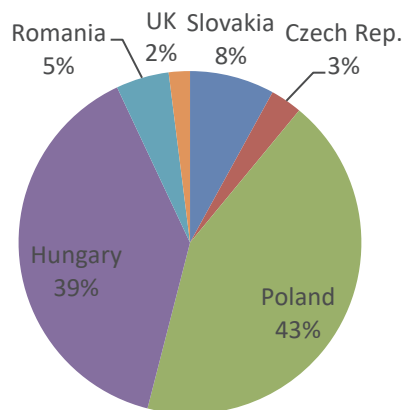
Percentage of exports of orders to EU countries

Figure 1 The percentage ratio of all orders throughtout the EU countries [12]

2. DATA INPUTS

The company CB Slovakia provided its monthly customer sales for 2016 and 2017 for forecasting of orders to optimize planning in the PUSH system. The amount of orders is shown in the number of exports by trucks. Depending on the volume of the can (500 ml, 330 ml, 250 ml), one truck represents approximately 240,000 beverage cans.

After the data were processed, the individual orders were classified into the following sections:

- **According to the assortment:** individual customers of the company were redistributed based on the assortment of beverages: beer, soft drinks and energy drinks. Beer is bottled into 500 ml cans, soft drinks are bottled into 330 ml cans, and energy drinks are bottled into 250 ml cans.

- **According to the regions:** individual customers of the company are located in several regions (mentioned above), but only two regions were selected, where the company sends the highest number of trucks to its customers. The **Figure 1** shows the percentage of all company orders for the years 2016 - 2017 to particular EU countries. Most customers and thus the largest share of orders up to 43 % (6778 can trucks) are transported to Poland and slightly less 39 % (6110 can trucks) of the total number of orders are transported to Hungary. The third place is for customers in Slovakia Max Drinks owns 8 % share of the total number of orders produced in CB Slovakia s.r.o. and next (4th place) with 5 % share belongs to Romania [12].

3.   FORECASTS

Based on the data selection above, there will be analyzed the data and selected the appropriate forecasting method and then consequently calculated the monthly forecast for 2018 in this chapter.

3.1.   Future orders forecast according to assortment

The customer sales during years 2016 and 2017 are presented in the number of exported trucks, in **Figure 2**. In breweries, the demand for cans starts to rise slowly in February and from the arrival of spring until the end of summer, customers order cans in the largest quantities compared to other months of the year [12].
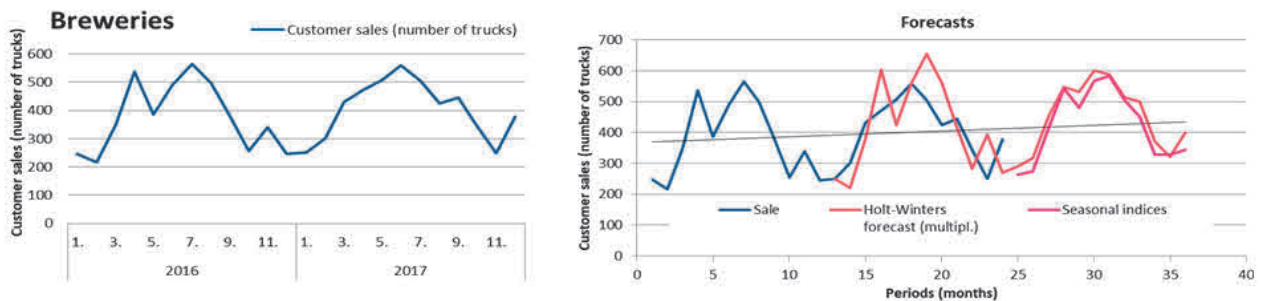

Figure 2 Sale and forecast of sale for breweries cans

The second category in the section by assortment includes soft drinks. **Figure 3** shows customer sales during years 2016 - 2017 to customers such as Coca-Cola and Pepsi Cola, these soft drinks are very popular of among the young people. For comparison with breweries, there is not so much visible seasonality.
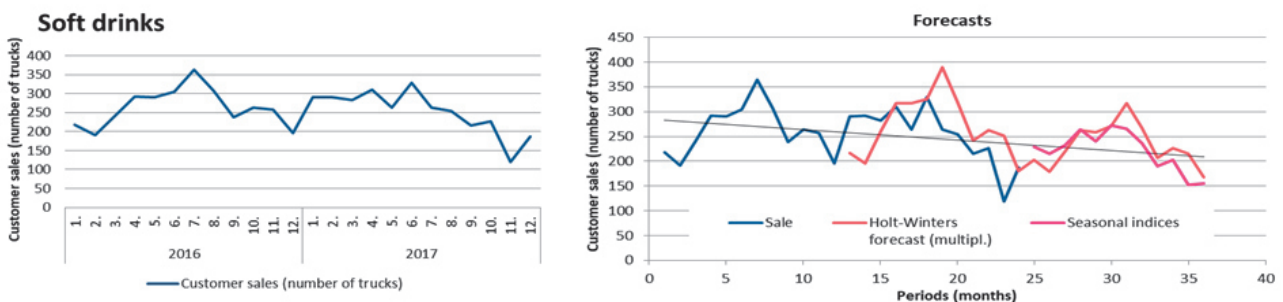

Figure 3 Sale and forecast of sale for Coca-Cola and Pepsi Cola cans

The last category in this section is energy drinks. **Figure 4** shows the sales of cans for energy drinks, interesting is, that there is the same number of trucks sold in July and August in years 2016 - 2017. For energy drinks, the number of trucks is not as high as for beer and soft drinks.
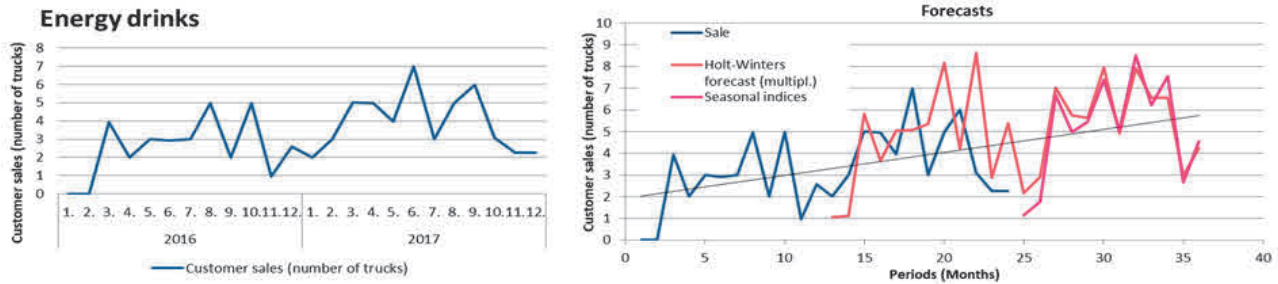

Figure 4 Sale and forecast of sale for energy drinks cans

3.2. Future orders forecast according to regions

The analysis and forecast according to the region is focused on two strongest regions of customer sales. The strongest region for the company is region Poland. There are 9 customers in the region of Poland, with whom the company has signed contracts for the delivery of cans. In 2016 and 2017, the company sold 6,778 beverage cans to this region. In 2016 it was 3456 total number of trucks and in 2017 it was 3322 total number of trucks [10].

Figure 5 graphically shows sales to all customers in Poland within years 2016 and 2017 and there is quite strong seasonal influence, especially during summer months, when the highest demand for cans is recorded.
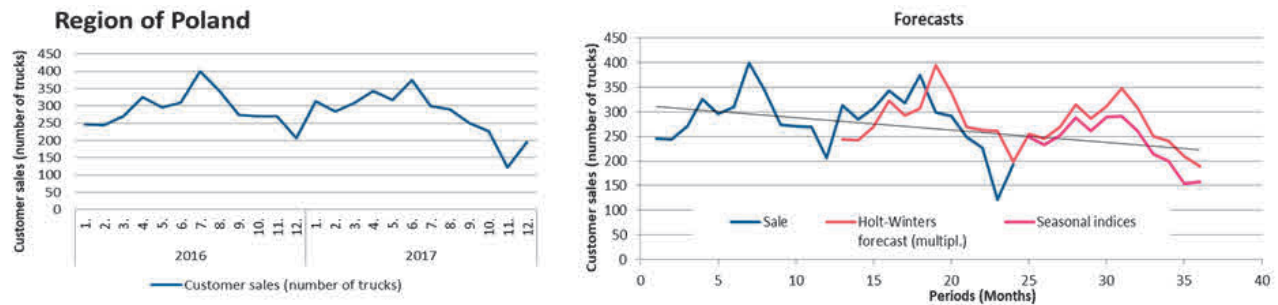

Figure 5 Sale and forecast of sale of cans in Polish region

The second strongest region is Hungarian region. There are 3 customers in the Hungary region who ordered a total of 6,110 beverage cans in 2016 and 2017. In 2017 it was 2981 and in 2016 it was 3129 trucks. The sale is graphically presented in **Figure 6**. There can be seen a sharp increase of sale beginning of year 2015, where in February sold 83 trucks and gradually in April climbed up to 385 trucks. In 2016, the demand for cans also increased significantly, but more smoothly.
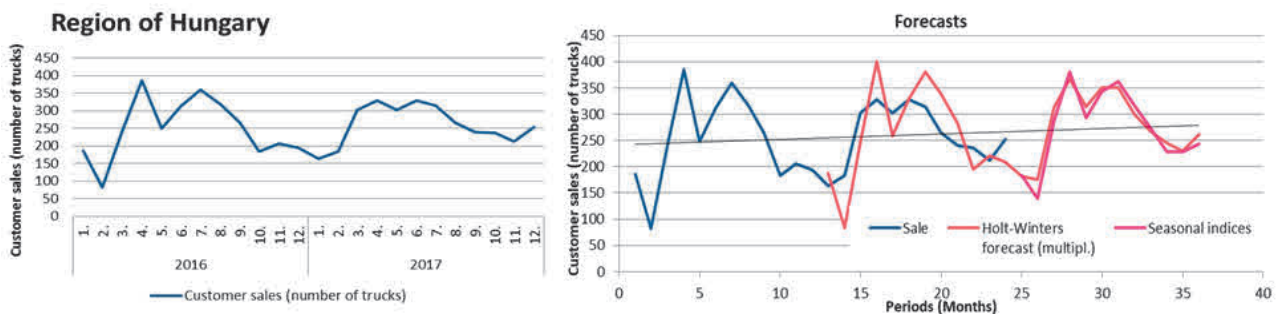

Figure 6 Sale and forecast of sale of cans in Hungarian region

4.   CONCLUSION

The benefit of created forecast is not only in managing input materials and completing orders, but also in managing inventory in the form of final products in stock. When planning is running within PUSH system, then it would be better to start producing small orders, according to the calculated forecast and it would save time associated with multiple re-setting lines during the month (when real orders come). It is recommended to start fulfil high volume orders for particular customers in December, January, February to use enough production capacities, when the company receive orders in relatively lower numbers and volumes compared to other months of the year. In this case, the company would be better prepared for the rapid increase of orders and their volumes. In the case of the production "to stock", in the form of final products, which are delivered to customers with a specific design, (this is the case of described company), it is very important communication with customers about upcoming design changes. Design changes in packaging products in the food industry are very common, when manufacturers try to attract buyers for their goods and prepare various competitions or limited edition packaging e.g. if there are Olympic Games, football or ice hockey championships.

Based on the forecast, each enterprise can better set the supply and storage levels. It can determine the maximum and minimum stock levels as well as the order level. In the case of unexpected situations, requirements can be supplied with the safety stock, which must be always kept in stock, especially for the most important components or products for the most important customers [13].

REFERENCES

[1]   MALINDŽÁK, Dušan. *Production logistics I.* Košice: Štroffek, 1997. p. 167

[2]   MALINDŽÁK, Dušan, PACANA, Andrzej, PAČAIOVÁ, Hana. An effective model for the quality of logistics and improvement of environmental protection in a cement plan. *Przemysl Chemiczny*. 2017. vol. 96, no. 9, pp. 1958-1962.

[3]   VEGSOOVA, Olga, STRAKA, Martin, ROSOVA, Andrea. Protecting and securing an environment affected by industrial activity for future utilization. *Rocznik Ochrona Środowiska*. 2019. vol. 21, no. 1, pp. 98- 111.

[4]   VILAMOVÁ, Š., BESTA, P., KOZEL, R., JANOVSKÁ, K., PIECHA, M., LEVIT, A., STRAKA, M., SANDA, M. Quality quantification model of basic raw materials. *METALURGIJA*. 2016. vol. 55, no. 3, pp. 375-378.

[5]   KAČMÁRY, Peter. *Príspevok k aplikáciám metód prognózovania v logistike podniku: Habilitation thesis*. Košice: TU FBERG Košice, 2018. p. 193.

[6]   ARMSTRONG, J. SCOTT. *Principles of Forecasting: A handbook for researchers and practitioners*. Dordrecht: Kluwer Academic Publishers, 2001. p.849.

[7]   VEGSOOVA, Olga, STRAKA, Martin, SULOVEC, Vladimir. Global Assessment of Industrial Expansion for Minimizing Environmental Impacts Utilizing the Principles of Mining and Logistics. *Rocznik Ochrona Środowiska*. 2019. vol. 21, no. 1, pp. 14-28.

[8]   STRAKA, Martin, MALINDŽÁKOVÁ, Marcela, KHOURI, Samer, ROSOVÁ, Andrea, LENORT, Radim, BESTA, Petr. Application of the mathematical statistics for the evaluation of the waste incineration process. *Ochrona Środowiska: Annual Set The Environment Protection*. 2018. vol. 20, pp. 32-53.

[9]   PETERKA, Pavel, KREŠÁK, Jozef, ŠIMOŇÁK, Jan, BINDZÁR, Peter, KEČKEŠOVÁ, Ivana. Tractive work of the aerial cableway towing haul rope. *Measurement*. 2017. vol. 100, pp. 322-328.

[10]   LAUBERTOVÁ, Martina, MALINDŽÁKOVÁ, Marcela, ROSOVÁ, Andrea, TRPČEVSKÁ, Jarmila. Material flow model of electronic waste sampling and assaying. *Przemysl chemiczny*. 2016. vol. 95, no. 7, pp. 1390-1394.

[11]   STRAKA, Martin, TREBUŇA, Peter, ROSOVÁ, Andrea, MALINDŽÁKOVÁ, Marcela, MAKYSOVA, Helena. Simulation of the process for production of plastics films as a way to increase the competitiveness of the company, *Przemysl Chemiczny*. 2016. vol. 95, no.1, pp. 37-41.

[12]   DAŇKO, Adrián. *Návrh prognózovania budúcich objednávok pre optimalizáciu plánovania v systéme Push v spoločnosti Crown Bevcan Europe & Middle East: Diploma thesis*. Košice: TU FBERG Košice, 2017. p. 56.

[13]   ŠADEROVÁ, Janka , BINDZÁR, Peter. Using a model to approach the process of loading and unloading of mining output at a quarry. *Gospodarka Surowcami Mineralnymi*. 2014. vol. 30, no. 4, pp. 97-112.