OPTIMISATION OF THE EXPEDITION PROCESS OF SHAPES IN THE ENGINEERING COMPANY

MICHAL BUCKO, VLADIMIRA SCHINDLEROVA, IVANA SAJDLEROVA

Department of Mechanical Technology, Faculty of Mechanical Engineering, VSB – Technical University of Ostrava, Ostrava, Czech Republic

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michal.bucko@vsb.cz

Process optimisation in production is an integral part of management in all companies. Given the constantly increasing pressure from customers, companies are forced to take steps to satisfy them. These steps include, above all, increasing production capacities and optimising production and service processes while maintaining or minimising all costs. The changes implemented today should be oriented towards modern trends in the field of lean manufacturing and Industry 4.0. However, companies cannot optimise all processes at once due to costly investments to implement the relevant changes. The paper contains an analysis of the shipping process in a selected company, which is also focused on assessing the implementation of business orders, storage and assembly of finished steel shapes. Based on the identified problems, this article aims to propose optimising the dispatch process, even concerning whole implementation process of business orders.

KEYWORDS

Optimisation, Expedition Process, Shapes, Manipulation, Storage, Business Orders

1 INTRODUCTION

In recent years, companies have been continuously trying to improve their production by looking for bottlenecks to strengthen their market position in terms of competitiveness. [Bucko 2020]

The 21st century, also called the modern era, brings a lot of new opportunities for industrial companies, especially in the research and development of new technologies (cutting with minimal burrs), products and services. Due to the ever-increasing pressure from customers, companies are forced to take steps to satisfy them. These steps include, in particular, increasing production capacities and optimising resources, production and service processes while maintaining or minimising all costs. [Krejci 2019], [Cada 2021], [Cepova 2018].

Optimising processes at low costs allow businesses to meet demanding customer requirements and increase their competitive advantage in the market environment. The changes implemented today should already be oriented towards modern trends in the field of lean manufacturing and the increasingly popular Industry 4.0. However, businesses cannot optimise all processes at once due to the increased investment required to implement the relevant changes. In this regard, all changes are implemented gradually, and investments are directed to optimising specific processes. To smartly streamline engineering production, companies are also using 3D printing along with various optimisation elements. [Marsikova 2018], [Sproch 2021]

2 METHODOLOGICAL BASIS

Over the past twenty years, the introduction and implementation of lean manufacturing principles have significantly impacted the manufacturing company. Experience shows that lean manufacturing methods and tools are not equally applicable to large and small businesses. The concept of lean thinking, which was successfully implemented even in medium-sized enterprises, arose after implementation in large companies belonging to the automotive sector. [Matt 2013], [Bucko 2020], [Vargova 2020]

2.1 Materials handling

Several sub-methods are used when compiling a design, which leads to the assembly of individual parts of the project per one of the recommended material handling design procedures. The so-called systematic design of material handling can be considered a representative of the procedures. It is a method of designing a material handling project that includes an analysis of the material flow and layout of the plant. In the context of material handling and subsequently verifying the results of the computer simulation and the results obtained in practice, we can confirm the suitability of using computer simulations in optimising production processes and systems in practice. [Schindlerova 2016], [Bucko 2019]

2.2 International Commercial Terms

Incoterms are the international terms and conditions of trade for the transport of goods that set out the payment for transportation, risks and obligations between the carrier, the buyer and the supplier. These terms of delivery primarily determine the obligations of the contracting parties during the delivery of goods. From a management perspective, Incoterms are a commercial standard accepted by governments, legal authorities and trading companies worldwide. The most recent version is the INCOTERMS 2020 terms, which are shown in the image below (Fig. 1), but older terms can also be used. However, it is always necessary to indicate which conditions were used. The following groups of legal clauses are included in INCOTERMS 2020: [Petrova 2021]

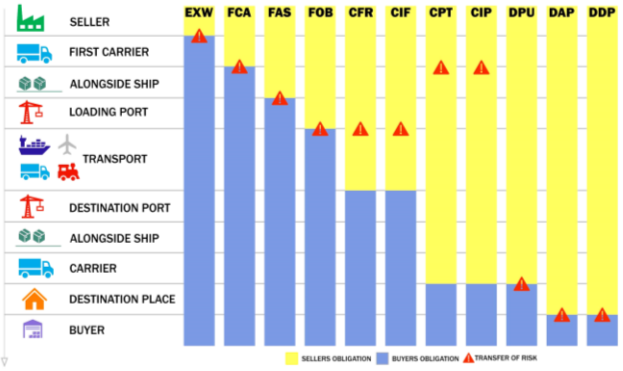

Figure 1. Incoterms clauses 2020 [Petrova 2021], [Novosadova 2022]

2.3 Stock management

Storage can be defined as a subsystem of the corporate logistics system that ensures the storage of products, i.e., raw materials, parts, semi-finished products and finished products, at the place of origin and between the places of origin and the places of consumption. [Bucko 2019]

Warehouses have their place in companies, even if related to the necessary technology and the costs associated with their operation. They are essential because they balance supply and demand; in the case of assembly warehouses, for example, they also create added value. [Rakesh 2015], [Cepova 2018].

2.4 SWOT analysis

SWOT analysis is a universally used tool that maps and analyses a specific phenomenon (e.g. a specific condition, situation, task, problem, work team, project, etc.). It allows one to look at the analysed thing from four points of view and gives a static snapshot of the analysed phenomenon, which can be transferred into a dynamic perspective. The SWOT matrix (Fig. 2) is a conceptual framework for systematic analysis that facilitates the comparison of external threats and opportunities with the internal strengths and weaknesses of an organisation or project. [Nazarko 2017]

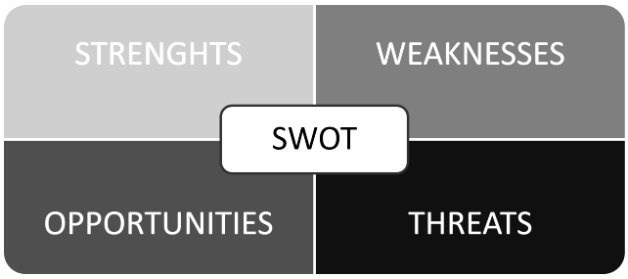

Figure 2. Diagram of SWOT analysis [Nazarko 2017],

3 ANALYSIS AND IDENTIFICATION OF PROBLEMS

A SWOT analysis was prepared with evaluation using IFE (Internal Factor Evaluation) and EFE (External Factor Evaluation) matrices for a more detailed description. As part of this analysis, data related to business orders were processed, especially the progress and duration of implementing two specific orders. Subsequently, in the analysis of the storage of finished products, a diagram of the production hall is shown with a description of the current storage and dispatch process.

3.1 SWOT analysis

The SWOT analysis is mainly about identifying and evaluating individual factors of the internal and external environment, which significantly influence the function of this company. The selected factors (Tab. 1) are commented on during the analysis, and the resulting evaluation is carried out in the form of IFE and EFE matrices, which indicate the company's position concerning its intention.

All factors are subsequently evaluated using the internal and external environment matrices to assess the company's state. It is a method of evaluating the identified factors of the SWOT analysis, which points to the company's position. Importance values and ratings are given based on subjective observation.

Weight	Description	Weight	Description
4	Significant strengths	4	Significant opportunities
3	Negligible strengths	3	Negligible opportunities
2	Negligible weaknesses	2	Negligible threats
1	Significant weaknesses	1	Significant threats

Table 1. Factor rating scale

The internal factors matrix (Table 2) and subsequent rating obtained a score of 2.78 out of a possible 4, indicating that a moderately strong internal position supports the company's intention.

The EFE matrix is also used in addition to the IFE matrix. Using this matrix and then evaluating the opportunity and threat factors, a score of 2.56 out of a possible 4 was achieved, giving the same result as in the previous case, that the company's intention is supported by a moderately strong but now external position.

Factors		Importance	Rating	Total
Strengths	Certification in different areas	0,14	4	**0,56**
	Qualification of employees	0,17	4	**0,68**
	Sufficient technical equipment	0,2	4	**0,8**
	Production of welded structures	0,03	3	**0,09**
	Innovation process in place	0,08	3	**0,24**
Weaknesses	Storage of residual material	0,19	1	**0,19**
	Discontinuity of production with IS	0,05	1	**0,05**
	Undefined production programme	0,02	2	**0,04**
	Low investment in advertising	0,01	2	**0,02**
	Failure to meet delivery deadlines	0,11	1	**0,11**
Internal total				**2,78**

Table 2. IFE matrix

The graph (Fig. 3) is based on each factor's scores and importance. Factors consisting of points located in the upper half of the graph are more important the higher their rating and more distant the higher their importance. Conversely, factors located in the lower half of the graph are more significant the lower their rating and more distant the greater their importance. This chart was also created for the company's external environment. [Souc 2020]

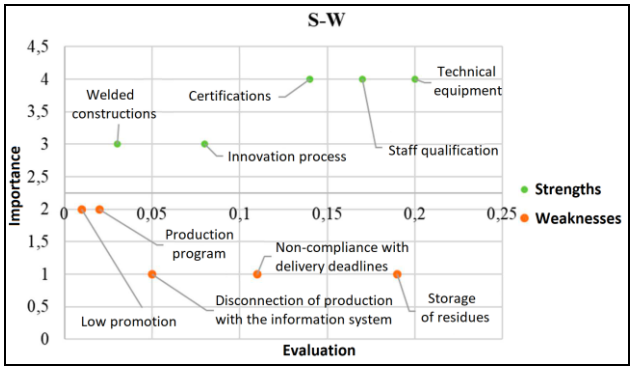

Figure 3. Position map of the internal environment [Souc 2020]

3.2 Business orders

The final stages of the process in order execution are the storage, completion and dispatch of finished products. To understand each stage of the process, it is first necessary to clarify the entire process of business order realisation, which is shown below (Fig. 4), including the number of orders per calendar year (Fig. 5).

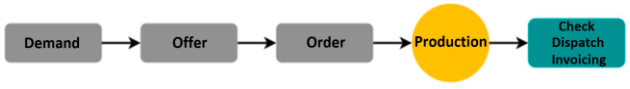

Figure 4. The realisation of a business order [Souc 2020]

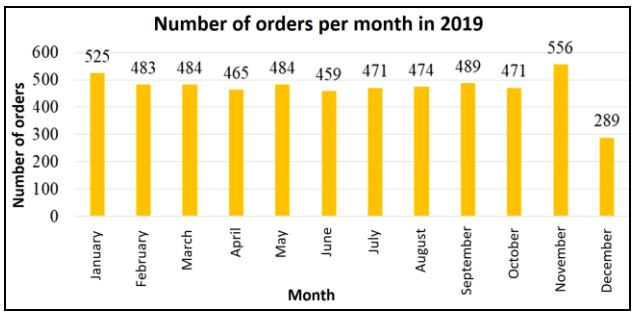

Figure 5. Monthly overview of orders [Souc 2020]

1) Demand - the whole process is handled by the company's sales department, where the demand is assigned either to a salesperson (up to CZK 50,000), a sales director (CZK 50,000 to CZK 500,000) or the CEO (over CZK 500,000) based on the amount of the order. Subsequently, if the demand meets all the requirements, it is entered into the K2 corporate information system.

2) Offer - after processing the demand, the sales department creates an offer for the customer. For the creation of the offer, input data are important, including: weight (net, gross), length of firing, quality, and technological and delivery conditions.

3) Order - if the customer is satisfied with the offer, they create and send an order. In case of changes, the trader responsible for the order updates the offer, with which he continues to work.

4) Production - orders are received in production by programmers, while the programmer also has the production planner position. Each programmer is usually in charge of a specific burning machine or group of burning machines, depending mainly on the thickness of the sheet metal (0.5 to 350 mm) from which the product is made. When processing an order, the programmer works with the internal K2 information system and the Turbo Wrykrys planning software (Fig. 6).

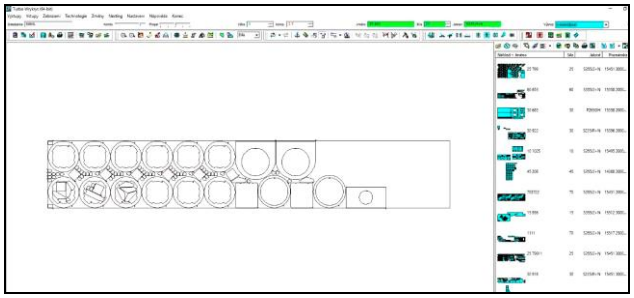

Figure 6. The elaborated board in Turbo Wrykrys [Souc 2020]

5) Completion and dispatch - are represented by three dispatchers in the hall and two dispatchers in the dispatch office. The dispatchers in the dispatch office mainly transport the products according to the delivery conditions to the customer and print or send delivery notes. The dispatcher primarily works with the order and sorts the orders received according to the shipping date. If it is a repeat order, the dispatcher already knows where the steel shapes might be located. Otherwise, if the order is new, the dispatcher searches for steel shapes according to the shapes and dimensions given in the drawing or product markings. The completion (Fig. 7) and dispatch (Fig. 8) process is illustrated in the figure.

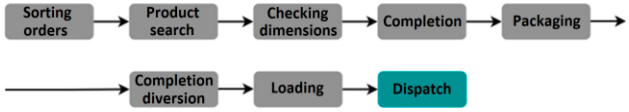

Figure 7. Completion process [Souc 2020]

The dispatcher also checks whether the steel shape conforms with the certificate supplied. The dispatcher's complete order is transferred to the information system via the terminal. The prepared products then wait for the arrival of the carrier's vehicle. They are loaded and transported to the customer. [Souc 2020]

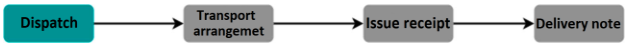

Figure 8. Dispatch process [Souc 2020]

3.3 Analysis of internal orders

Following the general process of order realisation, an analysis of specific orders in the company was carried out to assess the whole process clearly and to identify the problems encountered. An example of one of the orders is given below (Table 3).

Order summary information		
Internal order reference	VY/2020/717	
Required number of products	12 ks	
Required delivery date	28. 2. 2020	3 ks
		1 ks
	9. 4. 2020	3 ks
		1 ks
	20. 7. 2020	2 ks
		2 ks
Drawing documentation	MIA21-0042/1D1	
	MIA24-0062/1D	
Cooperation	Beveling, pre-bend, roll-bending, stitching	

Table 3. Order VY/2020/717

Subsequently, the communication procedures with the customer when dealing with demand, offer and orders were noted in detail. Furthermore, the characterisation of the production and cooperation process, completion and subsequent dispatch was carried out. The timeline of the order progress is shown in the figure (Fig. 9). The realisation diagram is in the figure below (Fig. 10).

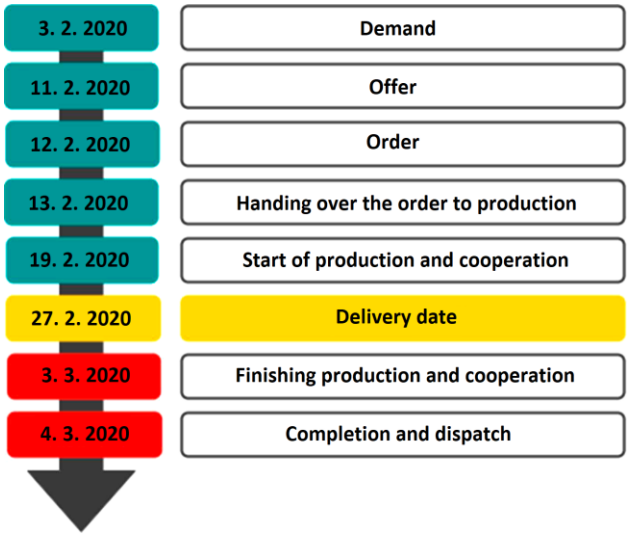

Figure 9. The timeline of the order progress [Souc 2020]

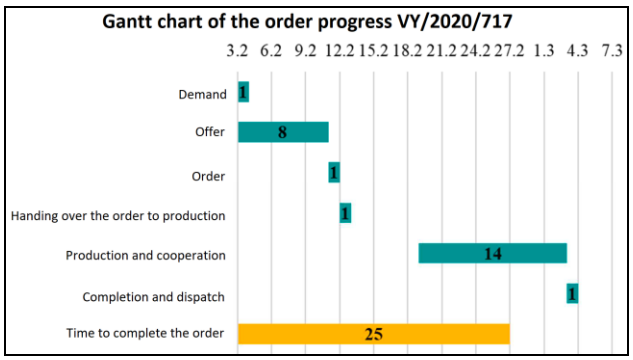

Figure 10. Gantt chart of the order progress [Souc 2020]

3.4 Product storage and dispatch

The layout of the company's production hall (Fig. 11) shows that the hall is divided into several sections, visually and physically separated by crane tracks into halls and fields HA, H7, H8, H9, P8, P9 and P10. Section H7 is currently used to produce machine and technological structures (welded structures), which is classified as separate production unit and is not related to the production of steel shapes. This section also houses the offices of dispatch, technologist and programmers. Only the HA, H8 and H9 sections are used for producing and storing steel shape products, where all the burning machines are located and where the finished products are stored. Thus, it can be said that the production and storage areas are shared, and separate warehouses are not used. In the layout below, the warehouses and workplaces are shown in yellow, the warehouses and workplaces are shown in blue, the product pallets are shown in red, and the transport routes and tracks are also shown.

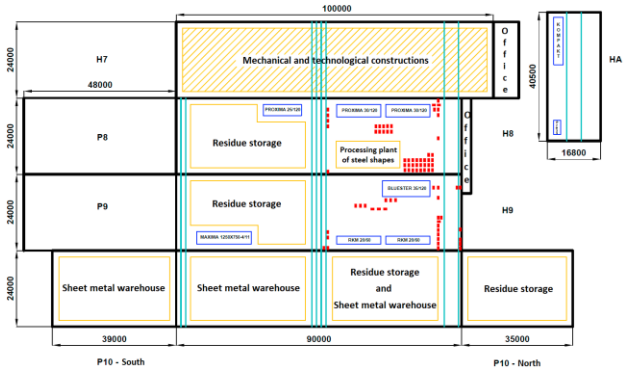

Figure 11. The layout of production and storage areas [Souc 2020]

The finished steel shapes are mainly stored in bulk on Euro pallets; no racks or stackers are available. Pallet stacking is used in some cases. For the most part, the pallets of finished products are arranged in an illogical sequence, especially wherever there is free space (Fig. 12). The pallets produced in hall HA are moved to halls H8 and H9 for later dispatch.

Figure 12. Storage of steel shapes in the hall H8 [Souc 2020]

The chart below (Fig. 13) shows the number of orders processed within a specific timeframe in 2019. In the chart, it can be seen that most orders were completed between 8 and 14 days. The second group consists of orders processed from 1 to 7 days. Depending on the complexity of orders, the company could consider 7 or 14 days as the primary deadline for processing the order. [Bucko 2019]

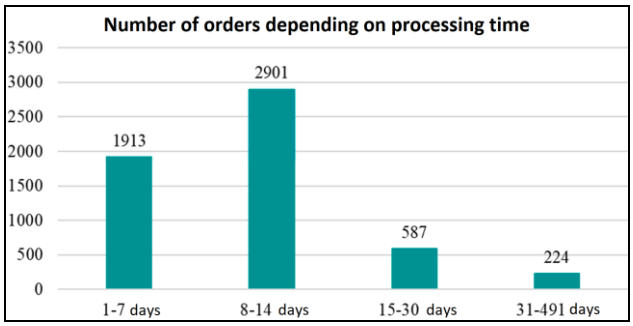

Figure 13. Orders processing time in 2019 [Souc 2020]

3.5 Product marking

Steel shapes are marked (Fig. 14) for a better overview for the dispatchers and depending on the customer's requirements. Different marks are used, but the products are sometimes not marked. The agreed rule is to mark the products with the order number as an internal requirement. Other markings are given if agreed between employees or if requested by the customer. Most products are marked in white chalk, but a white marker is also used.

The flame cutter does the marking of the pieces after the pieces have been burnt. If finishing is necessary, the steel shapes are marked by the grinder. [Souc 2020]

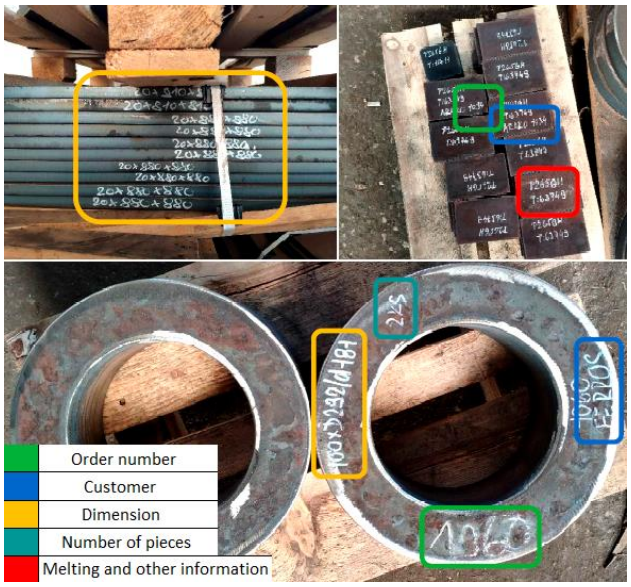

Figure 14. Marking of steel shapes in the company [Souc 2020]

3.6 Completion and dispatch

This part describes the current state of completion and dispatch in the company. It includes, in particular, the overview of employees, their job description, the progress of the dispatch process, and the available resources for the performance of the activity. The completion and dispatch procedure is shown in the table below (Tab. 4).

The picture below shows the packaged pallets ready for dispatch to the customer (Fig. 15).

Step	Activity	Note
1	Receiving orders	-
2	Sorting orders	According to the delivery date
3	Verification of production completion	Information system
4	Certificate check	-
5	Searching for steel shapes	According to the shape and dimensions in the drawing
6	Checking the largest dimensions	Tape measure
7	Completion of steel shapes	Collection of all steel shapes belonging to a given order
8	Packaging of steel shapes	Foil, tightening tapes
9	Confirmation of completion in IS	Terminal
10	Storage/loading	-

Table 4. Completion and dispatch procedure [Souc 2020]

Figure 15. Example of packaging steel shapes [Souc 2020]

Concerning dispatchers, the information system K2 (Fig. 16) is used only marginally. In it, the dispatcher looks for the production status, i.e. if the steel shapes of the given order have already been produced and are ready for completion and dispatch. This system is also used to transfer the completed order via the terminal.

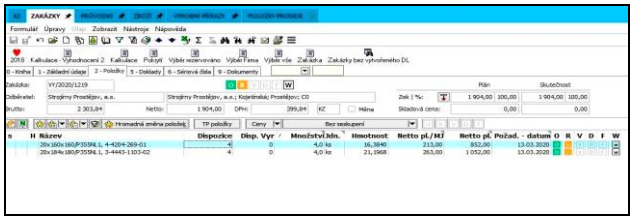

Figure 16. Order in the K2 information system [Souc 2020]

Terms of delivery:

When dispatching its steel shapes, the company uses international terms of delivery, the so-called Incoterms (International Commercial Terms), globally recognised in the forwarding business. The analysis of these delivery terms was carried out from the information found concerning orders in 2018 and 2019 (Tab. 5).

Terms of delivery	Number of orders	
	2018	2019
CFR	1	2
CPT	208	404
DAP	2665	2386
DDP	1	0
EXW	13	3
FCA	2699	2774
Total number of orders	5587	5569

Table 5. Terms of delivery used [Souc 2020]

Out of the 11 known delivery terms, the company mainly uses 6. However, some terms were included in only one order and are therefore neglected.

4 IDENTIFICATION OF BOTTLENECKS

The analysis of the current situation revealed specific problems in business order processing, including the process of completing and dispatching finished steel shapes.

4.1 Programmer is also a production planner

By planning activities, programmers, as production planners, reduce the added value to the production process. After receiving an order, it is up to the programmer to schedule the production according to priorities, such as the delivery date or other conditions. The programmer should mainly deal with the creation of programmes for burning machines.

4.2 The programmer is looking for material

To begin the product layout of orders for the given sheet metal order, the programmer must ensure that the sheet metal they need is physically present in stock. Since no material storage system is provided, the programmer walks around looking for the sheet metal in all sections of the production hall. The time spent searching for sheet metal can be several hours within a work shift. A working day record and a graph of the proportions of each time in a shift were created to determine all the required times in a shift. (Fig. 17).

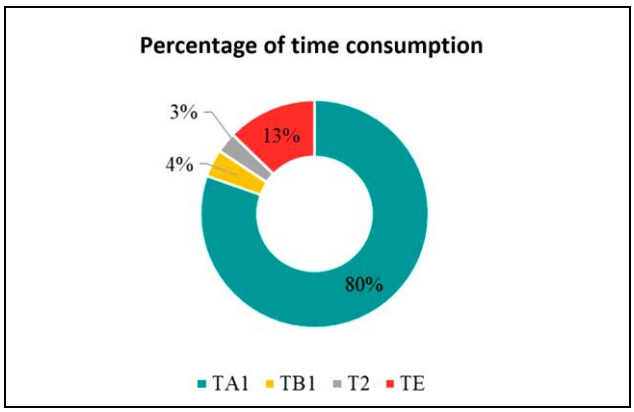

Figure 17. The proportion of individual times in a shift [Souc 2020]

The chart focuses on the time consumption of the programmer's work activity. The largest share of the work time is TA1 (410 min.), which makes up 80% of the total shift time. TB1 time (20 min.), i.e. sorting and preparing orders, comprises only a small percentage of the labour time. A significant proportion is lost time TE (65 min.), during which the material is ensured and prepared for actual production, as well as handing over the burning plans to the machine operator. Ensuring the material mainly involves finding and arranging for its transfer to the production site. In this case, the search time for the sheet metal is 30 min within the shift. However, this time is often much longer (up to several hours). With appropriate changes, this time should be reduced or eliminated. T2 time (30 min.) is lunchtime.

4.3 Delay in dispatching orders

If production is poorly planned, there may be a delay in dispatching orders. It may be because the company lacks a production planner, and planning is the responsibility of programmers. In addition to poorly planned production, delays can also occur in the case of certain changes requested by the customer, which may affect the processing of the already started business order.

The number of delayed orders and the time range of the resulting delay are shown in the following charts below (Fig. 18 and Fig. 19).

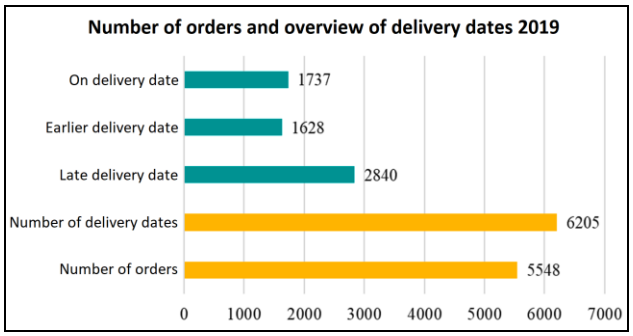

Figure 18. The proportion of individual times in a shift [Souc 2020]

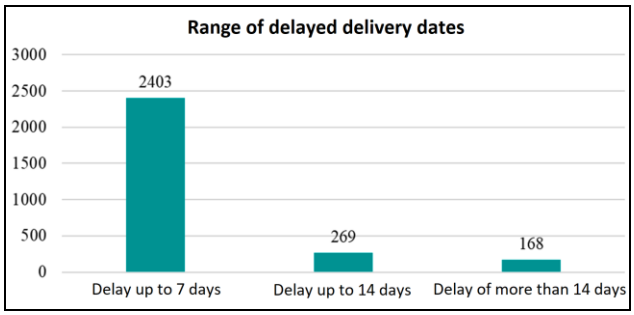

Figure 19. The proportion of individual times in a shift [Souc 2020]

4.4 Improper storage of steel shapes and their subsequent search

The company does not have a storage system for steel shapes. The steel shapes are stored around the hall, especially near the burning machines and the processing plant, where there is free space. Bulk storage on Euro pallets is used or stacking of Euro pallets, which is inappropriate in some cases.

To complete the order, the dispatcher must find all steel shapes. They search according to the order number marked on steel shapes, but also according to the shape and size, which are given in the drawing documentation.

4.5 Inappropriate marking of steel shapes or no marking

The steel shapes are marked with white chalk, sometimes with a white marker. The chalk can be erased by careless handling, which can cause complications in identifying the steel shapes. The steel shapes are marked with information such as order number, manufacturer, number of pieces, size, etc. The problem is in the realisation of the marking. Each piece of information is written on different parts of steel shapes. If only a few pieces are handled, the data recorded is lost.

4.6 Missing road markings

Regarding safety, the roads for handling operations and paths for the movement of persons are not marked according to ČSN 73 5105 and other warning signs and signalling according to Government Regulation No. 375/2017 Coll. Concerning drivers of transport activities, all roads in the area are not sufficiently marked, as well as all entrances to the production hall. [Souc 2020]

4.7 Defining the objectives of the case study

- Proposal for marking sections of the production hall and company premises for better orientation of employees.
- Proposal for storage areas and storage system for steel shapes.
- Selection of means and equipment for handling steel shapes (Fig. 20).
- Proposal for marking steel shapes.
- Optimisation of the connection between the dispatch process and the information system.

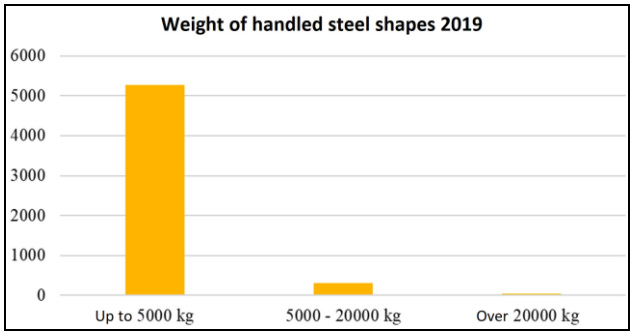

Figure 20. The weight of the handled steel shapes [Souc 2020]

5 OPTIMALISATION OF THE PROBLEM SOLVED

Based on a thorough analysis of the company, it was subsequently possible to optimize selected problems.

5.1 CPM analysis

A network analysis using the CPM method was used for the correct course of the business order and the timely delivery of steel shapes, which points to the critical path of the investigated project.

The critical path includes those activities for which there is no time reserve. A business order is a project in which the whole company participates. Activities are carried out by employees of individual departments who cooperate and are accountable to their manager, the company's CEO. Each department is responsible for specific activities that must be carried out conscientiously and on time, considering the customer's requirements.

- **Network chart**

Based on the activities performed during the business order processing, a network chart is prepared (Fig. 21). In the network chart, the activities are marked in the form of oriented edges representing the critical path.

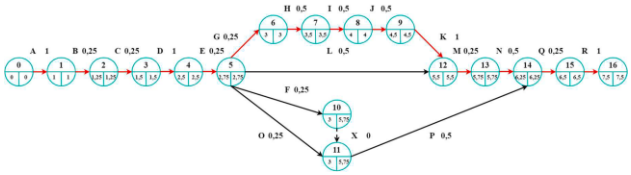

Figure 21. Network chart [Souc 2020]

- **Incidence matrix**

The incidence matrix (Fig. 22) is a network analysis tool used to verify the results of the constructed network chart. In the matrix, the durations of each activity are given, as well as the earliest possible and latest permissible dates of each node (TE, TL). The incidence matrix shows the total reserve, whose zero values form the project's critical path. The matrix is generated for all the activities outlined and confirms the correspondence with the network chart. [Souc 2020]

The critical path consists of 14 activities. These activities must be performed on time, as there is no reserve time for them. In the event of a delay in any activity, the entire project (processing the business order) will also be delayed.

TE	i/j	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	0		1															
1	1			0,25														
1,25	2				0,25													
1,5	3					1												
2,5	4						0,25											
2,75	5							0,25				0,25	0,25	0,5				
3	6								0,5									
3,5	7									0,5								
4	8										0,5							
4,5	9													1				
3	10												0					
3	11															0,5		
5,5	12														0,25			
5,75	13															0,5		
6,25	14																0,25	
6,5	15																	1
7,5	16																	
TL		0	1	1,25	1,5	2,5	2,75	3	3,5	4	4,5	5,75	5,75	5,5	5,75	6,25	6,5	7,5
CR		0	0	0	0	0	0	0	0	0	0	2,75	2,75	0	0	0	0	0
KC		K	K	K	K	K	K	K	K	K	K	-	-	K	K	K	K	K

Figure 22. Incidence matrix [Souc 2020]

5.2 Proposal for marking individual sections of the production hall

Due to the unsystematic marking of the sections in the production hall, a new marking is proposed (Table 6), which will facilitate the orientation of all employees in the given areas. The individual sections of the production hall are divided by crane tracks. The halls are currently marked with a serial number descending from the entrance, except for the new hall for the bending press and burning laser, marked as Hall A (Fig. 23). Only sections of the production hall are marked. For ease of reference, the sections are marked in ascending order from the entrance and the position within that section is also included. It is recommended to add the new markings to the K2 information system. [Petrova 2021]

Original marking		New marking	
HA	Hall A	HA	Hall A
P10	Field 10	PA	Field A
P9	Field 9	PB	Field B
P8	Filed 8	PC	Field C
H9	Hall 9	B1 a B2	Hall B1 (left section) Hall B2 (right section)
H8	Hall 8	C1 a C2	Hall C1 (left section) Hall C2 (right section)
H7	Hall 7	D1 a D2	Hall D1 (left section) Hall D2 (right section)

Table 6. Marking of production halls and outdoor fields [Souc 2020]

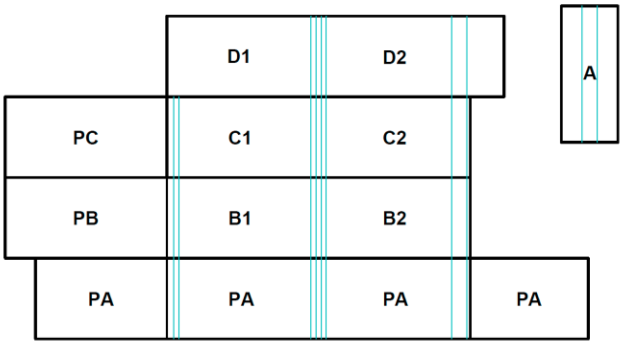

Figure 23. Scheme of the new section markings [Souc 2020]

5.3 Proposal for storage areas and storage system

The warehouse design is made for two possibilities for storing the Euro pallets: bulk storage (Fig. 24), which the company would like to keep, and the racking system. For the proper functioning of the warehouse and the safety of moving people, routes are also designed for the operation of technical equipment and the safe movement of people. According to the new marking, the storage areas are located in section C1, where there is only one burning machine that could be moved. Section C1 was chosen because of the greater length of the access road, on which more vehicles can be dispatched, and the proximity of the hall of machine structures.

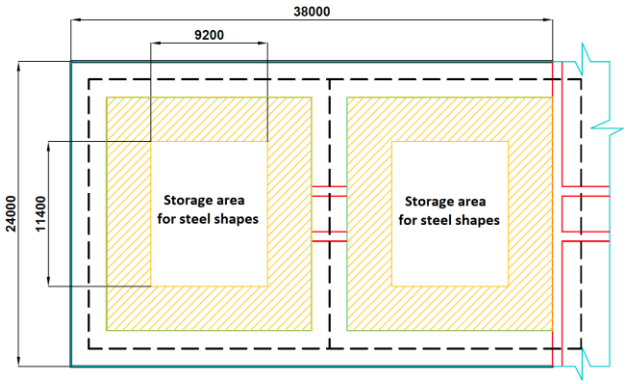

Figure 24. The layout of the storage in bulk area [Souc 2020]

Subsequently, a pallet graph (Fig. 25) was created, where the closest intersections under the diagonal are marked with coloured points, and linear equations are constructed. For this particular case, 7 alternatives for placing the Euro pallets in the storage area were created. Due to the similarity of the alternatives, 3 alternatives with a different number of pieces of Euro pallets are further elaborated.

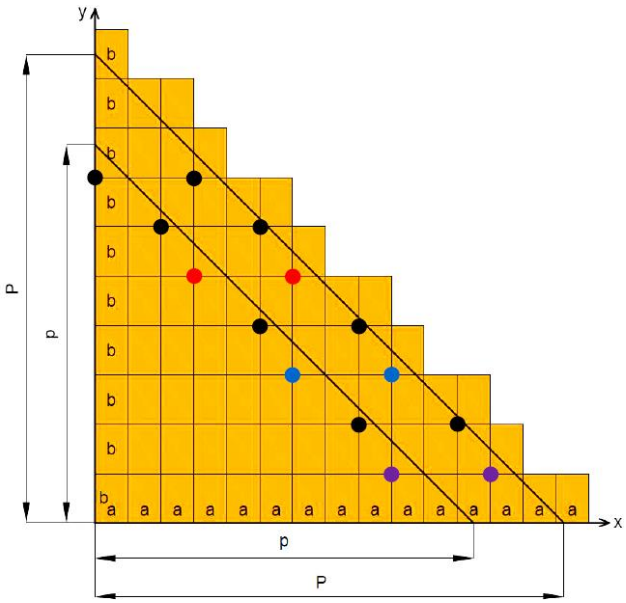

Figure 25. Pallet graph [Souc 2020]

Alternative number 1 (purple dots) was used to store 176 pallets. Alternative number 3 (red dots) was calculated to store 188 pallets. Alternative number 2 (blue dots) was the best of the three options, where we can store up to 190 pallets. (Fig. 26). [Souc 2020]

Calculation of alternative number 2:

P = 9a + 3b

p = 6a + 3b

Final number of Euro pallets: N_{EUR} = 95 * 2 = 190 ks

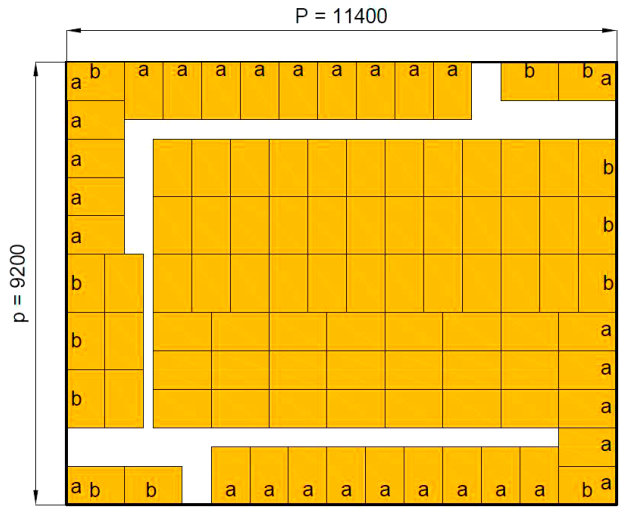

Figure 26. Pallet storage for alternative 2 [Souc 2020]

The number of pallets stored in the warehouse depends primarily on the storage method used and the company's decision.

A warehouse layout with a rack system was designed based on further calculations. According to the processed layout (Fig. 27), the number of racks Nr can only be estimated. For this particular layout, Nr is equal to 40. In the case of using a racking system, there are several variants of rack layout over the warehouse area, and the number of racks depends mainly on the number and frequency of orders and the number of steel shapes in each order.

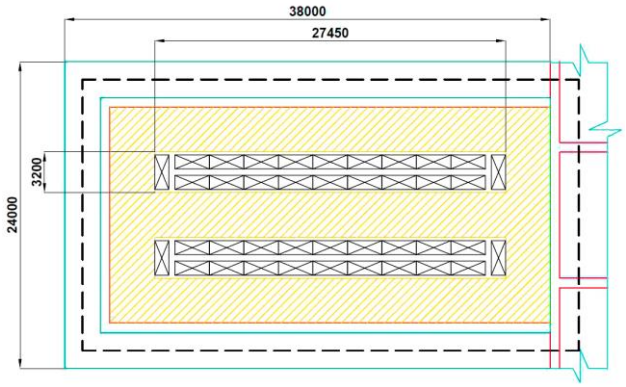

Figure 27. Warehouse layout with racking system [Souc 2020]

As part of the storage, suitable racks were also designed for use in the warehouse (Fig. 28). Since the steel shapes are stored on Euro pallets, the choice of pallet racks is appropriate. The number of racks depends on the number and processing flow of the orders. Overhead cranes, forklifts and pallet hand trucks will be used for pallet handling.

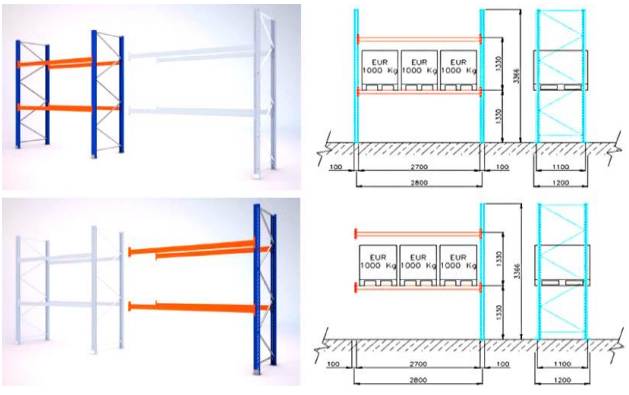

Figure 28. Selected racking system [Souc 2020]

5.4 Selection of means and equipment for handling steel shapes

Following the identification of problems in handling facilities, new facilities are proposed below to suit the conditions of the new warehouse.

The handling equipment is selected according to the weight of the pallets to be handled in 2019 and the maximum load of the Euro pallets. For handling, two forklift trucks (DESTA E 20 and DESTA DV 35 T4) and a manual semi-electric pallet truck (Ameise HPT A20) have been chosen.

5.5 Marking of steel shapes

Following the identification of the marking problem, it is recommended to use adhesive labels (Fig. 29) with information about the given order and steel shapes supplemented with a barcode, as the company currently owns barcode readers.

COMPANY NAME	
Order	VY/2020/717
Customer	Strojírny ABC a.s.
Quantity	8 pc
Weight	37,581 kg
Date of delivery	13.3.2020
Machine	PROXIMA 30/120
Additional information	-
VY20201219	C2

Figure 29. Proposal for the adhesive label [Souc 2020]

5.6 Information system and dispatch

As stated in the analysis of the current state, the dispatcher works only with the order and uses the information system to ensure whether the steel shapes of the order are produced. Regarding connecting the information system with dispatch, it is necessary to add modules that will allow the dispatcher and the company a better overview of steel shapes, possibly who processed the order and on which machines the order was produced. The design of additional modules must be solved with K2 software programmers.

Proposal for additional modules - burning machine, burner, the position of steel shapes, time of arrival of the transport vehicle. [Souc 2020]

5.7 Visual marking of floors according to 5S and additional signalling in the premises

Based on safety, the employees' better orientation, and the individual parts' marking, the floor marking in the production hall in the form of stripes is proposed using the 5S method, which was assumed (Table 7).

The striping can be done with suitable paint or adhesive tape with a given colour or pattern.

Colour marking		Application in the company
Yellow		All roads and aisles
White		Warehouse of steel shapes with racks
Blue		Material warehouse
Black		Residue storage
Green		Storage of steel shapes in bulk
Red	white	Areas near fire extinguishers and electricity
Black	yellow	Areas for burning machines and gas cylinders

Table 7. Possible floor marking in the company [Souc 2020]

From the point of view of facilitating dispatch and eliminating dispatch errors when several transporter vehicles meet at the same time, it is recommended to install a camera system and traffic lights at the individual entrances to the production hall (Fig. 30), according to which the dispatcher in the dispatch office can correct the entry of the relevant transporters, or they can prioritise carrier with higher priority. [Souc 2020]

Figure 30. Entrance to the hall with camera and signalling 2020]

6 CONCLUSION

The article aimed to analyse the process of storage, assembly and dispatch in the selected company and suggest possible steps to eliminate deficiencies and problems. The dispatch section was chosen based on the company's requirements, primarily because the established system and facilities for completion and dispatch were replaced by a separate unit for producing machinery and technological structures. The proposed solutions include recommendations for the proper functioning and smooth running of the dispatch process, also in terms of workplace safety and facilitating the work of the dispatchers.

Due to the company's current state, the resulting proposals are applicable to the company. The results have shown that the above recommendations follow the analysis of the current state and the identification of shortcomings and problems. Their use will streamline the entire process of processing a business order, especially the storage, completion and dispatch phases, make work more accessible and more pleasant for employees and create a safe and visually clear workplace.

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CONTACTS:

Ing. Michal Bucko
Ing. Vladimira Schindlerova, Ph.D.
Ing. Ivana Sajdlerova, Ph.D.
VSB – Technical University of Ostrava
Faculty of Mechanical Engineering
Department of Mechanical Technology
17. Listopadu 2172/15, 708 00 Ostrava-Poruba, Czech Republic
michal.bucko@vsb.cz, phone: +420775474277
vladimira.schindlerova@vsb.cz
ivana.sajdlerova@vsb.cz
https://www.fs.vsb.cz/345/cs/