THE ORGANIZATION OF PROCESSES AND THEIR RELATIONSHIPS IN THE IMPLEMENTATION WELDED CONSTRUCTIONS

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Abstract

The organization and supervision of logistics processes which are related to the implementation and delivery of welded pillars, has been presented in this work. The article contains the characteristics of logistics processes that affect the creation of plans to executions' schedule. The paper presents an analysis of the assumptions and requirements for the transport of bulky products, which are carried out on the construction site of noise barriers in a timely manner and according to the accepted delivery schedule. The process of logistics, which has been presented in the work was built as an orderly chain of all operations related to the material and information flow between the various stages of the contract, along with the required technical documentation. Logistic service is a result of analyzed processes, which is directly related to the delivery of products in quality and quantity and the time consistent with the expectation of the customer.

Keywords: Logistic chain, large-scale transport, welding processes construction

1. INTRODUCTION

Nowadays there is a dynamic development of supply chains and their adaptation to the needs of internal and external customers. The supply chain is a synergy between many processing, trading, logistics and companies involved in the flow of products, information and financial resources. Supply logistics requires the implementation of numerous supply chain links that will be relatively constant and repetitive at regular intervals. Examination of order time, delivery period and storage will allow the company to reduce the value of frozen capital in stock. More and more companies seek to minimize the total cost of product flow of information while maintaining the level of customer quality, service delivery. Effective management is based on the integration and management of three types of flows or core processes: products, information and money. One of the basic tasks in supply chain management is to reduce the uncertainty that is the cause of purchasing stocks or inventories of security. The company should also take into account the inventory deficiencies that threaten the loss of potential customers. Supply, production, and distribution logistics should be so coordinated that its primary purpose is to meet customer needs and thus sales [1, 2].

The aim of the paper is to present the characteristics of the logistic relations with the manufacturing process and the transport requirements of the large loads that are carried out in the process as well as the delivery to the customer's premises.

2. TRANSPORTATION OF CARS ON PUBLIC ROADS

Within the European Union as well as in the Republic of Poland there are uniform regulations which apply to the maximum dimensions of heavy goods vehicles so that they can move on public roads in accordance with the law. Of course, there are some exceptions to these rules, namely the transport of so-called oversized loads, but they are treated in an exceptional way and require special permits. The rules that define the maximum dimensions of vehicles are very precise and primarily concern vehicle manufacturers who apply for approval within the European Union. Compliance with the legal requirements is the basis for obtaining an approval under which they are permitted for road traffic.

The maximum length of a single vehicle (truck) can not exceed 12 meters, and if we are dealing with an articulated vehicle, this length can not exceed 16.50 meters. On the other hand, vehicles with a trailer can measure up to 18.75 meters. The maximum width of the vehicle must not exceed 2.50 meters, which is related to the width of the lane and the difficulty of maneuvering on the road. However, this is a width not including the mirrors fixed on the articulated booms, the side lights of the vehicle and the elastic elements made of rubber or plastic. The height of vehicle can not be more than 4.00 m. Allowable weight loads transported depends on the type of vehicle which carries them. Under the traffic laws, the load in the first place must not exceed the maximum permissible mass or permissible load capacity of the vehicle. The permissible total weights of vehicles are specified in the Regulation of the Minister of Infrastructure concerning the permissible total weights of vehicles. The permissible total mass of a vehicle depends on the technical conditions of the vehicle and must not exceed that of the combination vehicle: two-axle trailers - 18 tons, three axles - 24 tons; vehicle assemblies having 5 or 6 axles - 40 tonnes, a combination of 4 axles consisting of a two axle vehicle and a two axle trailer - 36 tonnes, a two axle vehicle - 18 tonnes, a three axle vehicle - 25 tonnes or 26 tonnes.

3. CHARACTERISTICS OF THE RESEARCH SUBJECT

3.1. Logistics processes

Performing a customer order for welded constructions according to its specifications is realized with the use of materials and raw materials of the company. The welding technology team selects the quality requirements for the execution of the individual processes, taking into account the conditions of the design and operation of the construction and the quality standards and requirements for the qualification of the technology. The welding process of the components is carried out according to the guidelines prepared and included in the documentation of welding instructions. The purpose of performing the welded joint is to create a metallic continuity obtained by the weld process, which is obtained by local heat transfer resulting in the melting of the base material with the binder used. Welding processes are classified as special processes, due to the multiplicity of factors and their interdependencies that affect the final quality of the produced connection. In order to ensure an adequate level of quality for welding welds, and as a result of the whole structure, the process of the process must be properly prepared and supervised. The supervisor is responsible for: the appropriate welding technology depending on the conditions and materials, the concentration factor of the welding energy supplied, the characteristics of the materials to be bonded and the choice of the bonding material (electrodes or flux), the geometry and design of the joint [3]. All these elements must be included in the production document for the welding process plans required by the weld quality system guidelines according to the applicable standards.

Welding Department realizes construction projects using the arc welding method with the use of a fusing electrode made in the gas shield MAG 135. The use of automation and mechanization in welding processes is possible with gas shielding (MIG, MAG, and TIG) methods, which also allow the observation of arcs and lakes and enables welds in various positions.

A map of basic processes carried out in the subject areas of the researcher include: offering, acceptance of an order, preparation of an order, production planning, realization, settlement of production, logistics. Offers to DKS (department of construction) pass from the customer through the inquiry system, or as a result of the meeting. This information is then moved to the common system box "offer-DKS". On this basis, the system is entered and the ZK number (customer order) required for the calculation is entered. The department prepares the quotation of the inquiry on the basis of information: valuation and availability of materials (in firms 'internal warehouses), valuation of the necessary technological processes (their time and cost of working hours) and valuation of the individual transports required. The costs calculated by the CS Director's decision are addressed to the customer.

All information relating to the customer's requirements and the findings made, in a shorthand form, goes to Form F-100. Determining and accepting the offer by the customer becomes a prerequisite for further action.

The form contains a compilation of the calculated costs and the gathering of all the information required by the client, the necessary PN EN 1090 norms, the basic material, the scope of the necessary tests, as-built documentation requirements. Preparation of the production order is made by the engineer assigned to the subcontractor who confirms all previous arrangements and replaces the production schedule, booking material and orders for each department. If necessary, the main welder will be consulted regarding the feasibility of the project.

After the customer accepts only the order confirmation (internal F.P. program) or a customer agreement is signed, the legal department is required. In case of significant value of the project, the decision to join the contract will be made after approval of the CS Director. After all the required approvals, the order is delivered. If the order originates from a brand new client that is not in the customer base of the company (FP program), it is required to register and approve the cooperation started by the management on the basis of the client documents presented.

Production is carried out on a specific order, not on stock, and the most important part of the implementation is the fulfillment of the deadlines specified at the stage of accepting the order. First the KTM (Commodity and Goods Card) is created for each order, which takes into account the classifications of the grades of steel required and their thicknesses. This information is provided in the FastProfit program to the production manager, followed by a schedule of work at each workstation, and a CNC control program for the preparation of the pellet. Based on the information from the FP, the trade department receives a message about the acceptance and start date of the production work of the order. After the production, the documents go back to the Customer Service Department, which calculates the production and release of the goods for customer transport within the framework of the work of the Logistics Department. It is only the settlement of production in the FP program (performed by the DOK section) gives the possibility to generate PM for the next stage (also the magazine). The shift between the various technological operations is organized by DKS - it has to locate the items, wait for the magazine to settle and issue the PM necessary for the loading of the car - of course also in agreement with the logistics department of car and driver substitution. In agreement with the logistics department, the delivery date is generated and after the PM is confirmed, it is executed [4].

Employee and employee workload schedules and subsequent settlements are based on Gantt charts, as illustrated in **Figures 1 and 2**.

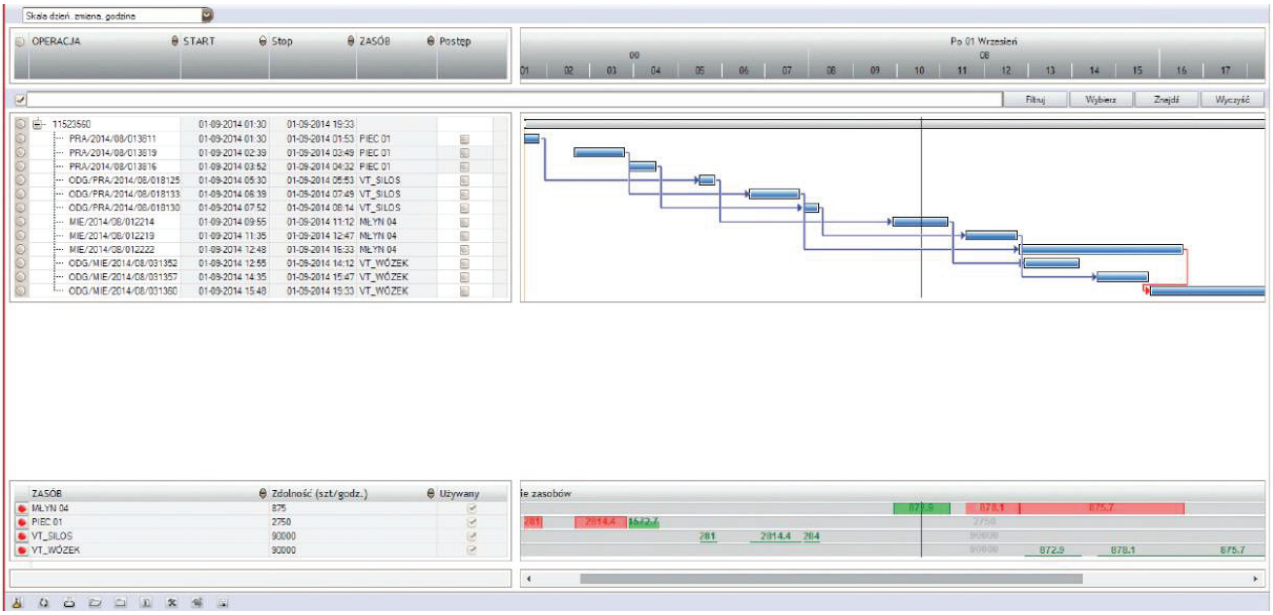

Figure 1 Gantt chart for production order

Figure 2 Resource load graph

3.2. Characteristics of the research object

Analysis of the basic manufacturing process carried out by the units of the research entity is presented on the example of the construction of "screen posts *02-03".* This product is one component of a design of a support structure designed to mount acoustic screens on highways and highways. Acoustic screens that are set up in the roadside lane are installed and assembled to HEB type profiles, they must be properly prepared and, most importantly, firmly embedded in the substrate. Designed and manufactured in the company, the pillars are the foundation of the supporting structure that holds the screens vertically and provide them with rigid rigidity. The project involves mounting posts to specially prepared foundations armed with threaded spindles, to which a laterally reinforced column foot is bolted.

The technical drawing of the product analyzed, as shown in **Figure 3**, contains a column structure of the type "S2.6- *PZ-S-8-118".* This pillar is a supporting element of screens H = 6.0 m high and span of single span 2.0 m. The presented product is part of the investment "Construction of the S8 expressway". The entire project consists of 6 different types of components: SD4.3 (106 pcs), SD4.6 (3677 pcs), S2.6 screens (2.0 m), post SD5.6 screens for 5.0 m span (106 pcs), SP1 anti-glare posts (104 pcs). The entire project requires the use of 1332390 kg of material which is general purpose structural steel S235JR and additionally aluminum anchors (element K1 - **Figure 3**). Unalloyed S235JR steel is widely used for welded components of load-bearing structures that are exposed to dynamic loads in operation.

The anchor block consists of foundation bolts (pipe type F30) with a minimum anchorage length of 1100 mm and Ø25 crossbar bars. The anchor block consists of 4 screws. It is advisable to fit the screws in the prepared template and it is important to secure the threads during concreting. Ground beams were designed as reinforced concrete of class B30 (C25 / 30) with different geometrical parameters, depending on the shape of the terrain on particular sections of the building. The preparation of the complex construction to install the acoustic shield panels in it must be fixed to the foundation foundations (so called foundation piles). Between the embedded individual columns, a concrete beam must be installed in order to grasp the level relative to the ground. This is done by adjusting it properly and, if necessary, cutting to the appropriate height at the ground.The components of the analyzed structure of the column are the main profile, the butt and the base. Material required for production (structural steel S235JR) in the form of two-piece beams is taken from the warehouse and transported to the cutting department.

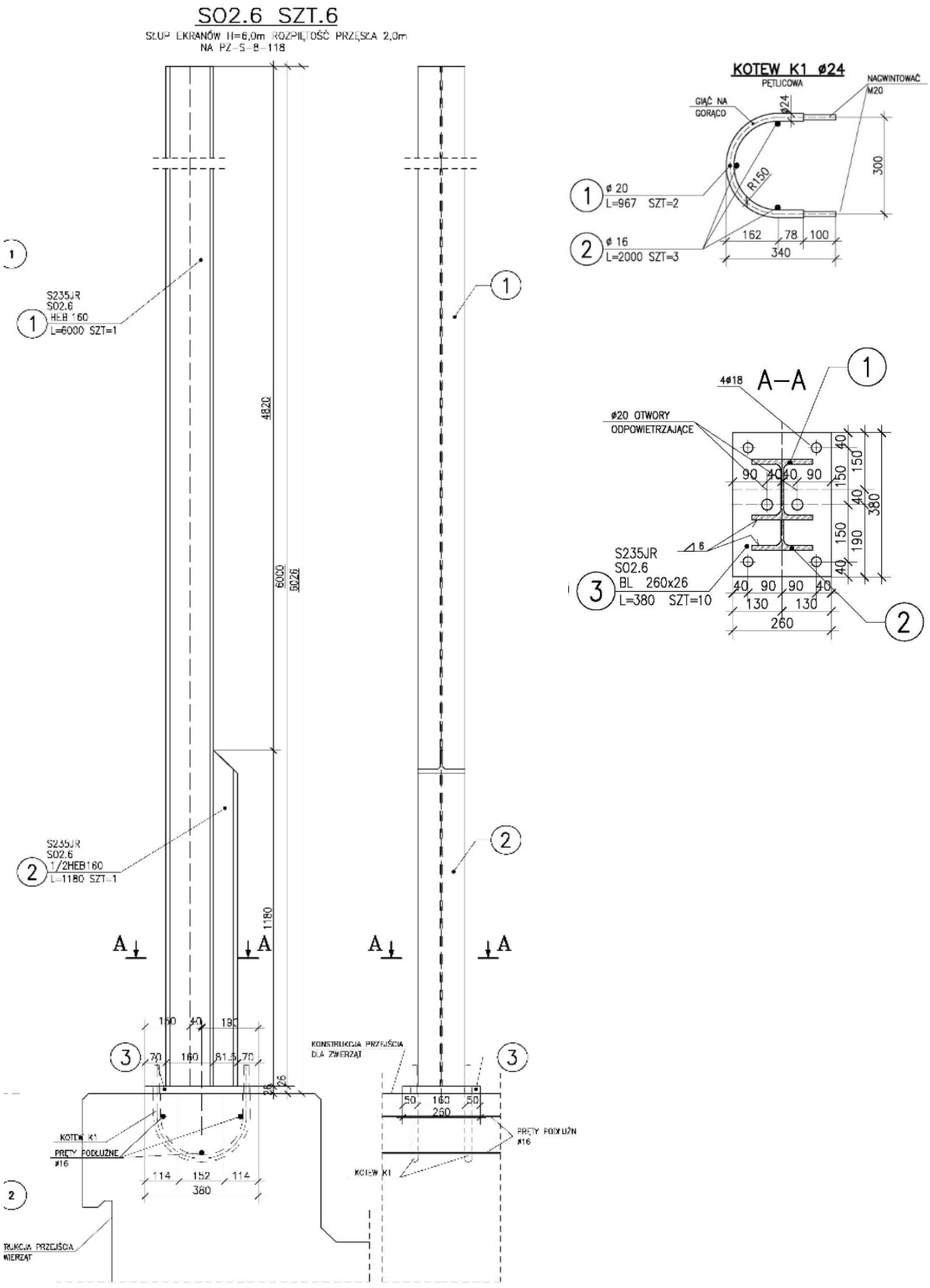

Figure 3 Technical drawing of columns construction elements „S2.6 - PZ-S-8-118”

The HEB 160 wide beam HEB 160, the HEB 160 wide beam halide halves, and the 26mm sheet steel for the base of the structure. At the cutting section, the HEB 160 bevelled cut is dimensioned on the pile of tape, the straight main profile and the 45 ° clamp, the ½ HEB 160 wide-angle beams burned halfway long as elements for the butt. After this stage the prepared butt stuff is transported to the firing department, where the longitudinal burnout process is carried out in half by means of a plasma scraper. The base parts of the structure are fired according to technical dimensions, including holes for sheet metal mounting anchors [5]. The individual parts are then transported to the welding department where they are assembled and the welding operations are performed, thus creating a ready-made pile structure.

Every technological operation is completed with a final quality control, where the process operator verifies the control results. In addition, according to the welding technology guidelines, this process must be completed by the quality controller. Each component of the structure, after performing all necessary welds, is subjected to quality control, including visual inspection of weld surfaces and geometric dimensions. Once approved, the semi-finished products are transported to the next stage of the galvanizing operation. Protective coating processes are performed on the galvanizing department or by the subcontractor. It is necessary that this process is preceded by a pre-treatment, which involves the proper preparation of the surface of the structure, at which point the digestion is performed. After preparation of the surface and the appropriate designation of each structure, the zinc coating is applied by dipping, by dipping the entire structure into a bath of hot zinc bath (about 465 °C). The second step in protecting the anticorrosive structure is wet painting with the use of epoxy-polyurethane paints. Prior to the painting process, the structure is subjected to a surface reclamation operation carried out by sand sweeping, which is intended to tarnish the zinc surface as this is necessary to obtain better adhesion of the paint. The painting process takes place in two stages, in the first part of this application process is epoxy paint, which is a primer, and then as a top coat is applied polyurethane enamel. Painting of the structure is carried out by means of the hydrodynamic pressure spraying method, which uses compressed air in the pump to supply the paint with a high pressure hose to the spray gun nozzle and spraying it appropriately.

Spraying of paint occurs as a result of exceeding the critical speed of its particles. This operation fully protects the structure by corrosive conditions, after which the construction is clearly marked and transported to the finished goods warehouse. When a planned batch of orders is made, the organization of large-scale shipments begins on the construction site. It is made according to the delivery schedule previously agreed. The shipment of ready-made construction is organized by the logistics department, which includes both the preparation of documents and the admission to large-scale transport operations.

4. SUMMARY

Satisfaction of the customer depends on the continuous improvement of the suppliers by their processes and the great flexibility of the companies in responding to customer needs. Increasingly, the success of an enterprise depends on cooperation with other partners in the competing supply chains. Integrated supply chain management, which operates according to a specific logistic strategy, makes it possible to make the best use of the capabilities and resources of the cooperating companies. The basis for this cooperation is precise information. An important role in streamlining flows in the supply chains is the packaging and marketing systems of these packages.

Getting information anywhere in the chain depends on the level of implementation of all relevant tools and information technologies in all of its components:

- integrated IT systems,
- a uniform standard for the identification of goods, services, locations,
- automatic identification of the order execution stage,
- electronic communications, including electronic data interchange.

Applying these solutions allows to: shortening cycle time ordering - invoicing - payment, availability of product information, tracking of traffic and location of each package, means of transport, etc., prompt and accurate input of information to the IT system, streamlining and automating the processes of receiving, storing, disposing and distributing goods.

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