RESEARCH IN LOGISTICS & PRODUCTION

TIMING WITH USING PRO_TIME_ESTIMATION PROGRAM

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Abstract This paper presents the issues of standardization of worktime. Presente, the basic methods of standardization of worktime and more detail described timing method. In the next article's parts presented selected possibilities of a computer program Pro_Time_Estimation. Characterized the basic stages and steps to be taken when working with this program. As an example standardization of worktime, selected experimental developments assembly workstation - manual assembly of fuel pump (Fiat 126p). Characterized the construction of this workstation and fuel pump.

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1. INTRODUCTION

Timing method is one of many methods of standardization worktime. Other known methods are: snapshot observation, the calculation of time based on the process parameters, comparing and assessing, polling and interview technique, elementary time systems, time norms, determining flow time, simulation methods. Effectiveness of the company is dependent on the use of such factors: engineering, technology, time, materials and energy, and involvement of management personnel. Better organization of the work process is always associated with a reduction in labor required for the execution of specific work tasks.

The result of standardization of worktime are standars worktime which are divided into the following varieties: standards time, standard amount of product (performance standards), standards of service, standards of cast. Of all the above variations standards work, basic considered standard worktime which determines the amount of time required to perform part of the task or the entire task (usually technological operations) (Wołk, 1969), (Strzelecki 1983).

Standards worktime can be developed with using variety of methods. Generally these methods can be divided into summary and analysis. The division methods of standard worktime for these two groups is caused by the decomposition (or lack thereof) technological operations for elementary components. Next, to the components of operations are assigned durations.

2. TIMING METHOD

Timing method - it is a method of measuring repetitive operations or their components in order to determine the appropriate duration and reasonable performance at a normal pace of work. Timing observations can be carried out continuously or piecemeal (Mreła, 1975). The timing observed results are material to:

- develop norms of the time for the routine activities or movements working which will later be a source of data to establish performance standards work,
- research methods of work in order to rationalize,
- research working conditions,
- observe the work line pipelined for better synchronization,
- development of technical standards for each operations,
- summary of performance achieved by individual employees.

To perform time-consuming timing measurements must be proper equipment and specially trained staff. Until recently, most commonly used instrumentations: clocks, stop-watch, writing self-measuring instruments, automatic control equipment. Today it's all being replaced by video and specialized software for the analysis of recorded movies.

Depending on the number of employees, whose work is the subject of observation, timing can be individual or group. Timing can be also continuous, random or cyclic. The existing steps to be followed during the timing are:

- collect data relating to the operations or activities,
- division operations and activities on components,
- determining the method of execution,
- determine the boundary points,
- determine the time and timing of measurements,
- summarizing and analyzing.

3. TIMING RESEARCH

Timing with using the ProTimeEstimation program will be carried out on the test assembly workstation of fuel pump (FIAT 126p). The remainder of this part describes: assembly workstation of fuel pump, characterized product (fuel pump) and working with ProTimeEstimation program.

3.1. Characteristic of fuel pump

The fuel pump is used to supply the fuel. Pump sucks fuel from the tank and pumped at a predetermined pressure to the carburetor. To pump two wires are attached which connect the fuel tank to the pump suction nozzle and pressure socket of the carburetor. Overall, pump consists of:

- the lower body which is the basis of the pump and the supporting member,
- the upper body which comprises the suction and pressure line valves,
- double membrane; two parts are separated by a membrane separator.

In the figure (Fig. 1) shows the complex pump

Fig. 1 Fuel pump

3.2. Characteristic of assembly workstation

The research assmebly workstation of fuel pump was shown in picture (Fig. 2). Assembly workstation consists of two workstations (ST1, ST2) which are sup-

ported by two workers (P1,P2). On the first workstation (ST1) is assembling the upper body and the piston. Ready assembly units are deposited on the first carriage (W1). On the second workstation (ST2) is assembling the lower body and assembly of finished assemblies. Ready fuel pump is deposited on the second carriage (W2).

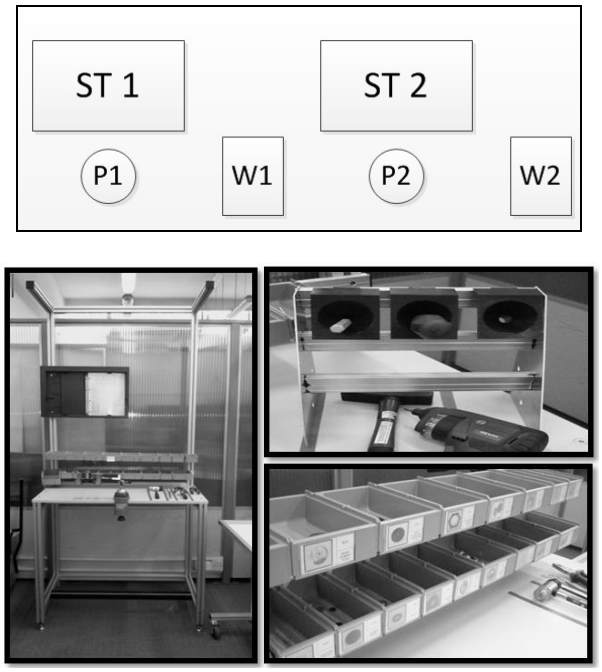


Fig. 2 Assembly workstation

3.3. ProTimeEstimation program

Computer program ProTimeEstimation supoports to carry out the process of standardization of worktime. Actually program is available in English, Portuguese and Spanish language. ProTimeEstimation allows you to:

- estimation of time to perform this task on the basis of the observed movements (MTM1, MTM-UAS itd.),
- estimation of time to perform this task on the basis of historical data entered,
- estimation of time to perform this task on the basis of data obtained from measurement stopwatch (timing).

There are two ways to use the program:

- 30-day free (demo),
- purchase of licenses and access to the full version.

System requirements are shown in the table (Table 1).

Table 1 System requirements

Minimum	Recommended
Pentium 3800MHz	Pentium 4 or later
256 MB RAM	512 RAM or more
15 MB free HDD	1 GB HDD or more
VGA adapter video and monitor	Super VGA adapter video and monitor

3.4. Realization of timing with using ProTimeEstimation

Timing was carried out in several stages:

Stage I – preparatory

At this stage of the preparatory action has been taken, or verified the completeness and efficiency of the equipment, supplemented containers for parts.

Stage II – obtaining the raw data for analysis.

Video recording assembly process. Assumed initial number of measurements for the production of small series n = 5.

Stage III – analysis of the results.

The results obtained in the form of videos have been imported into ProTime-Estimation computer program. The proceedings in the program are shown below.

Step 1.

Defining the task, the choice of units, description, and any observations. For each assembly unit was given a separate table (for example upper body assembly (Fig. 3))

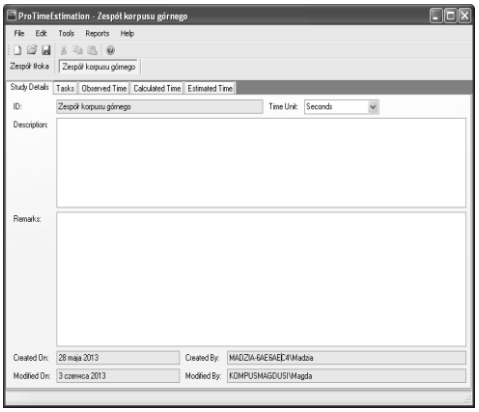


Fig. 3 Defining the task

Step 2

Enter the list of tasks (activities) Tab "Tasks" for each assembly unit. (for example: lower body assembly (Fig. 4).

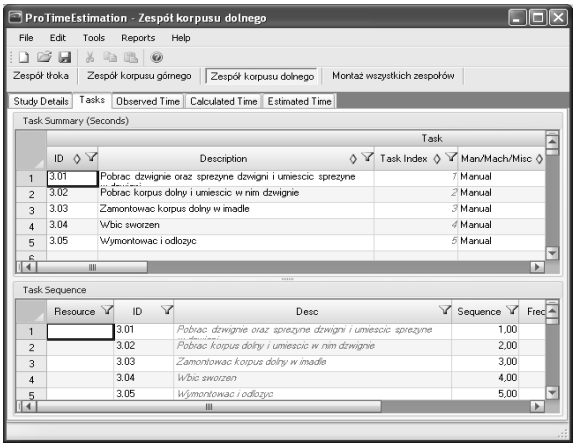
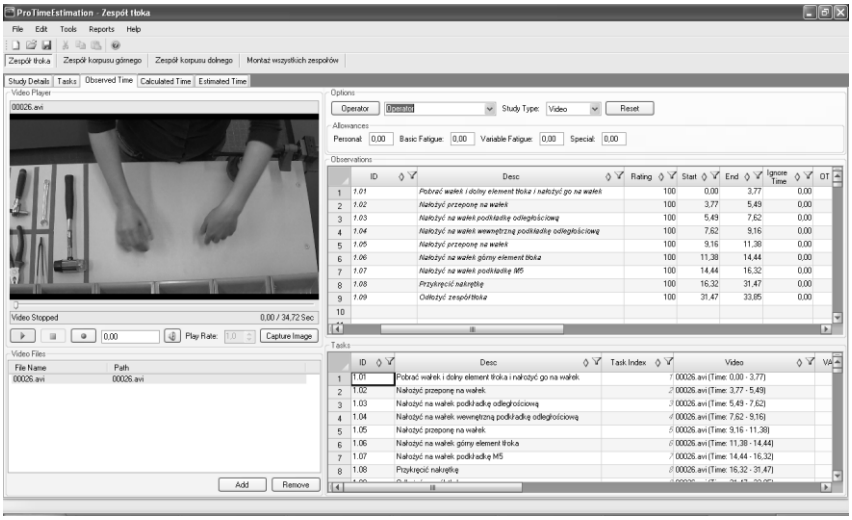
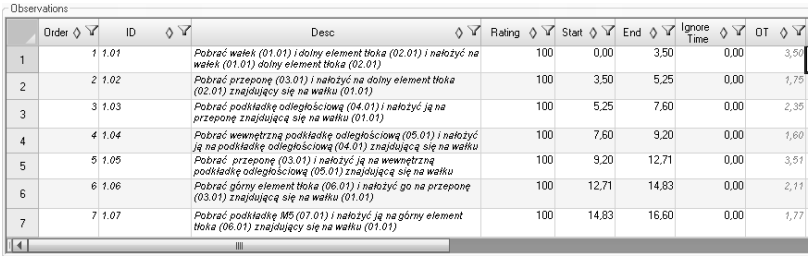


Fig. 4 Enter the list of tasks

Step 3

Analysis of videos on „Observed Time" tab. Here we have the ability to analyze videos and the duration of the read-out (Fig. 5). The start and the end of the operation, will automatically be saved in the "Observations" table. If inaccurate save time, you can manually fix errors. Once completed, you can generate a report that shows the tabular saved.





Observations

	Order	ID	Desc	Rating	Start	End	Ignore Time	OT
1	1	1.01	Pobrać wałek (01.01) i dolny element tłoka (02.01) i nałożyć na wałek (01.01) dolny element tłoka (02.01)	100	0,00	3,50	0,00	3,50
2	2	1.02	Pobrać przeponę (03.01) i nałożyć na dolny element tłoka (02.01) znajdujący się na wałku (01.01)	100	3,50	5,25	0,00	1,75
3	3	1.03	Pobrać podkładkę odległościową (04.01) i nałożyć ją na przeponę znajdującą się na wałku (01.01)	100	5,25	7,60	0,00	2,35
4	4	1.04	Pobrać wewnętrzną podkładkę odległościową (05.01) i nałożyć ją na podkładkę odległościową (04.01) znajdującą się na wałku	100	7,60	9,20	0,00	1,60
5	5	1.05	Pobrać przeponę (03.01) i nałożyć ją na wewnętrzną podkładkę odległościową (05.01) znajdującą się na wałku	100	9,20	12,71	0,00	3,51
6	6	1.06	Pobrać górny element tłoka (06.01) i nałożyć go na przeponę (03.01) znajdującą się na wałku (01.01)	100	12,71	14,83	0,00	2,11
7	7	1.07	Pobrać podkładkę M5 (07.01) i nałożyć ją na górny element tłoka (06.01) znajdujący się na wałku (01.01)	100	14,83	16,60	0,00	1,77

Fig. 5 The analyze videos and the duration of the read-out

3. CONCLUSION

The article shows one of the possibilities of the ProTimeEstimation – timing research. The use of modern audio-visual techniques and the appropriate software to analyze video footage, cause that a timing research is quick and easy. Most of the work on the measurement of time is beyond the workstation. This is of particular importance at the time of disclosure standards in hazardous environments.

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BIOGRAPHICAL NOTES

Dorota Warżołek is currently a Doctoral Student at Institute of Production Engineering and Automation at Cracow University of Technology. Her research interests include production scheduling and process optimization, machining and assembly process design, programming of CNC machine tools, methods of working time measuring and standardization of work time.

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