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PERFORMANCE IMPROVEMENT IN ECONOMY FOR ELECTRIC CURRENT DISTRIBUTION WITH LOGISTIC SYSTEM DEVELOPMENT

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Content

A flow of material and its optimization by development of logistic system will be considered in this paper. A set of activities which will enable design and making decision when planning, management, carrying out and control of material flow (supplu, transport and storing
of material) are shown.
The aim of this work is reducing and minimazing the transport costs as well as reducing of total expenses of distribution, storing, etc.
It is noticed that management of stocks is irrational in Economy societies for distribution of electric current.
The work gives answer to the question: How much material should be ordered, then store and kept so that the work process can be carried out without any delays, but with least expenses?
As an answer an optimization of stock of material was carried out as well as transport and managing system.
The optimal quantities of material on stock were determined and the degree of warehose space exploitation.
The plan for providing material is worked out in that way that total costs are the lowest. A modern logistic system principle of optimization of transport chain which includes allinclusive and simultaneous optimization of all steps of transport chain from a supplier to a warehouse is explained. A concrete column type N9/200daN has been observed.

Key words: logistics, optimization, supply, transport, storage, expenses, irrationality

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1.DETERMINING OF OPTIMAL MATERIAL QUANTITY ON STOCK AND DEGREE OF WAREHOSE SPACE EXPLOITATION

In respect of demands Economy societies for electric current must provide delivery:
- Suitable material
- Material in good technical condition
- Material on the right time
- Material at the right place

According to that the basic task of marketing logistics is providing optimal service of delivering material.
For determination of material quantity there are criteria which depend on business system specific operations.
Maintenance plans are worked out and operations for additional maintenance which should be carried out urgently due to extremly bad working conditions. Thus minimal terms are detremined when certain operations must be completed with building in of necessary material. So that on the basis:

- Of revision
- Maintenance
- Reconstruction
- Check-ups
- Urgent interventions
- Measuring and testing

Planning is carried out and in accordance with it annual, monthly and if needed weekly plans are made.

1.1. Determining of optimal material quantity on stock is realized according to the formula:

$$x_o = \sqrt{\frac{2 \times C_o \times X}{C_1 \times T}}$$

Supply and storage of material expenses are calculated on the basis:

$$\mathbf{F} = \frac{\mathbf{C_o} \times \mathbf{X}}{\mathbf{x_o}} + \frac{\mathbf{C_1} \times \mathbf{T} \times \mathbf{x_o}}{\mathbf{2}}, \text{ where}$$

X = annualy needed quantity (pieces)
Co = expenses of supply of one order (pieces/oredered)
C1 = expenses of storage of one material unit (eur./ pieces day.)
T = time interval (day)
n = number of orders (pieces)

1.2. Determining of warehouse exploitation degree – For calculating the degree of exploitation of indoor warehouse space we apply the formula:

$$\eta_v = \frac{\mathbf{V_m}}{\mathbf{V_s}}, \text{ where}$$

Vm = volume of stored material
Vs = storage volume

2. PLAN OF PROVIDING MATERIAL

Basically speaking transport is a managable process which has its own theory and technique as well as rechnology of management. The main cause of transport inefficiency is the weakness of managing of those processes. When we talk about a transport chain in Economy societies for electric current distribution we think about all inside and outside operations on materials during the transport to the building site.
The transport chain is realized in concrete relations for concrete material.
We are going to observe a concrete column N/200 daN.
Rationalization of transport is an imperative of a modern society. Rationalization does not mean building modern office buildings, supply of modern machines as transport devices, but it means finding most favorable, optimal relations when realizing transport services – that is introducing new technical-technological and organizational methods which for particular achievement reduce minimal losses of man's and drive energy, time, space and material.
Modern logistic principle of optimization of transport chain contains allinclusive and simultaneous optimization of all rings of transport chain from a supplier to a warehouse.
The following advantages are achieved by optimization of transport chains:
- time acceleration of material flow,
- rationalization of transport which is achieved by worj division and by simplification of operations
- reducing the total expenses of material distribution
- better exploitation of transport means capacity and human resources in transport and

- saving in packaging expenses, reducing of transport damages, thefts, losses (realized by application of standardized loading units).

2.1. Plan for providing concrete bearing columns N9/200daN – bearing concrete columns are taken into account as they are hard to be realized with minimal expenses.

Calculation of material is carried out supposing that each organizational unit of a company supplies independently needed quantity of material. The delivery is carried out directly from a supplier to the warehouse of the organization units.

Chart 2.1.1. The unit expenses for each organization part of a company taking into account distance of a supplier from the place of delivery and way of transport

Supplier	Organization unit of company		
	Cacak	G. Milanovac	Guca
„Gramper" Beograd	5	4	8
„Betonjerka", Paracin	6	7	10
„Elektroizgradnja" B.Basta	7	10	5

Chart 2.1.1. Unit expenses per organization parts of a company

Chart 2.1.2. Initial iteration is given obtained by unit method

Supplier	Organization unit of company			Available quantities
	Cacak	G.Milanovac	Guca	
Beograd	**5** 200	**4** 0	**8** 0	200
Paracin	**6** 200	**7** 100	**10** 0	300
B.Basta	**7** 300	**10** 50	**5** 150	500
Needed quantities	700	150	150	1000

Tabela 2.1.2. Initial iteration

Initial transport expenses are:

Tp = 200 x 5+ 200 x 6 + 300 x 7 +100 x 7 + 50 x 10 + 150 x 5 = 6 250 n.j.

By Steping Stone method the optimization of initial iteration is carried out, in the way that changes of transport expenses are calculated first in the following way:

$\mathbf{X}_{12} = 0$, $\mathbf{d}_{12} = C_{12} - C_{11} + C_{21} - C_{22} = 4 - 5 + 6 - 7 = \mathbf{-2}$

$\mathbf{X}_{13} = 0$, $\mathbf{d}_{13} = C_{13} - C_{11} + C_{21} - C_{22} + C_{32} - C_{33} = 8 - 5 + 6 - 7 + 10 - 5 = 7$
$\mathbf{X}_{23} = 0$, $\mathbf{d}_{23} = C_{23} - C_{22} + C_{32} - C_{33} = 10 - 7 + 10 - 5 = 8$

From the calculation it can be seen that a negative value: $\mathbf{d_{12} = -2}$. That is why we increase values x_{12} i x_{21} for 100, and reduces values x_{22} i x_{11} for 100.

U tabeli 2.1.3. Iteration shown 1

Supplier	Organization unit of company			Available quantities
	Cacak	G.Milanovac	Guca	
Beograd	**5** 100	**4** 100	**8** 0	200
Paracin	**6** 300	**7** 0	**10** 0	300
B.Basta	**7** 300	**10** 50	**5** 150	500
Needed quantities	700	150	150	1000

Tabela 2.1.3. Iteration 1

Transport expenses at iteration 1 are:

$\mathbf{T}1 = 100 \times 5 + 300 \times 6 + 300 \times 7 + 100 \times 4 + 50 \times 10 + 150 \times 5 = 6\,050$ n.j.

Changes in transport expenses:

$\mathbf{X}_{13} = 0$, $\mathbf{d}_{13} = C_{13} - C_{12} + C_{32} - C_{33} = 8 - 4 + 10 - 5 = 9$

$\mathbf{X}_{22} = 0$, $\mathbf{d}_{22} = C_{22} - C_{21} + C_{31} - C_{32} = 7 - 6 + 7 - 10 = \mathbf{-2}$

$\mathbf{X}_{23} = 0$, $\mathbf{d}_{23} = C_{23} - C_{21} + C_{31} - C_{33} = 10 - 6 + 7 - 5 = 6$

From the calculation it can be seen that a negative value: $\mathbf{d_{22} = -2}$. That is why we increase values x_{22} i x_{31} for 50, and reduces values x_{22} i x_{31} for 50.

U tabeli 2.1.4. Iteration shown 2 .

Supplier	Organization unit of company			Available quantities
	Cacak	G.Milanovac	Guca	
Beograd	**5** 100	**4** 100	**8** 0	200
Paracin	**6** 250	**7** 50	**10** 0	300
B.Basta	**7** 350	**10** 0	**5** 150	500
Needed quantities	700	150	150	1000

Tabela 2.1.4. Iteration 2

Transport expenses at iteration 2 are:

T2 = 100 x 5 + 250 x 6 + 350 x 7 +100 x 4 + 50 x 7 + 150 x 5 = 5 950 n.j.

Changes in transport expenses:

$\mathbf{X}_{13} = 0$, $\mathbf{d}_{13} = C_{13} - C_{11} + C_{31} - C_{33} = 8 - 5 + 7 - 5 = 5$
$\mathbf{X}_{23} = 0$, $\mathbf{d}_{23} = C_{23} - C_{21} + C_{31} - C_{33} = 10 - 6 + 7 - 5 = 6$
$\mathbf{X}_{32} = 0$, $\mathbf{d}_{32} = C_{32} - C_{22} + C_{21} - C_{31} = 10 - 7 + 6 - 7 = 2$

Now all iterations are positive which means that iteration 2 is optimal solution. From obtained values (not one d is not = 0) which means that there is no more optimal iterations.
Minimal (optimal) expenses of transport are:

T2 = Topt = 5 950 n.j.

only when the delivery from the supplier is carried out in the following way:

1) Warehouse in Cacak total of 700 columns
- from a supplier ,,Beograd" delivery of 100 pieces,
- from a supplier ,, Paracin" delivery of 250 pieces i
- from a supplier ,, B.Basta" delivery of 350 pieces,

2) Warehouse in G.Milanovac total of 150 columns

- from a supplier ,,Beograd" delivery of 100 pieces i
- from a supplier ,, Paracin" delivery of 50 pieces

3) Warehouse in Guca total of 150 columns

- from a supplier ,, B.Basta" delivery of 150 pieces,

3. CONCLUSION

Investigations are going in the directions to integrate functions of transporting and storing of optimal quantity of material in order to improve efficiency of business with minimal expenses. It is necessary to make a team of people, who would take care of improvement of performances by developing of logistic systems to determine for models of optimization,

- optimal quantity of material on stock and degree of storage space exploitation
- make a plan of providing material in such a way that total costs are the lowest.

4. Literature

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