DETERMINING WORK DELAYS AND TIME LOSSES AT WORK

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Abstract: *The research focuses on the analysis and optimization of standard times within the company's production process. The objective of this study was to examine the existing time standards, identify disruptions within the production process, and propose improvements that would enhance the company's overall efficiency and profitability. Accurately determined standard times in production enable better planning and organization of work processes. The chapter provides a detailed description of the analysed production in manufacturing company and presents the problem identified during the study. It was found that the existing time standards were outdated and no longer reflected the actual conditions of production. For time measurement and analysis, the Workday time profile method according to the REFA methodology was applied, along with the Normar 3.0 software package, which was used for precise monitoring and recording of operations within the production process.*

Key words: *normative time, production process, production optimization, production planning, time measurement*

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1. Introduction

Standard times represent a fundamental element in the effective planning and control of production processes. Their significance lies in several key aspects. Standard times, which are determined based on clearly defined conditions and specific assumptions, enable precise scheduling, organization, and optimization of production activities across various industries and sectors.

Accurately calculated standard times allow for the determination of the exact duration required for the execution of individual tasks or operations. This information serves as the basis for developing realistic production schedules, ensuring optimal capacity utilization, and supporting the reliable fulfilment of delivery deadlines. The processing times of activities can be determined using historical data, work sampling, or time studies (Tompkins at al., 2010; Buchmeister & Vujica Herzog, 2024; Garcia et al., 2019; Wong at al., 2020). In cases where changes occur in working conditions—such as modifications in workflow, technology, or workplace layout—deviations may arise between the planned and the actual execution times. Under such circumstances, it becomes essential to re-evaluate and update standard times to reflect the new conditions accurately (Bokranz & Landau, 2006; Grznar et al., 2022; Gupta et al., 2023; Palcic at al., 2024). Furthermore, it is advisable to conduct a comprehensive analysis of the entire workday of employees to identify potential inefficiencies and sources of time losses (Lee at al., 2023; Martinec at al., 2017; Wahid at al., 2020). This analysis provides valuable insights for the continuous improvement of work processes and contributes to enhanced productivity and operational excellence. For a better understanding of activity flows, it is also beneficial to consider simulations and the use of advanced technological equipment such as Xsens (Javernik at al., 2022; Vujica Herzog at al., 2023).

The purpose of this paper is to present a systematic approach for determining, evaluating, and applying standard times in production environments, with a particular focus on the REFA methodology. It outlines the key methods and procedures used for time studies, process analysis, and identification of improvement opportunities presented on a case of manufacturing company. The company is engaged in the development, production, and distribution of ventilation systems and solutions for improving indoor climate. Their products include a wide range of fans, air conditioning units, air handling units, fire dampers, and other components for ventilation systems.

In addition, the document provides practical guidance on how to apply standard times for production planning, capacity management, and performance optimization. Special attention is given to the role of time measurement systems, such as Normar 3.0 (Pisk, 2025) in setting accurate and reliable work standards.

2. Methodology

2.1. REFA approach

REFA is an association for work design, organization, and corporate development (REFA, 1997 and 2025). It is the oldest German organization in the field of work design, organization, and corporate development.

The REFA methodology originates from the Reichsausschuß für Arbeitszeitermittlung (Reich Committee for Working Time Determination), founded in 1924. Today, REFA is a registered and well-known trademark in Germany and more than 40 other countries.

When the Allied occupation authorities ordered the dissolution of all organizations in 1945, REFA also lost its legal status. However, in November 1948, the organization REFA Landesverband Hessen e.V. was re-established as Verband für Arbeitsstudien REFA e.V. Frankfurt am Main (REFA Association for Work Studies, Frankfurt am Main). Regional REFA associations had already started to be established from 1947 onwards. Today, REFA has a customer-oriented structure. Effective communication between REFA and its clients is ensured by 10 national and regional associations, which are further divided into approximately 85 regional organizations.

One of the key points in the founding protocol was the aspect of "cooperation with representatives of trade unions and employers' associations." All REFA association committees are composed of an equal number of members from trade unions and employer organizations.

REFA focuses on the optimization of work processes as well as the determination and evaluation of operational data. The basic methods can be used either as standalone tools or in combination with each other for a comprehensive analysis and optimization of the value-added chain within an organization. The REFA methodology is neutral with regard to wage and tariff policies.

For simple jobs where the work cycle depends on the worker—such as manual tasks or simple machine operations—standards are determined by recording and evaluating "planned sections" using systems such as Normar 3.0.

The time study analyst (recorder) carries out the following for each work process or operation:

- Work Process Analysis; The analyst reviews the workflow and workplace layout. Any inefficiencies are documented, and suggestions for more efficient work methods are proposed.
- Breakdown of the Work Process; Based on the duration and number of operations, the analyst divides the work process into meaningful segments and identifies key time-related parameters.
- Time Measurement; The analyst precisely measures the time required to complete each segment of the work process using the REFA method and evaluates the work performance level. All measured times are documented, regardless of their type.
- Evaluation of the Time Study; The time for each work segment and the overall process is assessed. The standard time is then determined based on the projected times according to the REFA methodology.
- Improvement Proposals; Along with setting the standard time, the analyst also provides proposals for process improvements, rationalization measures, or workplace enhancements.

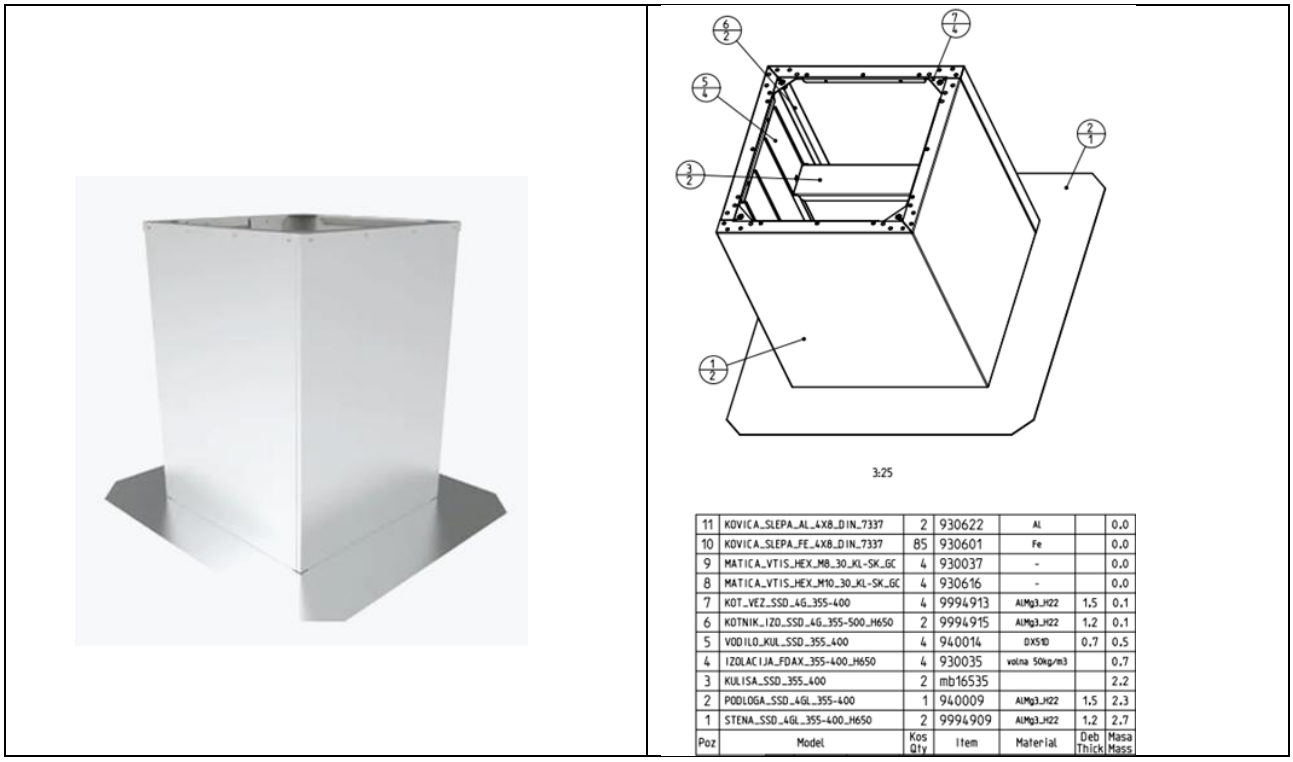
2.2. Workday time profile

The Workday time profile method is based on full-day time recordings, from which an appropriate time pattern of the process is obtained. Based on evaluations, standard times (norms) and the proportion of additional times are determined. Furthermore, it allows for a justified assessment of the structure and organization of work. The recording is carried out by logging the type and duration of all activities during the working hours. For performing measurements, we can use various software programs such as Drigus or Normar 3.0.

When conducting measurements using the Workday time profile method, it is important that the measurement procedure is carried out correctly and, above all, that we do not influence the overall process in any way (Krajnc, 2024). Ideally, measurements using this method should be conducted for around 40 hours or approximately one week. The larger the scope of the measurement, the higher the quality of the data obtained.

3. Current state and problem statement

The observed workplace is part of a sheet metal workshop, where most of the work is carried out by two workers (Leva, 2024). For our research product called 'Roof Socket Silencer' will be presented. This type of silencer has no slope, which means it is intended for flat roofs (Figure 1). The main work process involves assembly, which includes several smaller tasks such as riveting, drilling, screwing, gluing, sealing, cutting of wool, etc. The production mainly uses thin sheet metal, approximately 1 mm thick. A significant amount of insulation wool and foam is also used, serving as both sound and thermal insulation.



Poz	Model	Kos Qty	Item	Material	Deb Thick	Masa Mass
11	KOVICA_SLEPA_AL_4X8_DIN_7337	2	930622	Al		0.0
10	KOVICA_SLEPA_FE_4X8_DIN_7337	85	930601	Fe		0.0
9	MATICA_VTIS_HEX_M8_30_KL-SK_GC	4	930037	-		0.0
8	MATICA_VTIS_HEX_M10_30_KL-SK_GC	4	930616	-		0.0
7	KOT_VEZ_SSD_4G_355-400	4	9994913	AlMg3_H22	1,5	0.1
6	KOTNIK_IZO_SSD_4G_355-500_H650	2	9994915	AlMg3_H22	1,2	0.1
5	VODILO_KUL_SSD_355_400	4	940014	DX51D	0,7	0.5
4	IZOLACIJA_FDAX_355-400_H650	4	930035	volna 50kg/m3		0.7
3	KULISA_SSD_355_400	2	mb16535			2.2
2	PODLOGA_SSD_4GL_355-400	1	940009	AlMg3_H22	1,5	2.3
1	STENA_SSD_4GL_355-400_H650	2	9994909	AlMg3_H22	1,2	2.7

Fig. 1. Silencer base and its drawing with components.

The work is performed by two workers. To begin the task, all components and tools must be available. The components are always listed on the work order, which includes assembly drawings and the necessary parts. Additionally, the production time or standard time (normative time) is specified.

For an extended period, the Gantt chart outlining the production schedule has shown that the workload in the sheet metal department regularly exceeds 100%, occasionally even reaching levels above 160%. Despite this, production has continued to operate smoothly, without signs of overloading or delays.

As illustrated in the chart below (Fig.2), which presents workload percentages, the average occupancy rate is 128.2%. If such high workload levels are reflected in the planning tool, yet operations in practice proceed without disruptions or excessive strain, this indicates one of two possibilities: either the production processes are more efficient than initially assumed, or the Gantt chart does not accurately represent the actual state of operations.

In this context, it can be concluded that the standard times (normative values), which were set some time ago, are no longer aligned with current production capabilities — in particular, that the predefined times are longer than the actual times required for completion.

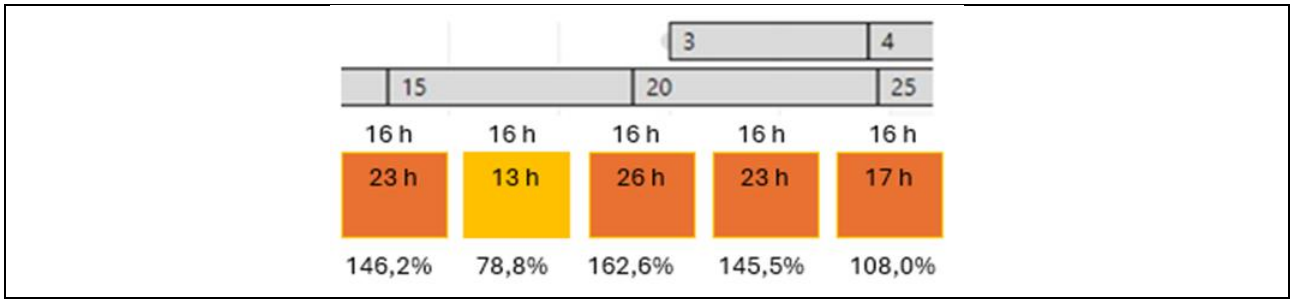


Fig. 2. Example of Increased Production Capacity.

The operation for assembling bases or silencers is labelled as 3KLEP. The standard time is indicated on the work order in hours, rounded to two decimal places. In this case, the original standard time was 7.78 hours, as shown in the Fig. 3. This translates precisely to 7 hours, 46 minutes, and 48 seconds — or approximately 7 hours and 47 minutes. It was later determined that the updated standard time differs significantly from the original value.

5	940009	Pisp SSD 355-400	12		piece	210524
10	9994909	Wall SSD 355-400 H=650	24		piece	210524
12	9994915	Angl vet SSD 4g 355-400 H=650	24		piece	210524
14	9994913	Angl Izzo SSD 4g 355-400 H=650	48		piece	210524
18	930616	Nut M10 HEX-30 KL-SK	49		piece	210524
20	930037	Nut M8 HEX-30 KL-SK	48		piece	210524
25	940901	Sliding block half-frame SDD 355-400	48		piece	210524
30	940014	Sliding block guide SDD 355-400	48		piece	210524
35	930035	Insul. Min vol. D=50 60 kg	28,80		m^2	210524
50	940388	Instaset SSD 355-400	12		piece	210524
60	930036	Insul. Min vol. D=50 60 kg	1,14		m^2	210524
5	**3KLEP**	**Assemble the base**		**7,78**		210524
55	930036	Wooden pallet SSD 335-400	1		piece	210524
15	**4EMBA**	**Pack Pak-K**		1,3		210524

Fig. 3. Displayed Production Time on the Work Order Including Packaging.

4. Workflow Using the Normar 3.0 Software Tool

Normar 3.0 is a specialized software tool used for data collection aimed at determining standard times. The company that developed the Normar 3.0 software package is a licensed partner of the REFA Association of Germany. Its core focus is on time standards and all aspects related to time measurement, rationalization, and optimization of production processes.

The program offers a selection of different methods depending on the characteristics of the work process. The user experience is further enhanced by the Slovenian-language interface, as the software is developed in Slovenia. It is designed for use on both computers and tablets, with tablets being a more suitable option due to their mobility. Normar 3.0 significantly simplifies the execution of time studies by providing an intuitive interface, along with immediate statistical calculations and visualizations, which are ready for further analysis and data export. Hierarchy of the Normar 3.0 software:

1. Product (may contain one or more products and one or more tasks),
2. Work task or analysis (A work task represents part of the time study data, while an analysis can be either Workday time profile method or Work Sampling Method),
3. Time study (represents all the data from the form defined by REFA),
4. Section (is part of an operation. Each section contains three key pieces of data: name, quantity, and measurement point).

Key Features of the Normar 3.0 software:

- Low package cost,
- Fast and easy paperless time capturing,
- Versatile use in work and time studies (REFA time recording, Work Sampling Method execution, planned times),
- Upgradeable for the use of various other methods and tools (e.g., Workday time profile method),
- Automatic evaluation of recordings – eliminates the need for manual statistical analysis by an analyst, saving time,
- Statistical processing of the entire section and individual segments, with the system automatically highlighting outliers based on the desired recording accuracy,
- WiFi protocol support for data transfer to and from the tablet,
- Photo or video documentation of the recording (if supported by the device),
- Real-time calculation and evaluation of all times during recording – directly at the workplace,
- Relatively short training time for users to operate the Normar 3.0 software,
- Easy archiving and structuring of individual recordings based on selected criteria, such as department, product family, product, operations,
- Simple and quick search for desired time recordings or individual operations,
- Data export to PDF or Excel, etc.

The image below (Fig. 4) provides a sample view of the Normar 3.0 software in use with the Workday time profile method. It shows the interface during the measurement process, where individual operations are added and times are recorded in real time. Later in the sample technical report, we will see that the software also offers valuable insight into the results and presents the analysis clearly through graphical representations.

When performing measurements using the Workday Time Profile method, it is essential that the measurement procedure is accurate and, above all, that we do not influence the entire process in any way.

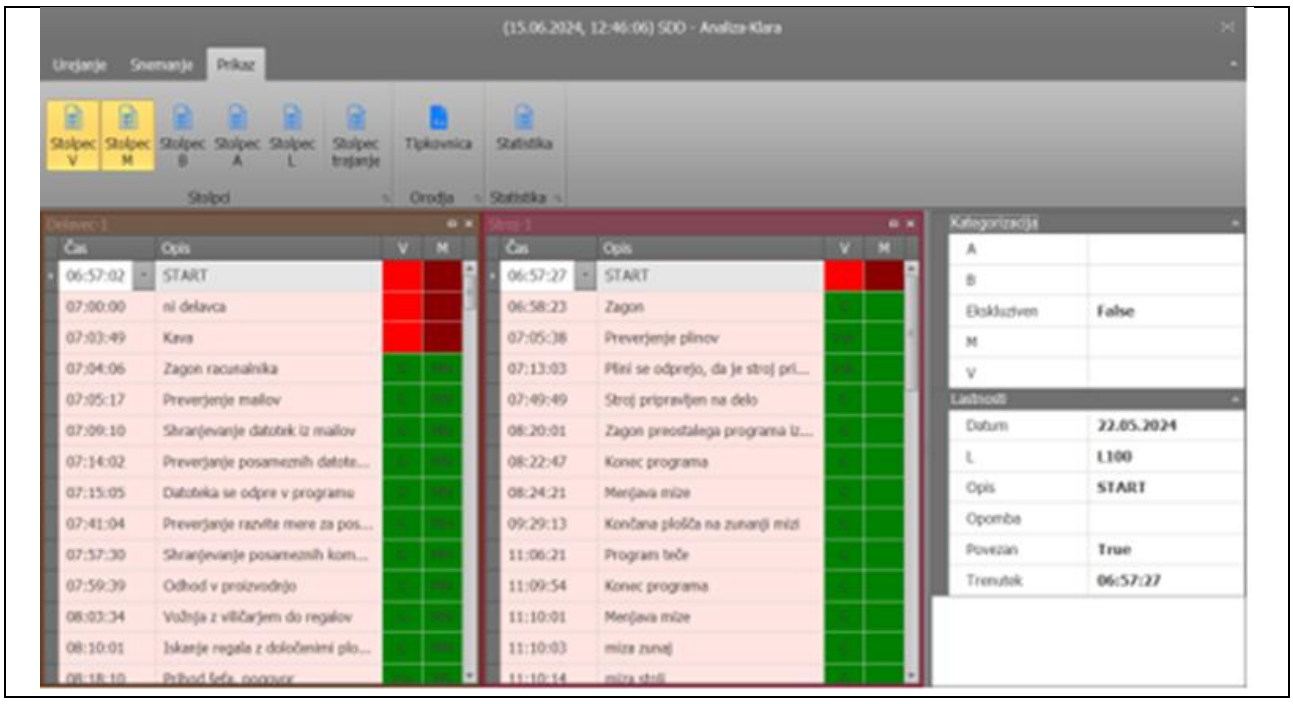


Fig. 4. Screenshot from the Normar 3.0 application.

First, we needed to familiarize ourselves with the workplace. It is important to understand the operations to be performed, as this facilitates later measurement and the identification of individual tasks. Next, the measurement location must be determined, ensuring that we do not interfere with the process or cause unnecessary interactions with the surroundings. At the beginning, it is necessary to decide how to divide the operations. The operations should not be broken down into too many individual movements, nor should they be too broadly categorized, as this would prevent detailed insight into the times of individual parts or tasks at a later stage.

Before launching the program, the date and time must be correctly set on the laptop or tablet. Once the time is set, two tables open: in the first table, each individual worker operation or task is entered, and in the second table, machine operations are recorded. The column "V" indicates the type of time, while the label "M" denotes the type of activity.

Measurements were conducted for 8 hours. We recorded all possible times, capturing everything that occurred during the workday. After completing the measurements, the individual times were categorized. Categorizing times is crucial in this case, as without it the times hold little meaning during analysis.

In our case, we categorized times as allocation times and by worker. In addition to these two categories, it is also possible to categorize based on work preparation, ergonomics, work object, etc., which we did not apply in our case.

Additional or allowance times are an unforeseen part of every work standard. They are added as a percentage (%) of allowance time to the basic working time. Based on the analysis, we determine the following allowance time percentages:

- The label G represents basic time, such as starting up the computer, checking emails, driving a forklift, operating a machine, creating a technology process, stacking parts, monitoring a machine, or removing waste.
- The label V_{sk} represents constant time, which is independent of circumstances, such as cleaning the workstation, saving files, or shutting down the computer. For machines, this includes activities like starting the machine, saving programs, or shutting it down.
- The label V_{sv} represents variable time, which depends on circumstances, such as cleaning the area around the machine, organizing the workspace, talking with the supervisor, or checking material stock.
- The label N represents non-recorded time, for example when the worker is not present at the workplace.
- The label F represents conditionally recorded time, i.e., time that is sometimes considered and sometimes not, such as talking with a coworker, walking to the machine, speaking with the operator, short team meetings, or machine idle time.
- The label V_p represents personal time, such as using a vending machine, going to the restroom, or taking a water break.
- The label E_r represents rest time.

The sum of these allowance time percentages gives us the total allowance time share "Z_{sv} [%]", which is added to the basic time. Using the calculated allowance time share, we can typically identify unjustified and unproductive times, as well as other times that may be considered under specific conditions.

Abbreviations and their meaning from Additional or allowance times work perspective:

- MH – Main activity (primary task performed by the worker),
- MN – Auxiliary activity (supporting tasks such as tool preparation or setup),
- MZ – Additional activity (tasks that extend the main task, e.g., documentation or reporting),
- MA – Interruption due to the procedure itself (e.g., waiting for a machine to complete a cycle),
- MS – Interruption due to disturbances (e.g., machine malfunction, missing materials),
- MP – Interruption due to personal reasons (e.g., phone call, private conversation),
- ME – Interruption due to recovery (e.g., short rest or fatigue-related pause),
- MX – Unidentifiable (activity or reason for time use could not be determined).

5. Results and discussion

The collected data will be presented in the form of a report, which includes a presentation of the results, suggestions, findings, and ultimately a new work standard. The results are presented and extracted from the Normar 3.0 software, with additional support for individual calculations provided by Microsoft Excel. On Tab. 1-4 and Fig. 5-8 additional or allowance times and the human times are presented for Workers 1 and 2.

	Duration	%
Σ of times G	5:06:51	71.4
Σ of times V_{sk}	0:22:43	5.3
Σ of times V_{sv}	0:06:30	1.5
Σ of times V_p	0:37:21	8.7
Σ of times E_r	0:00:00	0.0
Σ of times N	0:56:35	13.2
Σ of times F	0:00:00	0.0
Σ of times tr	0:00:00	0.0
Total sum	7:10:00	100.0

Tab. 1. Additional or allowance times for Worker 1.

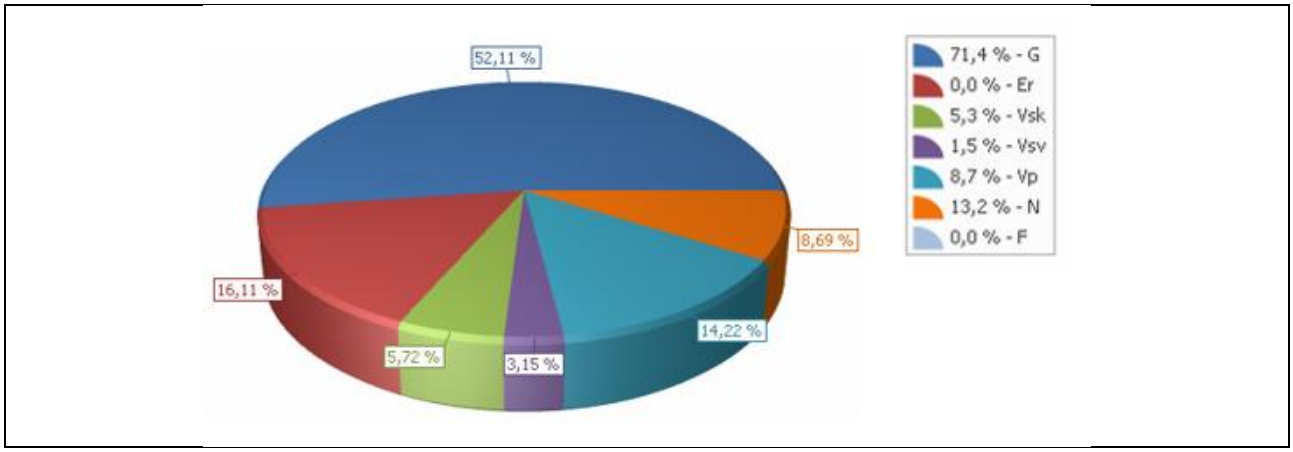


Fig. 5. Chart with additional or allowance times for Worker 1.

	Duration	%
Σ of times MH	3:44:04	52.1
Σ of times MN	1:09:16	16.1
Σ of times MA	0:13:33	3.2
Σ of times MZ	0:24:37	5.7
Σ of times MS	1:01:09	14.2
Σ of times MP	0:37:21	8.7
Σ of times ME	0:00:00	0.0
Σ of times MX	0:00:00	0.0
Total sum	7:10:00	100.0

Tab. 2. The human times for Worker 1.

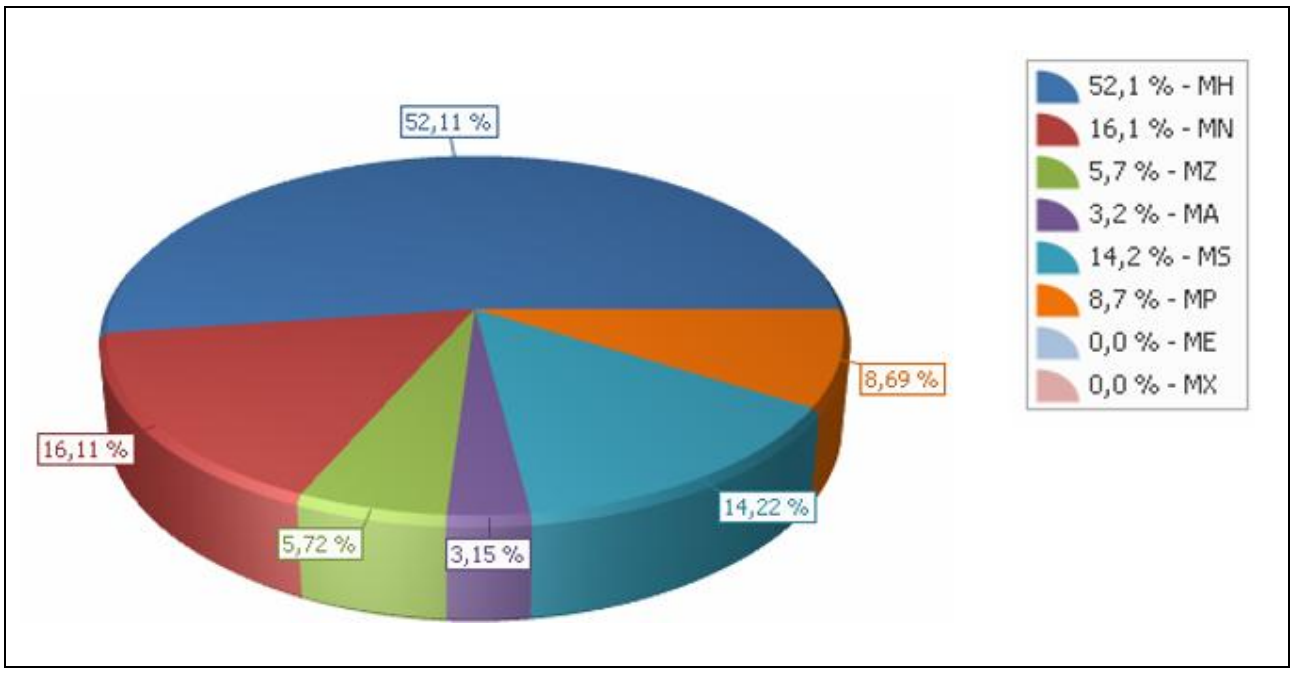


Fig. 6. Chart with the human times for Worker 1.

	Duration	%
Σ of times G	5:49:25	81.3
Σ of times V_{sk}	0:26:00	6.1
Σ of times V_{sv}	0:07:36	1.7
Σ of times V_p	0:16:37	3.9
Σ of times E_r	0:00:00	0.0
Σ of times N	0:30:22	7.1
Σ of times F	0:00:00	0.0
Σ of times tr	0:00:00	0.0
Total sum	7:10:00	100.0

Tab. 3. Additional or allowance times for Worker 2.

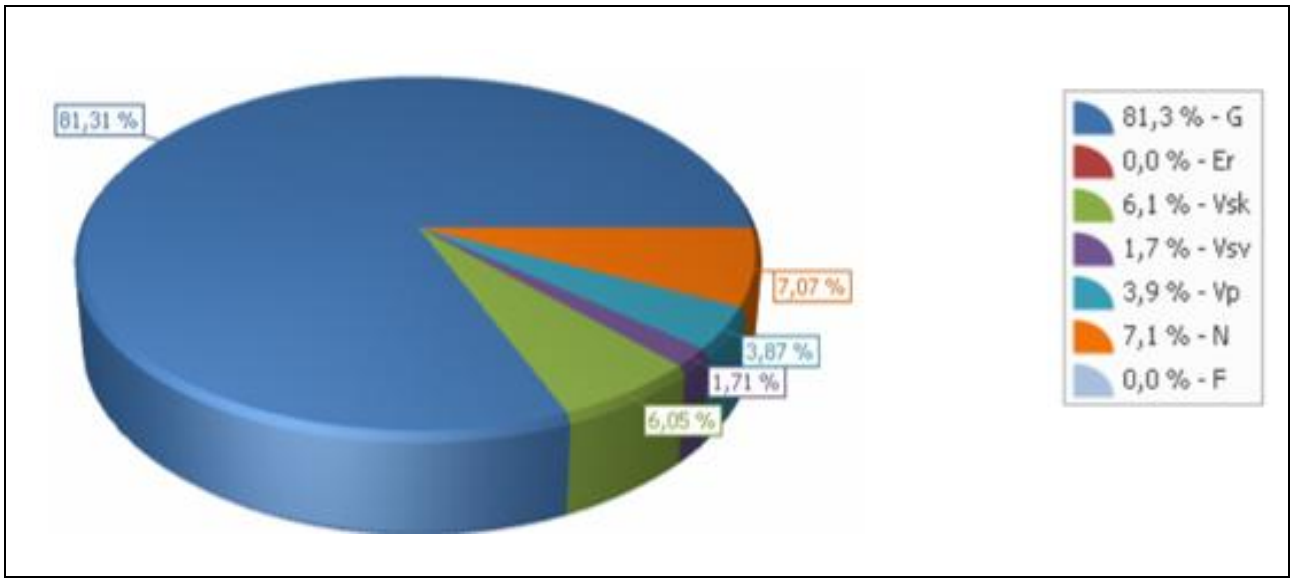


Fig. 7. Chart with additional or allowance times for Worker 2.

	Duration	%
Σ of times MH	4:57:17	69.2
Σ of times MN	0:38:32	9.0
Σ of times MA	0:13:42	3.2
Σ of times MZ	0:19:11	6.1
Σ of times MS	0:44:31	8.8
Σ of times MP	0:16:37	3.9
Σ of times ME	0:00:00	0.0
Σ of times MX	0:00:00	0.0
Total sum	7:10:00	100.0

Tab. 4. The human times for Worker 2.

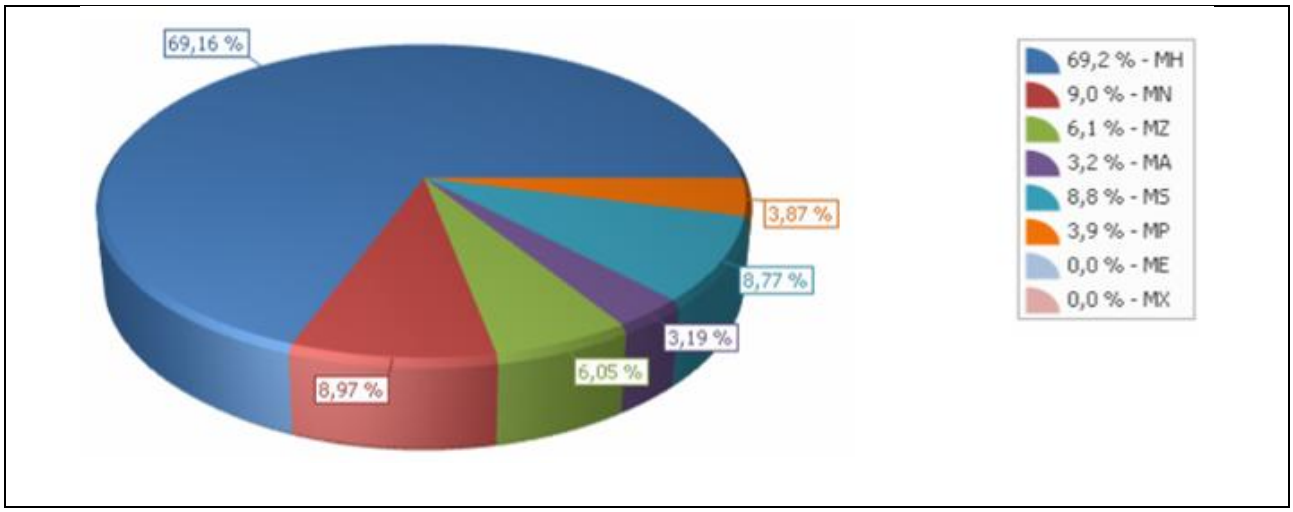


Fig. 8. Chart with the human times for Worker 2.

The data clearly show that Worker 1, like Worker 2, performs a sufficient or satisfactory share of work during the workday—71.4% and 81.3%, or 52.1% and 69.2%, respectively. For Worker 1, it is important to note that he has additional responsibilities, such as process supervision, recording work orders, etc., which reduce the share of main activities (MH). It is also essential to consider that the stated working time is not 8 hours, but rather 7 hours and 10 minutes. This is due to a 30-minute lunch break and two 10-minute short breaks. The current production time required to produce 12 base supports amounts to 7 hours and 47 minutes. In our case, the two workers completed this task in approximately 7 hours and 5 minutes, even considering that they were engaged in other tasks for about 5 minutes during that time.

By observing the work process—and based on the clearly presented data—it is evident that the assembly of 12 base supports proceeds at a normal working pace, meaning the set standard is met. However, we observe that during the 8-hour work process, there is a higher level of noncompliance or lack of discipline. The value of personal time also exceeds the normal range, although this is not as relevant in this case compared to other factors. The increased value of noncompliance (N) is a result of an overestimated normative time, which should be adjusted based on the measured actual production times.

From the Workday time profile method recording, we also obtained or calculated the times that occur most frequently and are of key importance in carrying out the specific work order, as well as the quantities that describe how many times a certain task needs to be repeated based on the work order, which in our case consists of 12 sub-items. In addition to the mentioned calculated or measured times, we must also take into account that shorter times related to activities not directly tied to the work order — such as cleaning, maintenance, minor disturbances, personal needs, preparation/cleanup of the workplace, and ultimately also non-compliance — are excluded. We also consider that, in our case, the work cannot be planned in such a way that both workers are 100% occupied at all times. Therefore, there are short periods where one worker has to wait for the other to complete their part, as their tasks are interdependent. As mentioned, this waiting is part of the work process and is therefore also classified under category G (basic time), specifically in subcategory MA, which includes times considered interruptions due to the nature of the process itself. For this reason, the calculation below is for informational purposes only. The waiting times, therefore, amount to worker 1 is 13min 33s and for worker 2 is 13min 42s. If we sum up the shorter times (excluding non-compliance and personal needs), we get the following times that are considered part of the work, for worker 1: 1h 21min 47s and for worker 2: 1h 4min 12s. If we add up the times for the basic operations (multiplied by the number of repetitions), include the waiting times and the aforementioned minor times, and then add an acceptable share for personal needs (4%) along with the average proportion of distribution time (1.6%), excluding non-compliance, we get the following new times. For worker 1: 4h 12min 12s and for worker 2: 05h 51min 24s.

In presented case, it makes sense to take the longer time as the realistic production time, which amounts to approximately 5 hours and 52 minutes. According to the original standard, which was 7 hours and 47 minutes for 12 products, we can calculate that the time required to produce one sub-item was approximately 39 minutes. Based on the new calculation, the time required for one sub-item is approximately 29.3 minutes. From all stated, we can conclude that the previously calculated standard was about 25% higher. In addition to the calculations above, it is also meaningful to determine the losses caused by increased personal needs as well as non-compliance, which is not tolerated (Tab. 5). The results show how much time would be spent on personal needs within the allowed limits, assuming there is no non-compliance at all. For comparison, the actual situation is also presented for each worker individually. The results also include calculations of how much time is lost on a daily basis due to these factors. The outcomes differ significantly between the two workers. Time loss compared to ideal state (412.8 minutes) is for worker 1: 77.0 minutes and for worker 2: 30.1 minutes lost.

	Work per shift (min)	Personal Needs		Non-Compliance		Actual Work (min)
		(%)	Minutes	(%)	Minutes	
Ideal	430	4.0%	17.2	0.0%	0.0	412.8
Worker 1	430	8.7%	37.4	13.2%	56.8	335.8
Worker 2	430	3.9%	16.8	7.1%	30.5	382.7

Tab. 5. Loss of time due to personal needs and non-compliance.

Assuming these losses occur daily and taking into account that the working year 2024 includes 262 working days (2096 hours), we estimated the annual time losses for Worker 1 is 336 hours and for Worker 2: 131 hours. Considering average labour cost per hour of 32€ per worker, we can calculate the annual financial impact by multiplying the number of lost hours by the hourly rate. Summing the two values gives us a total annual cost of 14,944€ due to time losses from excessive personal needs and non-compliance. To illustrate the cost-saving effect of implementing the new time standard, we can compare the labour costs for producing 12 sub-items under both the old and new standards. According to the old standard, it was possible to assemble at most 10 sub-items during an 8-hour workday (Tab. 6). Under the new standard, it is possible to assemble 14 sub-items in the same time. This clearly demonstrates the efficiency improvement and potential cost reduction brought by the new time norm.

	The old standard time	The new standard time
10 sub-items per 8-hour workday	6 h and 30 min	4 h and 53 min

Tab. 6. The old and new standard time for 10 sub-items.

6. Findings and recommendations

Findings and recommendations can be summarised as follows:

- Efficiency Gap Between Employees**;** there is an approximate 10% difference in efficiency between the two employees, which translates to around 43 minutes per day. Through task redistribution and standardization, this time loss could potentially be reduced, leading to improved overall productivity.
- Inaccurate Standard Time**;** the task was completed in less time than the defined standard, despite a higher share of personal time and noncompliance, which clearly indicates that the current standard time is not accurate and needs revision.
- Workplace Organization; when disregarding personal needs and noncompliance, the workstation is well-organized, and both employees are fully engaged most of the time. This suggests that the operational flow is generally efficient.
- Proposal for Process Optimization; it has been observed that manual sealing using a caulking gun is time-consuming and results in lower consistency in quality, often requiring rework due to unavoidable defects.
- In contrast, using an electric sealing gun would significantly reduce or eliminate such issues, improving both efficiency and quality repeatability.
- Adjustment of Standard Times; to increase productivity, the existing standard times must be revised. This adjustment would also help to reduce observed noncompliance. Current measurements indicate that the existing norms are not aligned with actual working conditions, contributing to decreased motivation and discipline. Recalibration would have a positive overall effect.
- Excessive Personal Time; the maximum prescribed share of personal time is 4%, whereas in both observed cases, it was at least twice that amount. After implementing a new standard, it will be necessary to verify whether the personal time shares decrease to the acceptable level.

6.1 Evaluation of Advantages and Limitations of the Applied Methods

The Workday Time Profile method is a specialized approach for conducting this type of measurement. Like any method, it offers distinct advantages but also presents certain limitations.

Key Advantages:

- Comprehensive coverage of the entire workday
- The method allows for recording the entire working day, offering a complete overview of the work process.
- Simplicity of data recording
- Data collection is straightforward and does not require complex technology, making the method practical and accessible
- Observational approach
- It enables the observation and documentation of activities that might be overlooked in standard operation-based measurements.
- Detailed analysis of the workday
- The method is well-suited for in-depth analysis, enabling better understanding of various phases and interruptions throughout the work process
- Visualization of allowance times
- It provides clear time allocation across different activities and tasks, supporting more accurate time and task planning.
- Suitable for complex tasks
- It is appropriate for more demanding work environments, such as operating multiple machines or group-based tasks.

Observed Limitations:

- Lack of focus on individual operations
- In contrast to methods dedicated to single operations, this method does not emphasize detailed analysis of specific operations
- Initial uncertainty in breakdown structure
- During first-time implementation, it may not be immediately clear how to break down operations into sub-operations, which can impact data accuracy and consistency
- Time-intensive implementation
- To achieve reliable results, at least 40 hours of observation (approximately one full workweek) are recommended, which may present time and staffing challenges.

7. Conclusions

An analysis of the existing standard times within the company revealed that these standards are outdated and no longer reflect the actual state of production processes.

This discrepancy led to inefficiencies in production planning, as the actual operation times frequently deviated from the predefined standards, negatively impacting production efficiency and worker workload.

Following precise time measurements and data analysis using the Workday time profile method, which involves full-day operation tracking, it was determined that the current standard times could be significantly improved.

The most important outcome of optimizing these standard times was a substantial increase in production efficiency. With the implementation of the new standards, the time required to complete individual operations was reduced, allowing for greater production capacity without additional investments in labour or equipment. This resulted in considerable cost savings, as production output increased without a proportional increase in costs.

Based on the analysis and time study, it was estimated that the new standards enabled a time savings of approximately 20% in the manufacturing of vibration dampening bases. This time reduction translated directly into lower labour costs, as fewer working hours were needed to produce the same quantity of products. Additionally, the improved work organization led to better working conditions, positively impacting both worker productivity and satisfaction.

These results clearly demonstrate that well-defined standard times are not merely a planning tool, but also a key factor in improving overall company efficiency. Optimizing standard times contributes not only to cost savings and increased productivity, but also to the long-term competitiveness of the company in the market.

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