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ELASTIC STRAIN TEST FRAME OF PROCESSING SYSTEM FOR PROFILING SHEET METAL BY ROLLERS

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Abstract: Experimental research of elastic strain frame of processing system was performed using eight strain gauges that are sealing on the frame. Strain gauges are connected using cables on amplifier DCMPlus, and data from the amplifier were recorded in real-time of process of profiling on software Catman Easy, where results of measurement are processed and analysed. Therefore, elastic strains of the frame of processing system are measured at twelve different types of load, i.e. profiling twelve boards sheet of different materials, thickness and width.
Keywords: processing system, strain gauges, encoder, Catman Easy, elastic strain, sheet metal, frame of processing system

1. INTRODUCTION

This paper describes the experimental research of deformation on the frame of one line module for profiling trapezodial sheet metal on eight metering points where the metering points are sealing. Strain gauges are connected with ½ Vinston's bridge and connected with which is connected at the ends of the connector for connecting to an amplifier DCMPlus that is manufactured by HBM, which is connected to the computer on which the program catmanEasy 3.3.5 is installed on which recording is performed and data processing obtained through experiments according to the plan of matrix. Program catmanEasy 3.3.5 was recorded in real time elastic strain for all eight strain gauges during omission of sheet metal panels of different thickness and width and mechanical properties through the line for profiling sheet metal [3],[4],[8].

For the purposes of performing experimental researches of elastic strain on the frame for profiling sheet metal it is used twelve transmits that is twelve metal sheet panels where we are for each transmit of metal sheet panel obtained values of elastic strains with all eight gauge points on the same frame.

The procedure of sealing strain gauges, connecting with a cable and connecting to an amplifier was performed according to the instructions of the manufacturer of the measuring equipment.

2. PLAN OF AN EXPERIMENT

To perform an experiment it is used the plan of matrix in form as it is shown in the following table. From table 1 it can be seen which input parameters we have used for the experiment. We see that every passage gives us eight values for elastic strains.

2.1. SEALING OF STRAIN GAUGES

Strain gauges are sealed on another pair of rollers and to the left on the line for profiling. Before the start of the forst sealing must be provided where it will be setting strain gauges, clean off grease, dirt, dust etc. And it must have be done using sandpaper for small processing to obtain clean and smooth surface where the starin gauge is sealing [8].

Table 1. Matrix of the plan of the experiment

Ordinal number of experiment	Physical variables of process			Data from computer with label L	Output values of measurement
	σ_m	s	b		
	[N/mm²]	[mm]	[mm]		
1	130	0,5	950	L-I-1	T1,T2,T3,T4,T5,T6,T7,T8
2	383	0,5	950	L-I-2	T1,T2,T3,T4,T5,T6,T7,T8
3	130	0,7	950	L-I-3	T1,T2,T3,T4,T5,T6,T7,T8
4	383	0,7	950	L-I-4	T1,T2,T3,T4,T5,T6,T7,T8
5	130	0,5	1250	L-I-5	T1,T2,T3,T4,T5,T6,T7,T8
6	383	0,5	1250	L-I-6	T1,T2,T3,T4,T5,T6,T7,T8
7	130	0,7	1250	L-I-7	T1,T2,T3,T4,T5,T6,T7,T8
8	383	0,7	1250	L-I-8	T1,T2,T3,T4,T5,T6,T7,T8
9	270	0,6	1100	L-I-9	T1,T2,T3,T4,T5,T6,T7,T8
10	270	0,6	1100	L-I-10	T1,T2,T3,T4,T5,T6,T7,T8
11	270	0,6	1100	L-I-11	T1,T2,T3,T4,T5,T6,T7,T8
12	270	0,6	1100	L-I-12	T1,T2,T3,T4,T5,T6,T7,T8

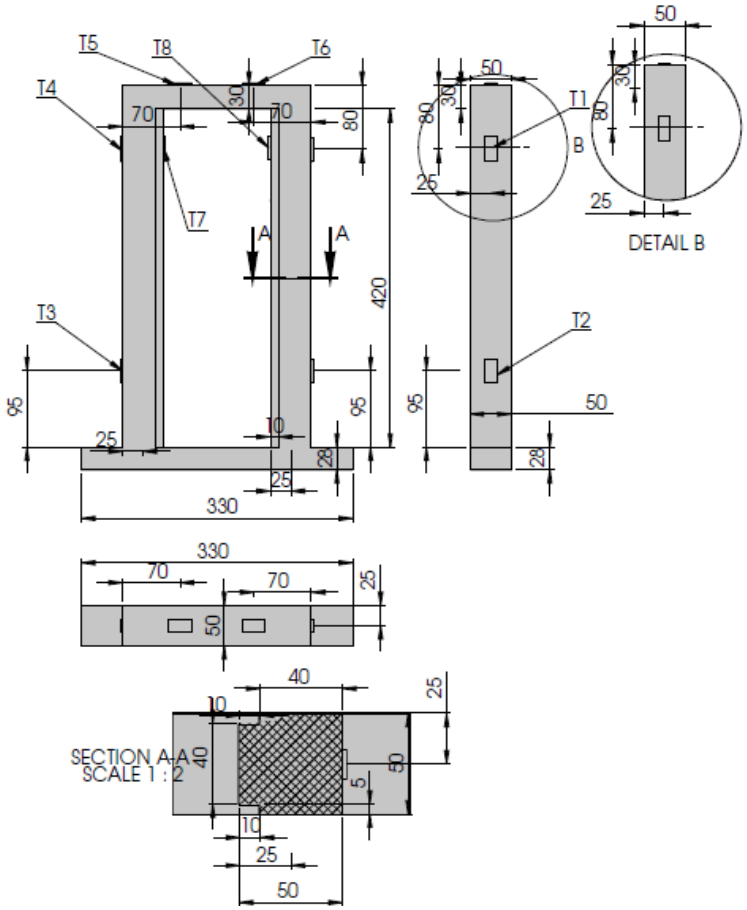


Figure 1. Position of strain gauges on the frame

On figure 1 it will be shown sealin scheme of strain gauges to the frame for profiling sheet metal, where the strips are marked with T1-T8.

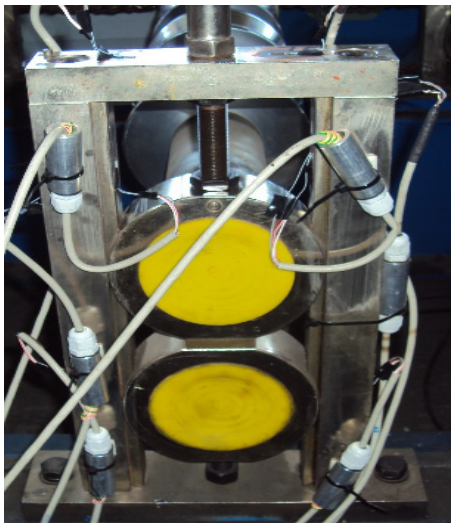


Figure 2. Strain gauges sealed on the frame of module two

Figure 1 shows the position of strain gauges on the line of the frame for profiling sheet metal, as well as dimensions of the frame on which is preformed gauges of elastic strains.

The figure below shows gauge chain for mentioned gauges.

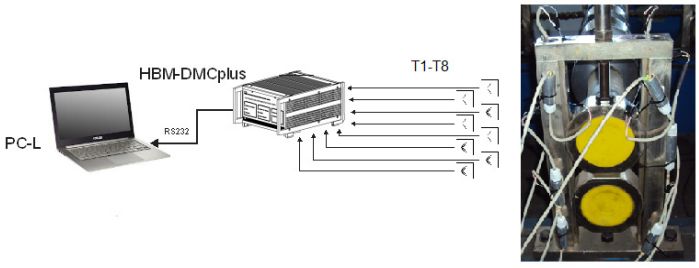


Figure 3. Demonstration of gauge chain

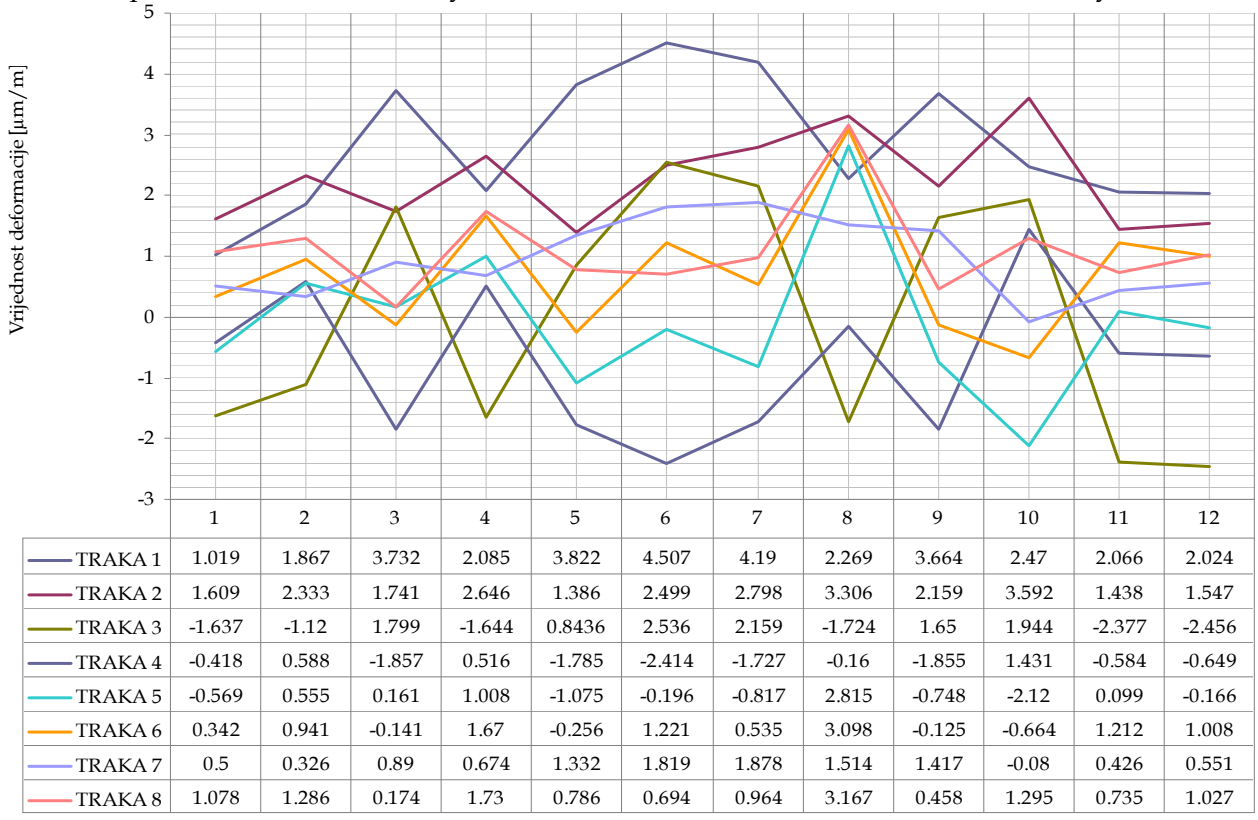
2.3. RESULTS OF THE EXPERIMENT

After performed preparations and tests of gauge equipment, it could be started with experimental part of testing and that is passage of appropriate panles of sheet metal according to the plan of matrix of the experiment shown in table 1. The results of elastic strains are shown in table 2.

Table 2. Results obtained of elastic strains after the experiment.

No.	Deformation of the frame							
	T1	T2	T3	T4	T5	T6	T7	T8
	μm/m	μm/m	μm/m	μm/m	μm/m	μm/m	μm/m	μm/m
1	1,019	1,609	-1,637	-0,418	-0,569	0,342	0,500	1,078
2	1,867	2,333	-1,120	0,588	0,555	0,941	0,326	1,286
3	3,732	1,741	1,799	-1,857	0,161	-0,141	0,890	0,174
4	2,085	2,646	-1,644	0,516	1,008	1,670	0,674	1,730
5	3,822	1,386	0,8436	-1,785	-1,075	-0,256	1,332	0,786
6	4,507	2,499	2,536	-2,414	-0,196	1,221	1,819	0,694
7	4,190	2,798	2,159	-1,727	-0,817	0,535	1,878	0,964
8	2,269	3,306	-1,724	-0,160	2,815	3,098	1,514	3,167
9	3,664	2,159	1,650	-1,855	-0,748	-0,125	1,417	0,458
10	2,470	3,592	1,944	1,431	-2,120	-0,664	-0,080	1,295
11	2,066	1,438	-2,377	-0,584	0,099	1,212	0,426	0,735
12	2,024	1,547	-2,456	-0,649	-0,166	1,008	0,551	1,027

Table 2 shows results of elastic strains by places of gauge on the frame for all twelve experiments which are performed for these analysis. What we can see is that elastic strains are very small.



	1	2	3	4	5	6	7	8	9	10	11	12
TRAKA 1	1.019	1.867	3.732	2.085	3.822	4.507	4.19	2.269	3.664	2.47	2.066	2.024
TRAKA 2	1.609	2.333	1.741	2.646	1.386	2.499	2.798	3.306	2.159	3.592	1.438	1.547
TRAKA 3	-1.637	-1.12	1.799	-1.644	0.8436	2.536	2.159	-1.724	1.65	1.944	-2.377	-2.456
TRAKA 4	-0.418	0.588	-1.857	0.516	-1.785	-2.414	-1.727	-0.16	-1.855	1.431	-0.584	-0.649
TRAKA 5	-0.569	0.555	0.161	1.008	-1.075	-0.196	-0.817	2.815	-0.748	-2.12	0.099	-0.166
TRAKA 6	0.342	0.941	-0.141	1.67	-0.256	1.221	0.535	3.098	-0.125	-0.664	1.212	1.008
TRAKA 7	0.5	0.326	0.89	0.674	1.332	1.819	1.878	1.514	1.417	-0.08	0.426	0.551
TRAKA 8	1.078	1.286	0.174	1.73	0.786	0.694	0.964	3.167	0.458	1.295	0.735	1.027

Figure 4. Diagrammatic presentation of the results of the experiment

CONCLUSION

On the basis of experimental research in terms of the load frame on one module line for profiling sheet metal using rollers measuring elastic strains on eight strain gauges on the frame, can reach to basic conclusion that strains given on the frame are very small and we can say that frame on the module on which are obtained measurements there is no significant load on machining system or on the line for profiling sheet metal. As in this experiment was performed testing and force profiling but on more modules we came to the realization that force growth from the first to the twentieth module, it is expected to strains grow proportionally on the frames for remaining modules which do not have any measurements.

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