INVENTORY OPTIMIZATION IN THE AUTOMOTIVE INDUSTRY

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Abstract: The "Inventory optimization in the automotive industry", theme wants to prove that an efficient inventory management is a strategic segment that is not limited to individual actions and does not refer to a single level of management. Demand forecasting, storage policies and replenishment activities are the basic techniques for stock optimization. Every aspect is crucial to ensure that the right stock is in the right places at the right time for all the companies.

***KEY WORDS**: stock, automotive, optimization, distance from suppliers, automatic synchronization, management, flow, efficient ordering, stock tracking*

Introduction

The main objective is to implement a new method of synchronous supply of workstations in order to reduce buffer stocks and therefore manufacturing costs.

The project itself consisted of continuous process improvement and took place in several stages within a well-defined timeframe.

To achieve this objective, the following steps were taken:

- ✓ assessment of the current way of supplying parts;
- ✓ understanding how the labelling, ground storage, manufacturing sequence reconstruction and trolley loading process works;
- ✓ management and tracking of indicators: cycle time, part change time, total of diversities, productivity, etc.;
- ✓ defining the maximum number of days of existing stock

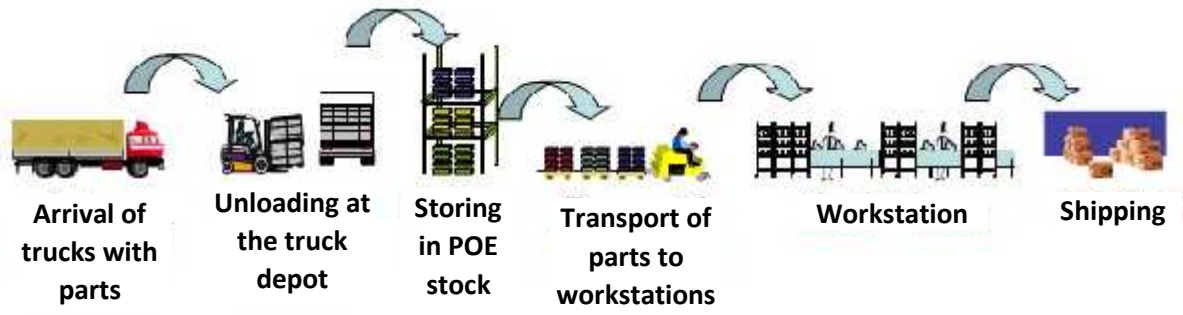

Fig.1.1 General flow of materials

The Logistics Service ensures all tasks related to the supply of parts at the head of the line in sufficient quantity.

The workshop covers all the internal activities of the assembly process, i.e., all the activities that add value to the product. The transfer of parts within the line is the responsibility of manufacturing.

* POE-parts of external origin.

2. The actual stage

This study describes the detailed functioning of the supply, storage and distribution process in the workstations for the seating collections.

Throughout the entire process, the vehicle assembly line is supplied in optimum time. The process contains several operations as shown in the layout diagram, these being:

1. the scanning operation
2. the labelling operation
3. the intermediate storage operation
4. the loading onto rolling bases operation.

In the scanning operation, the logistics operator checks all the parts that have newly entered the flow and, using a special gun, reads the bar codes on each individual package.

In the labelling operation, the same logistics operator prints and affixes the factory labels for the previously scanned parts. This operation is carried out in the same cell performed by one operator.

In the intermediate storage operation, the parts are stored according to the manufacturing sequence in order to send the appropriate parts for assembly to the assembly line.

Another logistics operator, with the help of a forklift, picks up the parts from the storage area and places them in the vicinity of the loading line on a rolling base for transport to the workstation.

Fig.2.1 Packaging with label

Another logistics operator, with the help of a forklift, picks up the parts from the storage area and places them in the vicinity of the loading line on a rolling base for transport to the workstation.

The packages must be arranged in a line so that operators can load them ergonomically and have a clear view of the labels.

During the loading operation onto the rolling bases, the parts are taken from the supplier's packaging and placed according to the manufacturing sequence and therefore to the customer's order on special trolleys for outdoor transportation to the workstation in another building (figure 3.5).

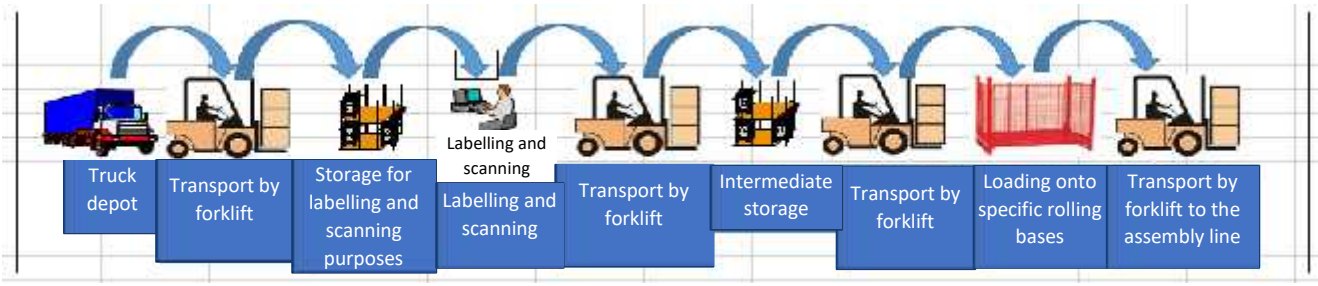

Fig.2.2 Flow chart for seat collections, initial situation

3. Improved method

The trucks dedicated to this flow are an integral part of the plant's fleet of vehicles, they will depart from the parking lot, to the M.O. from where they will pick up a maximum of 16 rear seats, then from the J.C. 24 collections of seats will be loaded, then the driver will transport the loaded packages to the customer plant.

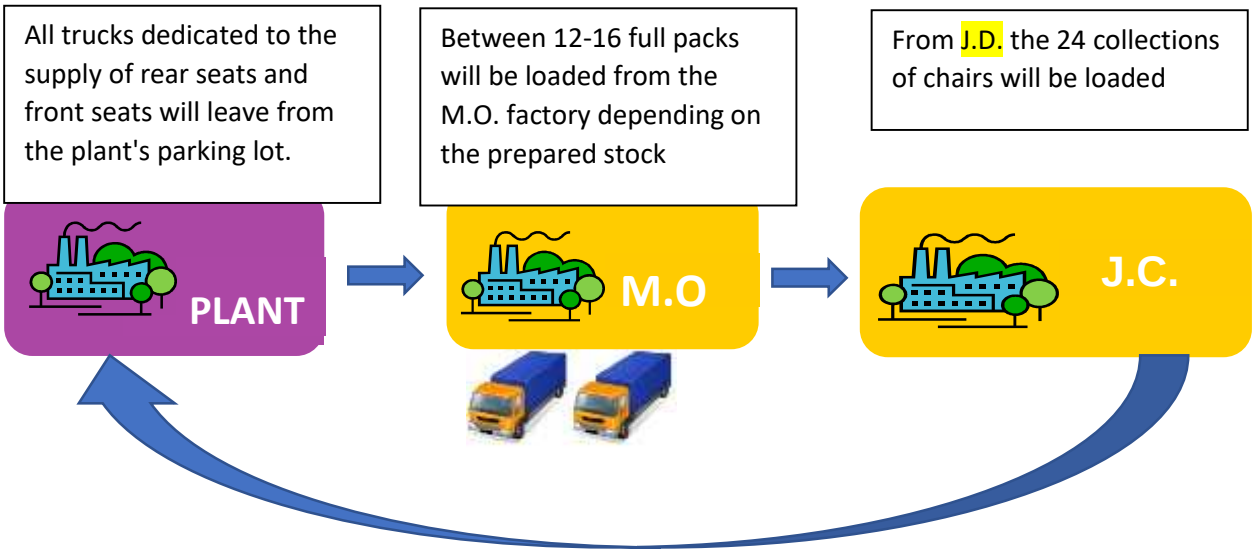

Fig. 3.1 Proposed flow

Therefore, in order to respect the production sequence and therefore the customer orders, the supplier J.C. must load the truck starting with the pile, noted in Fig.5.2 with the serial numbers 24/23; 22/21; 20/19 so that the last pile loaded is the one noted with 06/05; 04/03 and 02/01.

Once arrived at the truck depot in the plant, the unloading of the truck will start from pile 24/23; 22/21; 20/19 which will be stored in the area dedicated to the unloading of trucks, the area will be marked on the ground.

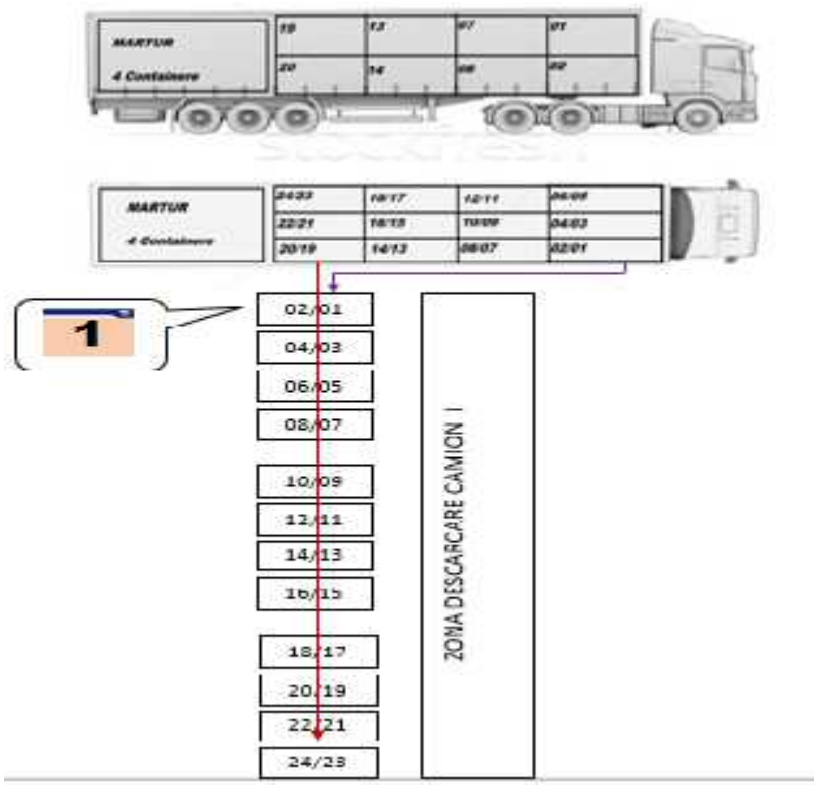

Fig. 3.2 Dedicated truck loading scheme

In the area marked on the ground, "Truck unloading area I", each four packages will be placed in series of three in order to facilitate loading onto the special rolling bases, in which, as mentioned above, eight front seats can be placed and four rear seats in the second type.

A logistics operator will pick up the packages from the unloading area and transport them to the loading area onto the rolling bases, thus completely eliminating the intermediate storage area which occupies a considerable surface area.

2.1 Improving the reception activity

Therefore, all packages in the same truck will have the same label colour to easily distinguish any potential errors.

The labels will be removable and will be placed by the suppliers in the metal holder on the back of each specific package.

Therefore, in addition to providing references and loading them into packaging, the suppliers in question will also carry out labelling activities.

All labels will be provided by the Plant, three sets will be printed, one for each participant in the flow.

Fig. 3.3 Packaging labelling

Fig. 3.4 Labelling activity

Once arrived at the Plant, the packages will no longer be scanned and then labelled, they will be loaded directly onto the rolling bases, thus eliminating the two logistical operations but also the operator carrying out this activity. If we look at the continuous manufacturing flow in the Plant, we see that each shift requires one operator to take the packaging and another to transport the packaging to the intermediate storage area.

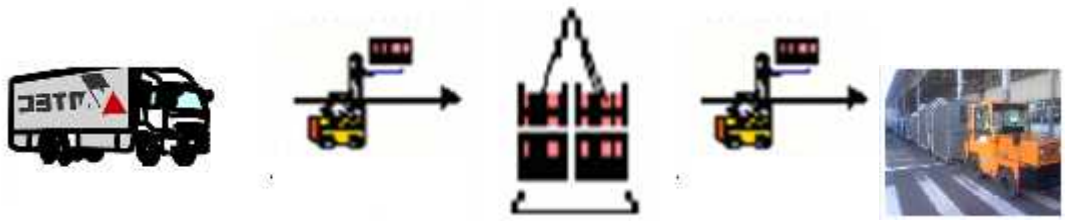

Fig. 3.5 Proposed flow

The initial situation *The proposed situation*

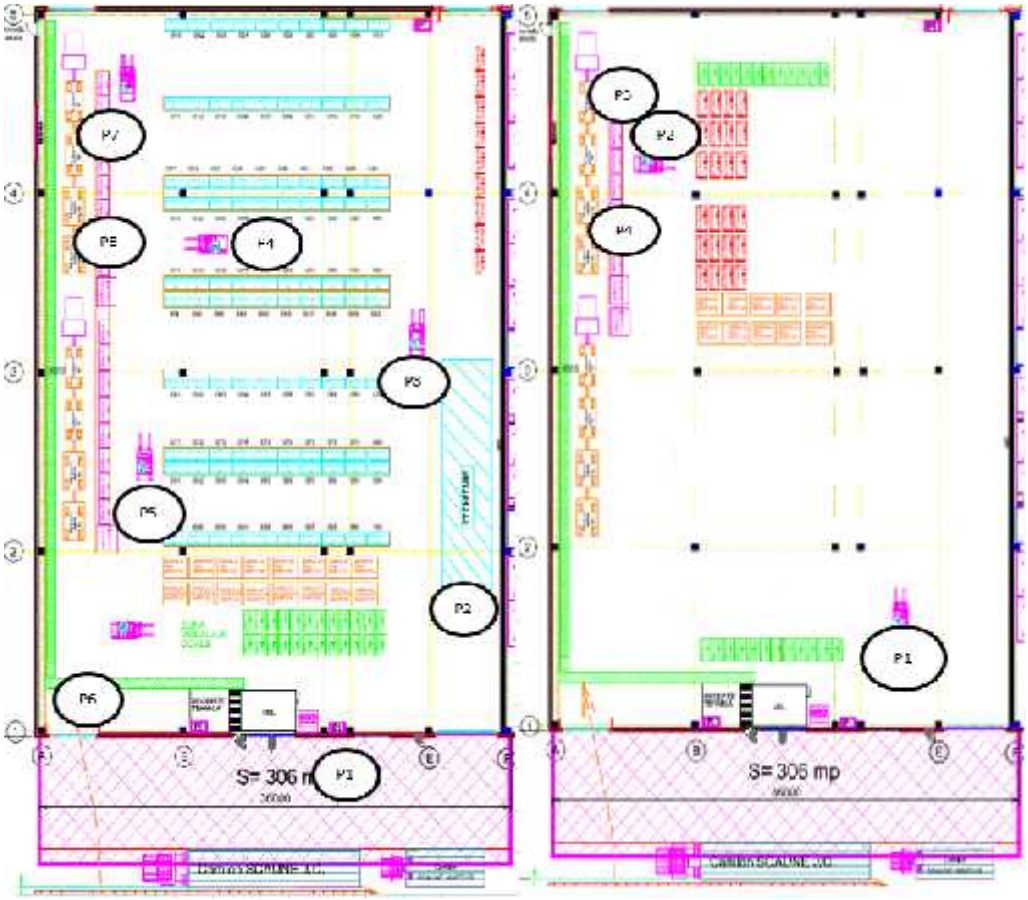

Fig. 3.6 Analysis and effectiveness monitoring of the proposed measures

Conclusions

The following conclusions can be drawn from the information presented in the previous chapters:

- Improvement of assembly line supply by introducing synchronous supply;
- Elimination of the intermediate storage area on the ground in order to reconstitute the firm manufacturing sequence;
- Elimination of labelling operations and by extension scanning, practically no more reception will be carried out;
- Elimination of the operators performing these operations mentioned above;
- Elimination of reception of reverse labelled packaging;
- Improvement of working and environment conditions by introducing AGVs on the transfer flow

It also means a significant decrease in product stocks, the total elimination of the intermediate storage area, which occupies about 70-80% of the total warehouse area, the reduction of lead time, the commitment modification and the reduction of the number of posts.

The improvement must be continuous, the actions to be taken in the future being: replacement of sectional doors in truck depots with automatic ones, elimination or reduction of reference swapping, increase of operational efficiency in the supply process.

Stocks generate costs. As stocks decrease, so do costs.

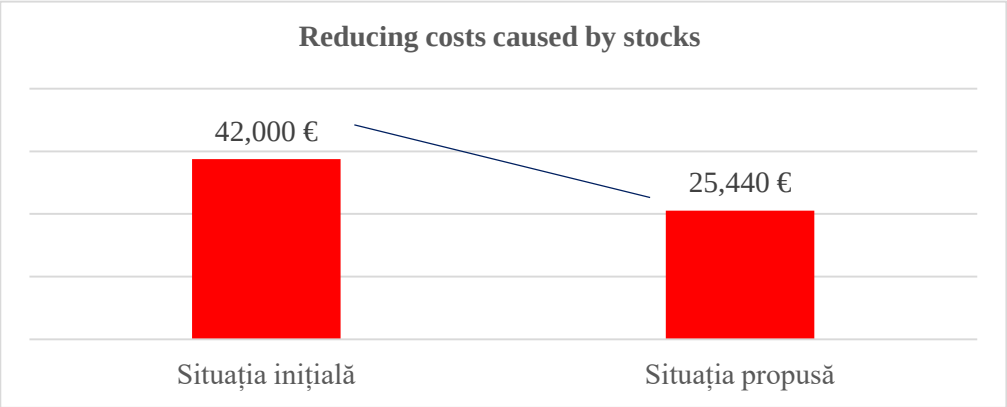

Fig.2.9 Reducing the percentage of storage area out of total area

42,000€ - 16,560€ = 25,440€

The costs caused by stocks have decreased by $\frac{25440*100}{42000} = 60.57\%$

Index I1 =17,160 (€)

Also, as stocks decreased, the percentage of storage area in relation to total area also decreased (Figure III.2).

Index I2 = $\frac{\text{Storage surface}}{\text{Total surface}}$ varies as in table 1.

Table 1 Variation of the I2 index

I2 – initial situation	I2 – proposed situation
$\frac{\text{I2 – initial s}}{\frac{848m^2}{1400m^2}*100}$= 60 %	$\frac{\text{2 – propose}}{\frac{100\ m^2}{1400\ m^2}*100}$= 7.14 %

1,400m² – 848m² = 552m² – area gained by eliminating stocks.

The storage area for seating collections decreased by $\frac{552*100}{840} = 65.71\%$

Thus, it can be seen, through the reduction of stocks of finished products, and at the same time their related costs and areas, that the synchronous supply method is much more advantageous. Also, once the reception activity, which involved labelling and scanning the packaging, was eliminated, 2 operators per shift were also eliminated.

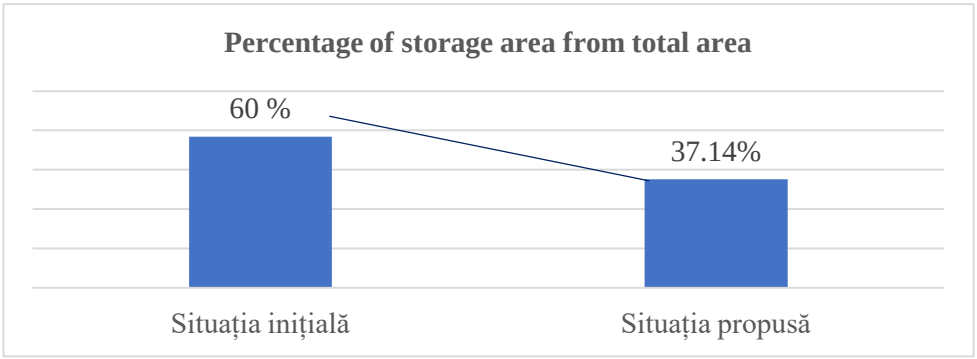

Fig. 2.10 Reducing the percentage of storage area out of total area

Table 2. General analysis (initial situation vs. proposed situation)

Process	Supply and storage of parts in an intermediate warehouse in the Plant	Supply and storage of parts directly at the truck depot in the proximity of the car assembly line in synchronous mode
ETP	27	15
forklifts	9	5
electric tractor unit for internal transport	3	0
AGV	NO	NO
No. of shifts	3	3
surface (m^2)	2500	1600
no. of quality incidents (monthly average)	6	2

Personal contributions

In terms of personal contributions to the study, these took the form of:

- Documentation and bibliographical study;
- Centralisation of the supply system information analysed;
- Participating in identifying weaknesses;
- Participating in interpreting the results and drawing the conclusions;
- Analysis of the current system;
- Identifying opportunities for improvement and proposing solutions;
- Analysis of the proposed situations;
- Identifying the optimal solution.

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