REENGINEERING OF FINISHED GOODS WAREHOUSE LOGISTICS AT BEER AND SOFT DRINK INDUSTRY

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Abstract: The aims of this paper are to introduce the reengineering of finished goods warehouse logistics at beer and soft drink industry, arising logistics tasks and solving possibilities of these.

Keywords: finished goods warehouse, prognostic production, reengineering, logistics tasks

Introduction

Characteristics of finished goods warehouse logistics are very important at beer and soft drink industries. Every company has already had a certain type of applied warehouse logistics. However due to the market demands changing the warehouse logistics need to be redesigned in accordance with demands.

Typical material flow connections between producing units and finished goods warehouses at beer and soft drink industry

Figure 1. shows the typical material flows connections between producing factories and finished goods warehouses at beer and soft drink industry.

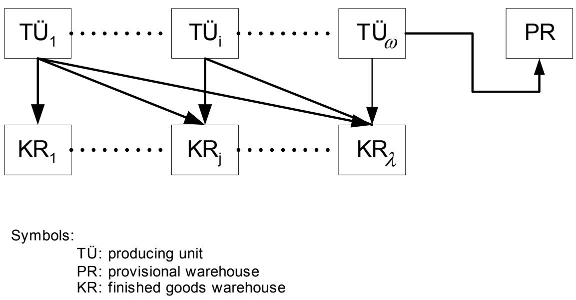

Fig. 1. Typical material flow connections between producing factories and finished goods warehouses at beer and soft drink industry

As we can see in the Figure 1. the finished goods are transported into finished goods warehouses. Provisional warehouse have to be used in case of need. In addition we suppose that the position of producing factories are not changed; the finished goods are storable into any finished goods warehouses nevertheless on behalf of cost reduction we have to endeavour to homogeneity; in case of producing units it is known what kind of products are to expect from the production (e.g. the $TÜ_1$ is producing bottle the TÜi is producing can products).

The conformation of production structure at beer and soft drink industry

This section describes the prognostic production including typical parameters and factors which lead to structure changing.

Prognostic production

In case of determination of prognostic production we start from statistical treatment of historic data of the preceding year which could be performed by products, groups of products in pallet dimension, by pallet type respectively examined by daily, weekly, monthly and yearly periods. [6] The probability of prognostic changes related to previous year will be given at demand of product types and groups after the processing of historic data.
First of all the Φ matrix (1) will be introduced. $\varphi_{\varepsilon\alpha}$ item specifies the change scale of ε^{th} product type related to base amount (ε products cover the foreign ones). If $\varphi_{\varepsilon\alpha}<1$ then the demanded products amount is smaller than previous year, if $\varphi_{\varepsilon\alpha}>1$ then larger. We could define $\Delta\varphi=\varphi_\alpha-\varphi_{\alpha-1}$, step space, between the change scales which doesn't depend on ε product type. It's practical that we define Δφ as a constant.

$$\phi = \begin{array}{c} \\ 1 \\ \vdots \\ \varepsilon \\ \vdots \\ k \end{array} \begin{array}{c} \begin{array}{ccccc} 1 & \dots & \alpha & \dots & d \end{array} \\ \left[\begin{array}{ccc} & & \\ & & \\ & \varphi_{\varepsilon\alpha} & \\ & & \\ & & \end{array} \right] \end{array} \tag{1}$$

We introduce

$$d_0=\max(\alpha_\varepsilon) \tag{2}$$

which gives the scale number of ε product type. Thereafter we could define the P probability matrix (3) on the basis of Φ matrix where $p_{\varepsilon\alpha}$ item gives the probability of α^{th} change scale of ε^{th} product type.

$$P = \begin{array}{c} \\ 1 \\ \vdots \\ \varepsilon \\ \vdots \\ k \end{array} \begin{array}{c} \begin{array}{ccccc} 1 & \dots & \alpha & \dots & d \end{array} \\ \left[\begin{array}{ccc} & & \\ & & \\ & p_{\varepsilon\alpha} & \\ & & \\ & & \end{array} \right] \end{array} \tag{3}$$

Because the P is a probability matrix therefore the following condition (4) has to be fulfilled

$$\sum_{\alpha=1}^{d} p_{\varepsilon\alpha} = 1 \tag{4}$$

If new products would be introduced then they will be forecasted with yearly demanded amount defined in the Q^{B^*} matrix where $q^{B^*}_{\varepsilon^*\alpha}$ item gives the demanded amounts from ε^* product at α^{th} scale (5).

$$Q^{B^*} = \begin{array}{c} \\ 1 \\ \vdots \\ \varepsilon^* \\ \vdots \\ k^* \end{array} \begin{array}{c} \begin{array}{ccccc} 1 & \dots & \alpha & \dots & d \end{array} \\ \begin{bmatrix} & & & & \\ & & & & \\ & & q^{B^*}_{\varepsilon^*\alpha} & & \\ & & & & \\ & & & & \end{bmatrix} \end{array} \tag{5}$$

We suppose at above mentioned cases that the forecasted product changing's will change proportionally in the actual year as previous year. Otherwise the Φ, Q^{B^*} és P matrixes will be 3 dimensions where the different time intervals would give the 3rd dimension.

Structure change of the whole production

As mentioned earlier the product structures related to different periods (daily, monthly, yearly) could be determined and analysed by the help of processing historic production data. Structure change might be caused by a varying demand in the market by introducing a new product or finishing to sell another one. If the rules of environment protection change they can modify the market structure as well.
This latter could be for example the introduction of larger green tax. In this case the production structure has to be redesigned using other packaging mode in such a way that the customer satisfaction won't decrease and it would be profitable for the company.

Yearly production structure change of individual producing unit

We have to define the typical periods at yearly production structure change of individual producing unit by the help of historic data processing. We will be able to know which producing lines are making products; which finished goods warehouses are used; the periods can be settled when finished goods transfer to warehouses; the transported goods amount could be determined from producing units to finished goods warehouses. The total production structure change of beer and soft drink industry has an influence on the yearly production structure change of individual producing unit. Moreover it is true that servicing producing lines should be scheduled for non producing periods because the possible unexpected failures could have had an effect on yearly production structure of individual producing unit.

Product seasonality

In this case we could speak about two important observations. The first relates to the total production structure change of beer and soft drink industry. The periods can be determined when the seasonal effects predominate (summer period; holidays).
On the basis of another observation the production of individual units is above the average value at periods where seasonal effects predominate. [8][9]

The reason of circulation speed change at product groups

There are 3 reasons of circulation speed change. The first reason is that the market demands change. This could be created by seasonality mentioned above. The second reason is the varying (i.e. sometimes increasing, sometimes decreasing capacity demand of warehouses) Finally the third reason is if the production scheduling is out of the tune with market demands.

Actual characteristic value of warehouses

The three most important elements will be introduced which could be used at reengineering of finished goods warehouse logistics at the beer and soft drink industry.

Storage capacity and storage capacity utilization at actual warehouses

We introduce the C_j which gives the storage capacity of j^{th} warehouse (6):

$$C_j = A_j * \varphi_j * \vartheta \quad . \tag{6}$$

In this case A_j means the surface of j^{th} warehouse in m^2, the φ_j means the useful utilization factor of j^{th} warehouse related to 1 m^2 and finally ϑ means the number of pallets to be piled on upon the other ones. This latter value depends on the packaging mode of product and the pallet type that serves as some loading unit creation.
The storage capacity utilization, ν_j, can be calculated by the help of (7) relation, where R_j means the stock of j^{th} warehouse.

$$\nu_j = \frac{R_j}{C_j} \tag{7}$$

Circulation speed by product type

The change of circulation speed can be calculated by the help of following relation (8),

$$f_\varepsilon = \frac{V_\varepsilon}{\overline{R}_\varepsilon} \tag{8}$$

where V_ε means the coefficient of dispersion of stocks related to ε^{th} product type, $\overline{R}_\varepsilon$ gives the expected average value of stocks related to ε^{th} product type.

Capability of loading-in and out at individual warehouses

The following relation has to be fulfilled at capability of loading-in and out at individual warehouses (9)

$$Q_b + Q_k = max! \tag{9}$$

where $Q_k = \frac{1}{T_k}$; $Q_b = \frac{1}{T_b}$ and T means the average duration of loading-in and out. It is as much as saying that loading- in and out strategies should be dimensioned for the maximum capacity.

Structure of logistics tasks at reengineering of finished goods storing

The structure of logistics tasks at reengineering of finished goods storing can be visible at Figure. 2. As we can see there are tree main fields. In case of A) we can see the storage capacity demand where permanent and seasonal impacts can be distinguished. The lack and surplus cases have to be examined at both cases. In case of B) the decreasing circulation speed is checked because this has a direct influence on finished goods storing. This task has to be examined also in cases of permanent and seasonal impacts. Finally at C) case the varying of loading-in and out capacity demand is examined. We have to analyze it in cases of permanent and seasonal impacts regarding increasing and decreasing cases.

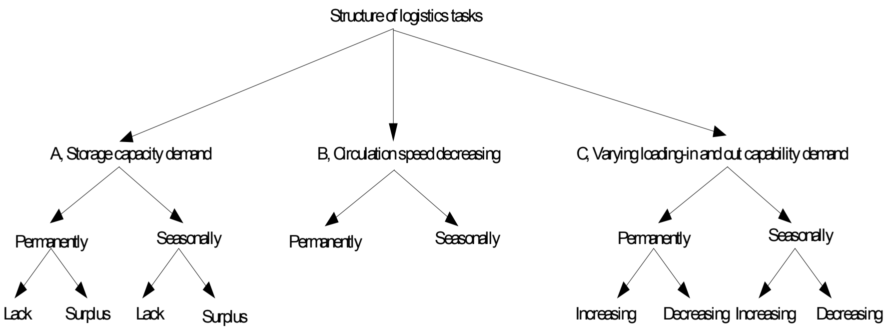

Fig. 2. Structure of logistics tasks at reengineering of finished goods storing

Table1 shows the possible logistic tasks to solve at reengineering when storing of finished goods is in process. The results point to the individual main tasks. In our future research we would like to elaborate mathematical methods and models for some further possible solutions.

Table 1. Logistic tasks to solve at reengineering of finished goods storing

Varying storage capacity demand	Circulation speed decreasing	Varying loading-in and out capability demand
• moving of products between warehouses, • establish or terminate of provisional warehouses, • using or terminate (reducing) of warehouses outside the company, • changing of storage techniques, • terminate of rented storage inside the own warehouse, • computerized storage place recording, increasing possibilities of free goods placement • decreasing of circulation speed of goods	• integrated management of production scheduling and distribution logistics	• changing place and number of warehouse loading-in and out place, • development of computerized management, • changing of goods arrangement inside the warehouse, • intensification of handling equipments, • changing the number of handling equipments

Summary

This paper has presented the reengineering of finished goods warehouse logistics system at beer and soft drink industry. Firstly, the significant material connection between producing unit and finished goods warehouse was demonstrated. After that the examinations and analyses were presented related to prognostic production and actual characteristics value of warehouses.
The essay has revealed different kind of possibilities how we can solve logistics tasks.

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