

Sensor Network Application for Timber Decoration Materials Optimization Line

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-----ABSTRACT-----

The paper analyzes the optimization of the new production line for processing timber, which was established in 2015, the output was evaluated after the introduction of a new optimization line, and technical analyzes of equipment and process equipment were made. The efficiency of production was analyzed on the basis of data from 2014 and 2015; production reports the company Ltd Osukalns.

Keywords: *Automation control systems, sensor systems and applications..*

Date of Submission: 26-10-2017

Date of acceptance: 09-11-2017

I. INTRODUCTION

From a technical point of view, in order to be able to perform any type of machine operation, it is necessary to monitor this operation and deliberately lead it to repetition or against its suspension to observe this logic. This possibility is currently provided to us through a sensor network and signal processing equipment of sensors. Proper logging can be performed with a fully automated production cycle or any other necessary process that needs to be monitored and maintained only in the workplace. Consequently, the main small devices that help us create a delightful automatic process are the sensors, in turn, if there is a desire to perform complex processes, it will be necessary to create a network of sensors, and signal processing equipment will be required.

Therefore, active wood producers are aware of the risks, and in order to compete with other producers and improve the quality of existing products, they use timber optimization lines, whose task is to maximally select, sort and analyze the wood that enters the market.

The purpose of the article is to analyze how economical the selected sensors and signal processing equipment selected in the optimization line are, and what economic contribution the new optimization line gives when comparing the production data with the optimization line that worked until a new line.

II. PROBLEM FORMULATION

In today's world, we everywhere come up with complex engineering systems (cars, phones, washing machines, etc.) about which we do not put ourselves into our daily lives, but these systems greatly facilitate our everyday life and make faster daily routine. Such systems are not only in everyday household appliances or in transport, and in today's business, these technologies are the basis for the most efficient work, provided that the equipment is selected correctly.

Before proceeding to the sensors for a general study, it is necessary to understand what a line of optimization of timber is. This installation or, more precisely, a set of equipment that performs analysis and processing of wood before the wood enters the final processing cycle (planing). The optimization line performs scanning of the wood with a scanner that scans the tree colors, bark, cracks, number of branches, etc., and, in addition, the most economical processing of materials was carried out. Under processing, harvesting of wood or automatic choice for processing, where wood is cut into a more economical assortment.

In order to be able to control and influence participation or be able to replace physical activity, it is necessary to somehow define, measure, record and transmit the desired effect or action in order to change the desired environment. For this process, we need equipment capable of converting information from the affected environment to the desired information form (data), a machine is needed that can process this data and additional information to achieve the desired process of changing the environment.

In turn, to carry out physical activity, this activity should be descriptive and coordinated. Sensors are devices that need to communicate about the environment and can in time limit physical activity in time to learn them.

A sensor is a device that receives a stimulus and responds with an electrical signal. [4]. By definition, we can conclude that one of the main tasks is to respond to external environmental characteristics (temperature, physical movement, etc.), and convert it into an electrical signal. Applications and selection of sensors are very wide from the place where it is used.

III. INDENTATIONS AND EQUATIONS

The scanner used on the new line scans the wood for the defect and analyzes which product comes from the tree, so it can be called an entire system.

The WoodEye 5 automatic wood quality scanner is almost one of the most important steps in the entire optimization line.

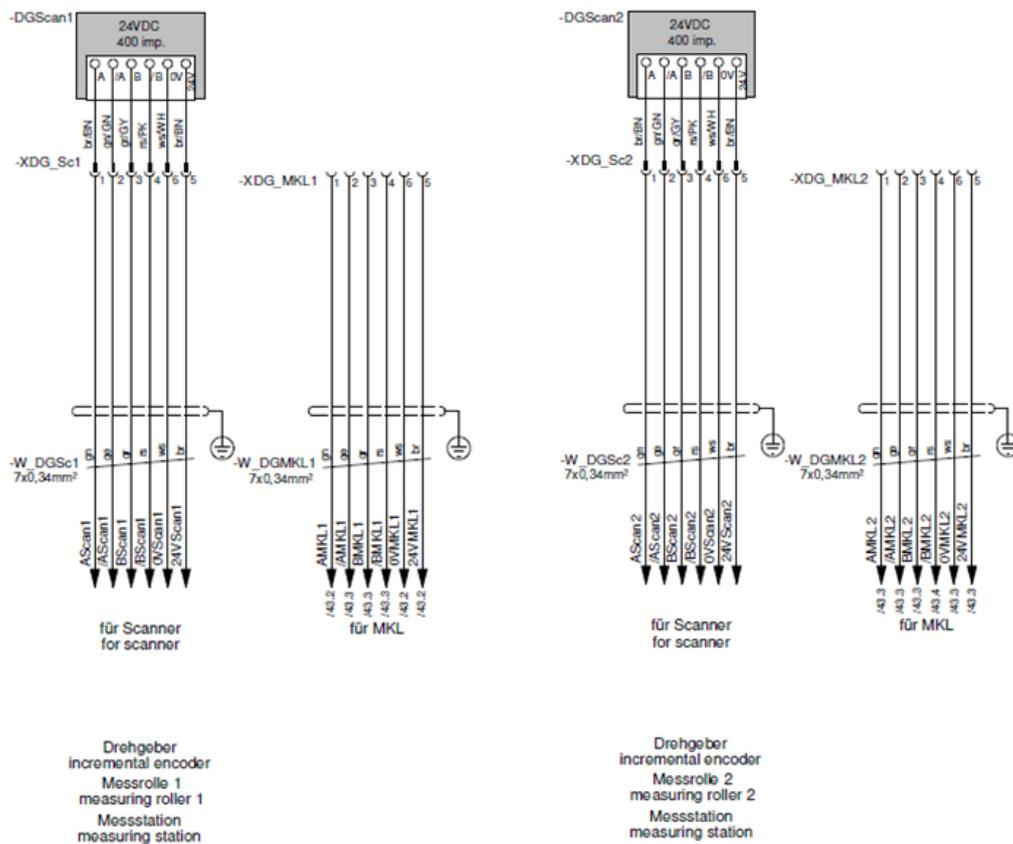


FIGURE 1. Scanner pulse sensor circuit diagram.

In order for the conveyor system to be able to understand that there is timber on it, two optic sensors are installed at the beginning. The sensors are two because the timber is sometimes curved and then the lower sensor does not react late and an error occurs due to the fact that this material is shorter. In addition to these sensors, the first board is measured with an inductive sensor that calculates pulses from the wheel and about the length of the board.

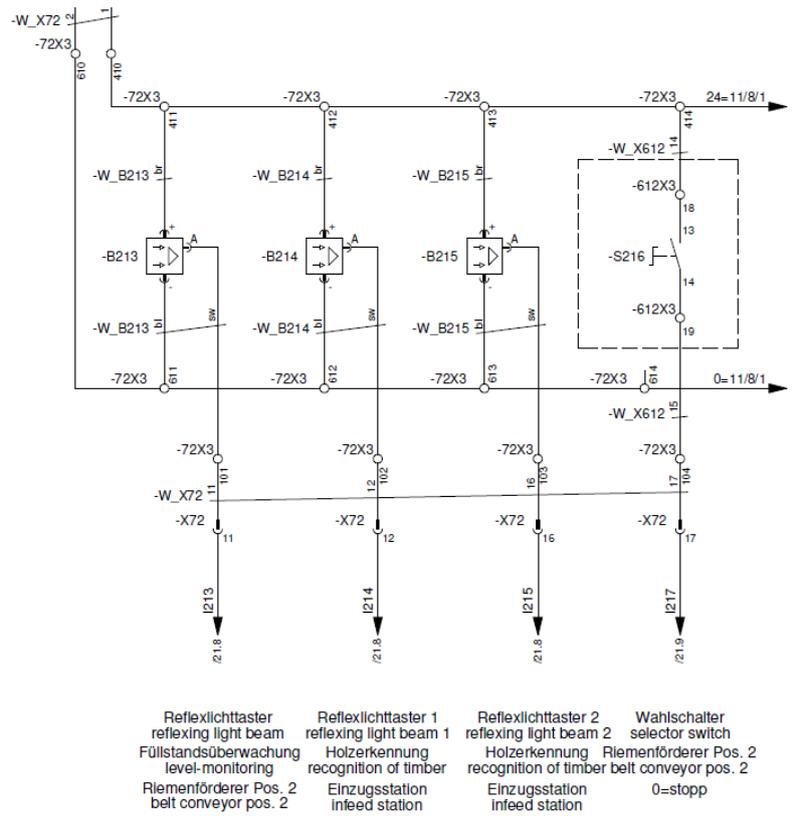


FIGURE 2. Scheme of the conveyor sensor

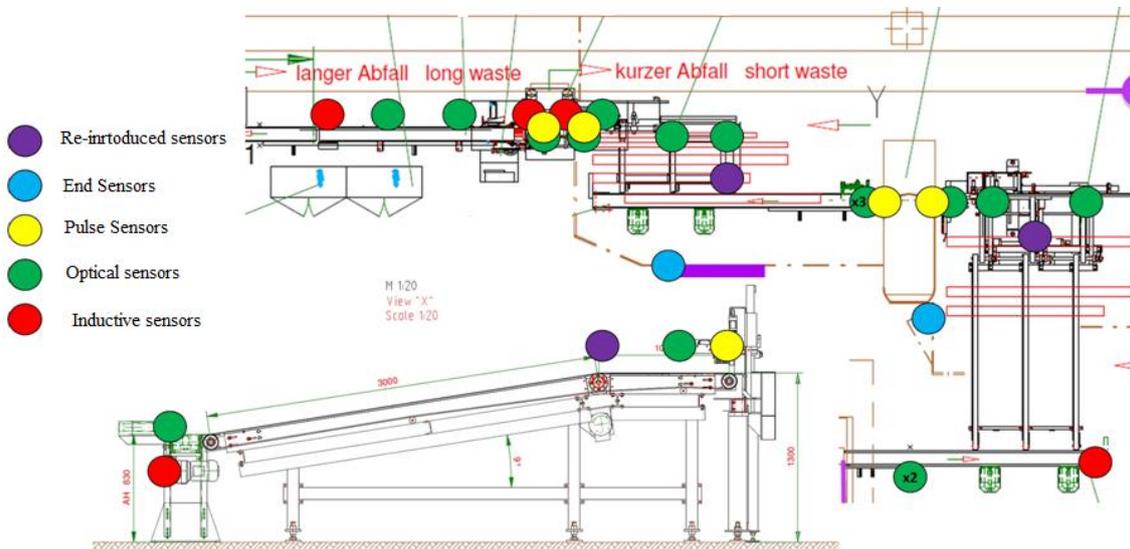


FIGURE 3. Sensor network fragment in optimization line.

A new optimization line adds value to the scanner and saw. To understand what speed is, the manufacturer can scan at a speed of 200 m / min, and the saw can be processed at a speed of 1 m / s, so that the saw can process 60 m / min. The time of sawing depends largely on the quality of the wood, the better the wood, the less the saw will work.

Let's take a look at the benefits of the scanner: the scanner allows us to process 200 m / min, it is possible that the scanner can handle about 3 m / s, during which the scanner handles wood on all four sides, in addition, the scanner can estimate which of the most economical processing options for the company and it takes 3 m / s.

In Figure 4 can visually see how the wood analysis in the scanner has occurred. The black line shows the places of the sawing, and the defective places are displayed in the red outline. You can see that the wood is measured up to a tenth of a millimeter. On the screen, you can see that the scanner really processes the wood on all four sides.

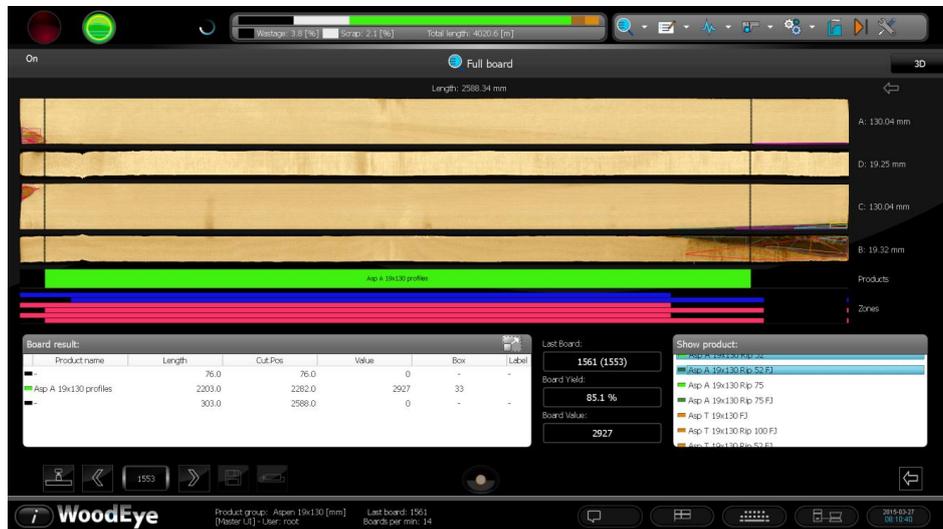


FIGURE 4. Screen optimized linear scanner analyzed for wood

In the following figure, you can see a screenshot of the WoodEye scanner, a much more detailed defect and a number of faults, as shown in FIGURE 5. It can be clearly seen that the wood has a crack and can be recycled to other material and obtain only other dimensions of the highest quality timber. Consequently, the scanner gives the saw a command to cut off the corresponding stage and send it for disposal.

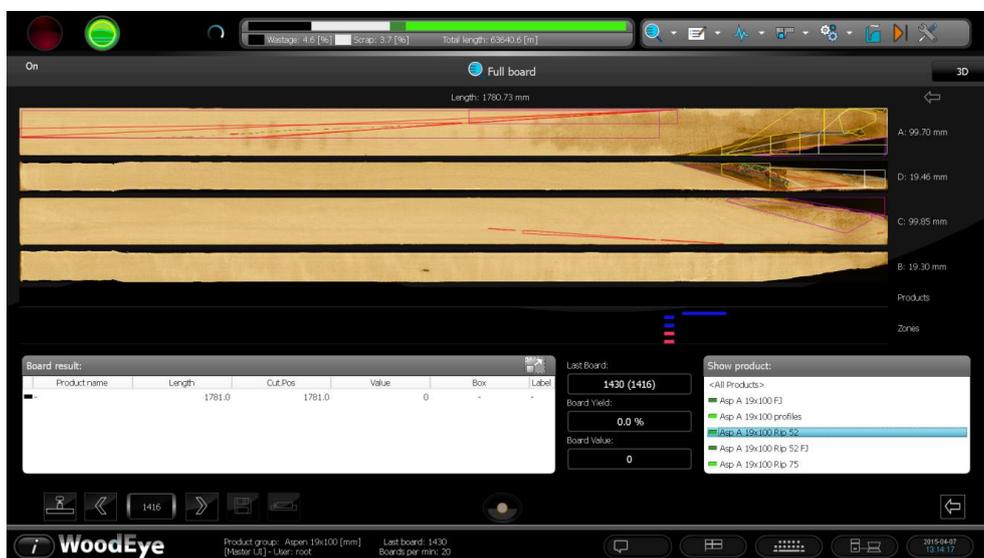


FIGURE 5. Lumber Screenshot from an Optimized Linear Scanner

IV. THE ECONOMIC INDICATORS OF PRODUCTION

After aggregated and computed data, this can be seen in the graphical comparison in figure No. 3.3.1 that the effective average production amounts to 91.15% of all 100% recycled woodboards, which is 2.56% higher than before the introduction of a new optimization line.

- Upon updating the line the optimization line got an average value 88.59% of all processed wood.
- After the line, the optimization line got an average value 91.15% of all processed wood.
- Increase by 2.56%.
- 6.85% more economical materials were obtained.

- The working time has been reduced by half.

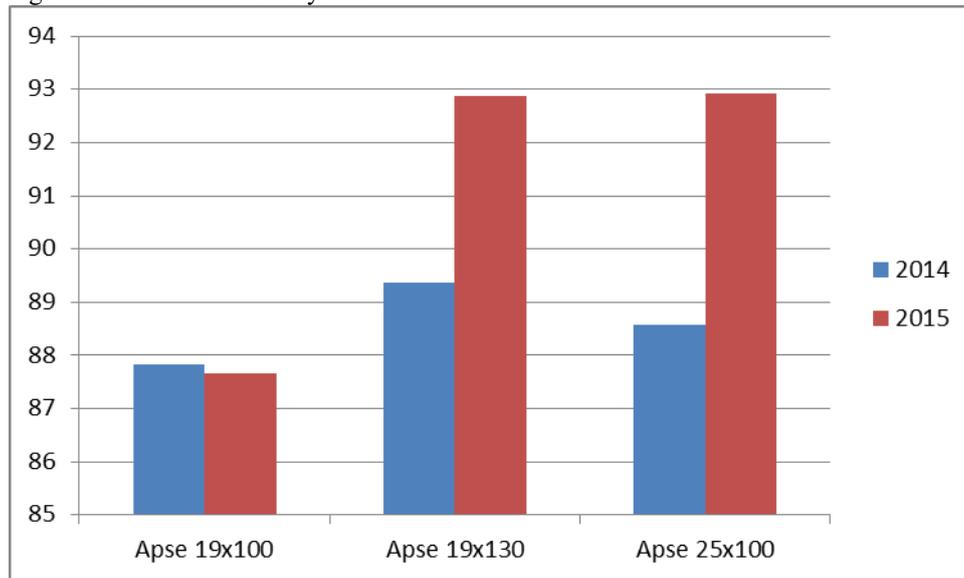


FIGURE 6. The efficiency of the production material in percent

One of the options that a scanner developer embedded in the user program is that the scanner automatically performs an economical calculation when scanning an announcement board. At the expense of the scanner, it is more profitable to make the material, and if it is more profitable to produce one long solo from an already scanned board than two small, then this board goes into recycling. Thanks to this performance has increased. On the whole, it can be seen that on average, 6.85% of the processing volume comes from processing.

Looking at that time, it should be noted that a person will not need to make any reports on the volumes of production in the network of sensors, which occur automatically and all 2015 annual production made, working in one shift, this is half the work than in 2014, and in addition there is no need for those who perform the function of the scanner. Consequently, a much more skilled and more powerful workforce can be provided. A very high added value is the performance of the optimization line, which is ensured by the correct and correct positioning of optical sensors, and the high precision of material handling is provided by pulsed transducers.

V. CONCLUSION

1. The working time was halved, from 16 hours in less than 8 hours of operation.
2. The increase in wood production is insignificant by 2.56%, but in addition, there is an economic benefit, the product "sorts out" 6.85%, which processes profitability of income.
3. To reduce the cost of sensors, it is recommended to replace the 3 sensors with other more powerful and economical sensors.
4. Equipment for processing sensors is selected in accordance with the needs of the equipment manufacturer, to ensure the future of the customer and improve them.
5. Having investigated the parameters of similar equipment for processing signals and market prices, in order to reduce the cost of optimization, it is recommended that the equipment manufacturer selects products at the best prices

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Marcis Lukasevic Sensor Network Application for Timber Decoration Materials Optimization Line." The International Journal of Engineering and Science (IJES), vol. 6, no. 11, 2017, pp. 20-24.