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FACULTY OF MECHANICAL ENGINEERING

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EXPERIMENTAL MODEL FOR A AUTOMATED PRODUCTION LINE

Botoaca Robert[1], Floroian Laura[2]
[1]Transilvania University of Brașov, Brașov, România
[2] Schaeffler România, Cristian, România

Abstract: *The scope of the project is to bring out LEAN Kaizen importance through the concomitant simulation of two production lines: one line with 3 workplaces and a cycle time for each workplace and another with a single workplace, and with a reduced cycle time. The project serves as a didactic resource for students from Professional Training Centre representing a practice introduction in LEAN Kaizen System.*
Keywords: *conveyor, workplace, waste, efficiency*

1. INTRODUCTION

LEAN Kaizen is a concept invented in Japan and represent the base of continuous improvement. The concept was created and implemented after the Word War II in small companies at that time, including Toyota Production System. The scope of the concept is to make daily optimization in activities through identification and elimination, if it is possible of the waste. Translated from Japan, Kaizen means "change for the better".
In our time the main focus in a factory with a big production volume is to fulfill the customer requirements. It's important the final product to be delivered in time, quantity and quality required of the customer, which is why the efficiency of the production process is one critical and interesting point.
LEAN Kaizen system is a factor which helps in this direction through methods like 5S, Value Stream, Problem Solving Strategy, production initiatives for reduced cycle time and implicit the costs.
The scope of the project was to exemplify through this simulation what is the benefit if the production flow is improved: the pieces come to the customer in due time (see in table 1)

2. THE STRUCTURE OF THE PROJECT

In order to implementation of the project was used: one programmable Logic Computer with Logo modules, 2 engine with alternating current, 2 bands "conveyor", 4 metallic boxes for simulating the workplaces, sensors/actuators

2.1. Project Description

The presented production line brings out the main differents between 2 production processes with different strategies: one process conventional with 3 workplaces, cycle time for each workplace and stocks between workplaces and one process improved with a single workplace, a reduced cycle time (see in table 1) and 0 stocks.
The first line is based on classic processing cycle, by which the pieces located as raw material become final products. Because the cycle time is higher, the production process has delays: stocks, and delays in customer delivery.
The second line simulate the case under which the production flow has one workplace in order to highlight the importance of the efficiently in a production process.
For a correct utilization of the application it's important the compliance of the following recommendation:

- the start of the application it's done through "on/off" ;
- there is a emergency button for emergency stop or failure;
- there is a visual system which notes that the application work or is in repose (red/green);

Additional the application contain:

- white flashing signal for moment when one piece arrived on the first production line;
- yellow flashing signal for the moment when one piece arrived on the second production line (LEAN production process)
- manual start button for preferential start for any of the two lines;

2.2. Tables

In table 1 is presented the structure of the application. As you can see the cycle time for line 2 is of 3 seconds compared to line 1, where the total cycle is 22 seconds.

Table 1: Application description

Line	Workplace	Cycle time[s]
Line 1	Turning	5
	Grinding	7
	Assembly	10
Line 2	Flexible workplace	3

As you can see in table 2 the tool which helped at automation of the production lines was a Programmable Logic Computer named “Logo Soft Control”, produced by Siemes. I used the Function Block Diagram Language with logical blocks presented in column 3.

Table 2: Programble Logic Computer Characteristics

Name	Language	Logical blocks
Logo Soft Control (producer Siemens)	Function Block Diagram (FBD)	input
		output
		marker/flag
		delay
		latch
		Logical functios (AND, OR, NAND, NOT)
		Asynchronous signals generator

2.3. Figures

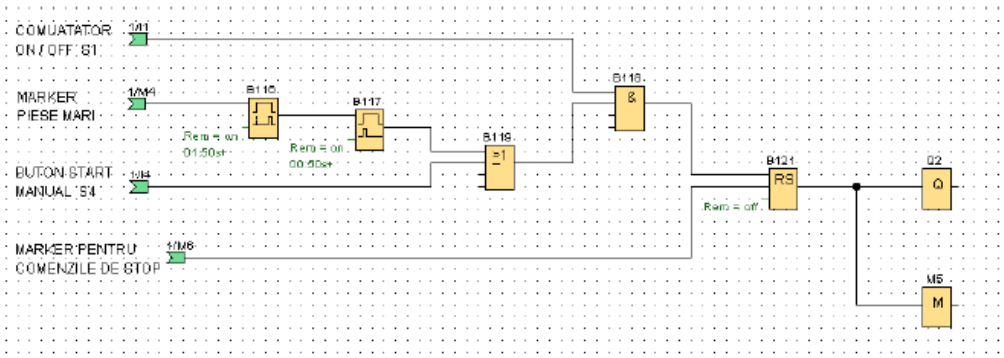

Figure 1: The command of the motor M2

In this picture was presented the logical scheme for the automatization of the motor M2. In this secvence was used “input” blocks for the ON/OFF switchs, asynchronous signals generators and logical functions (AND,OR).

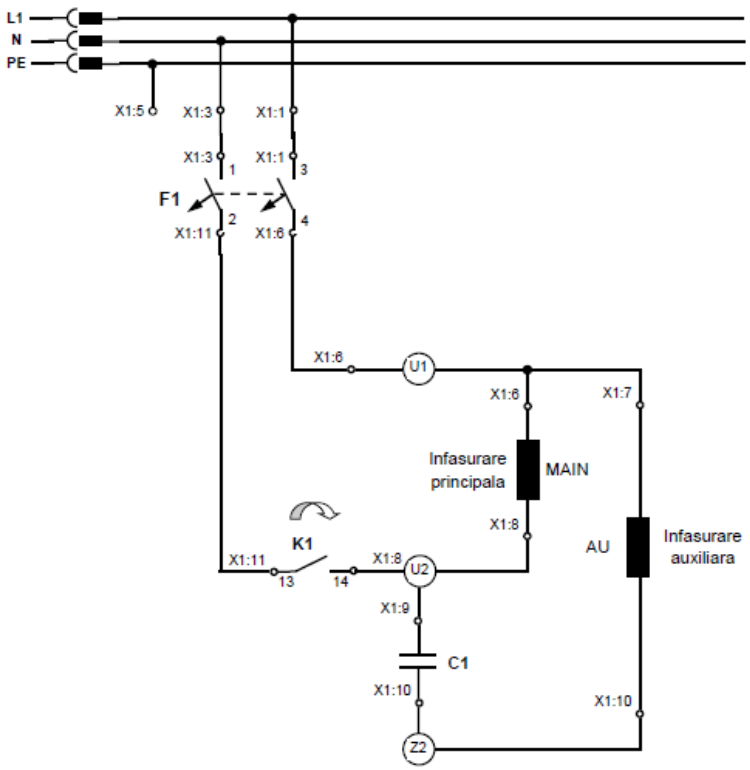

Figure 2: Electrical scheme for the engine M1 (for the operating of line 1 – classic production)

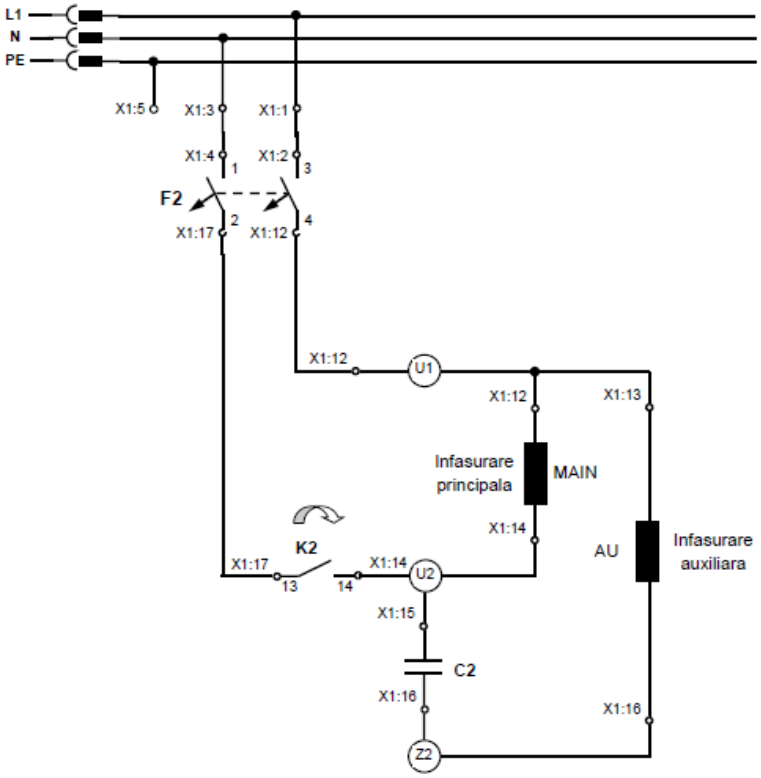

Figure 3: Electrical scheme for the engine M2 (for the operating of line 2 – efficiency production)

The Figures 2 and 3 represent electrical schematics which underpin of the operating of both motors, which operating the production lines in alternating current.

3. CONCLUSION

The project can be used as a practical exemple for the introduction in LEAN Kaizen System. Besides the fact that the efficienty of the production processes it's an important factor the application recommend that it is necessary visual signals for each workplace and the "emergency button" must be present also in production for each workplace.

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