Elekt Labs

Automation in Quality Control Process

No manufacturing process is perfect and during the course of production it is likely to find products with several defects. For their detection in different phases of the production, a quality control process is needed. This article will elaborate the automation of the quality control process, particularly focusing on the collection of data from a measuring devices with a Digimatic interface.

Our company, Elekt Labs, specializes in the development and deployment of systems for data collection and optimization of production in industrial enterprises. In 2007 we were asked by Ball AEROCAN CZ Ltd. (Hereinafter AEROCAN GB) to automate their quality control process. The company deals with production of aluminum cases and their main requirements were:

- Automatic enrollment of measured values into the database of the information system – MASA (Measurement and Statistical Applications)
- The ability to set limit values for allowed measurement parameters and inform the operator if they are exceeded
- Full replacement of paper forms

Prefabrication Quality Control in AEROCAN CZ

Depending on the type of quality process controls, there were various types of measuring instruments that were used, such as: indicators, calipers, scales, porosimeters (measuring the quality of finish etc). It was prescribed to every operator, the conditions that samples and required measurements must be taken in. For example, at regular intervals, after shutdown, at the beginning of production orders, etc. Although most of the measuring instruments had a digital communication interface (typically Digimatic, RS-232), it was not being used. Operators had to manually rewrite the measured dimensions of the product from the meter in a statement. Typical problems associated with manual measuring system are summarized in the following points:

- Data tampering on the part of the operator, i.e. rounding towards better values
- Failure to implement the required number of measurements at specified time
- Poor efficiency and ergonomics

Implementation – Data collection from measuring devices

Most of measuring instruments have a Digimatic interface, which can not be directly connected to a PL or PC. The main differences between the products of various companies are the number of Digimatic ports (typically one to eight), and the RS-232 interface. For the most part, their designs do not allow for application in an industrial environment.

A common feature of most Digimatic multiplexers is control via PC. The typical method for measuring several dimensions of the product is shown in Figure 1: The operator takes the appropriate measuring device to measure the product size. On his computer, he has to select the size measurement 1 (1) and measure it (2). The same must be repeated for size measurement 2 - (3) (4).

In this workplace aspect, we came across several problems. The operator would have to fiddle around with the PC to set the desired size measurement and neither PC control nor measuring device were placed in the operator's visual field. Ultimately, this meant higher time consumption than necessary.

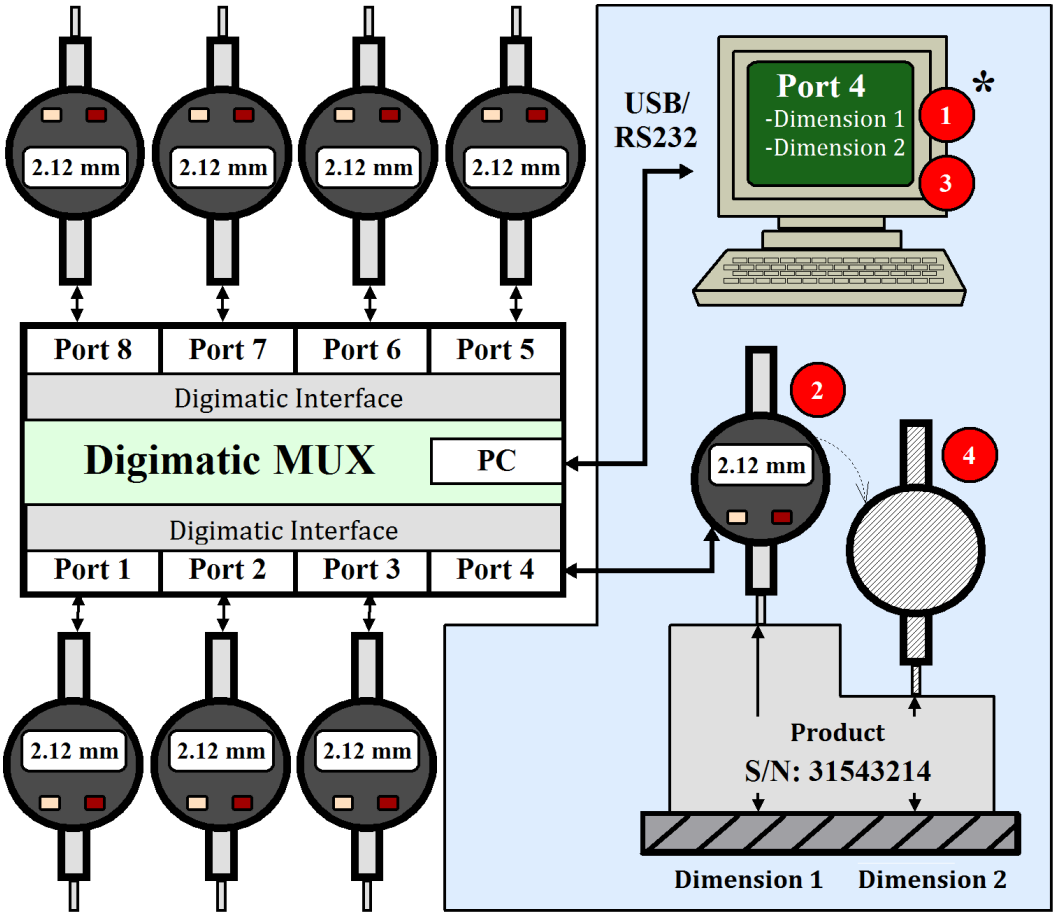

Fig. 1. Measurement of two dimensions of a product via PC

Elekt Labs

Implementation – Data collection from the measuring devices using 8x Digimatic

We were not able to find a Digimatic multiplexer model in Czech Republic or the external market, that would have had enough Digimatic ports or an industrial design, that allows indications to the operator (call for measurements, exceeding the limits, etc). For these reasons, we developed a data concentrator 8xDigimatic and RGB control panels. The data concentrator can connect up to eight measuring devices with a Digimatic interface. At some workplaces there are 12 measuring devices, and therefore we allowed connection of up to four 8xDigimatic in series.

We chose the control panel instead of a computer to select the measured size of the product. The control panel can have a maximum of eight buttons and therefore allows to measure up to eight sizes from the relevant measuring device. Overall, you can connect up to eight control panels to 8xDigimatic, which are assigned to each Digimatic port. Due to their size, the control panels can be placed in the visual field of the operator who is making measurements and therefore speed up the measurement process.

A typical method of measuring several dimensions of the product is shown in Figure 2: Flashes of orange color on the control panel buttons indicate that it is necessary to measure the dimensions 1 and 2. On the control panel, the operator selects the measurement of size 1 and the white button will light up (1). He takes appropriate measuring device and measures it (2). Back-lit button switches off. This procedure will be repeated for measuring the size of 2 - (3), (4). Measured values are automatically sent to the server. If the measured value is outside the set technological limits, the button will blink red.

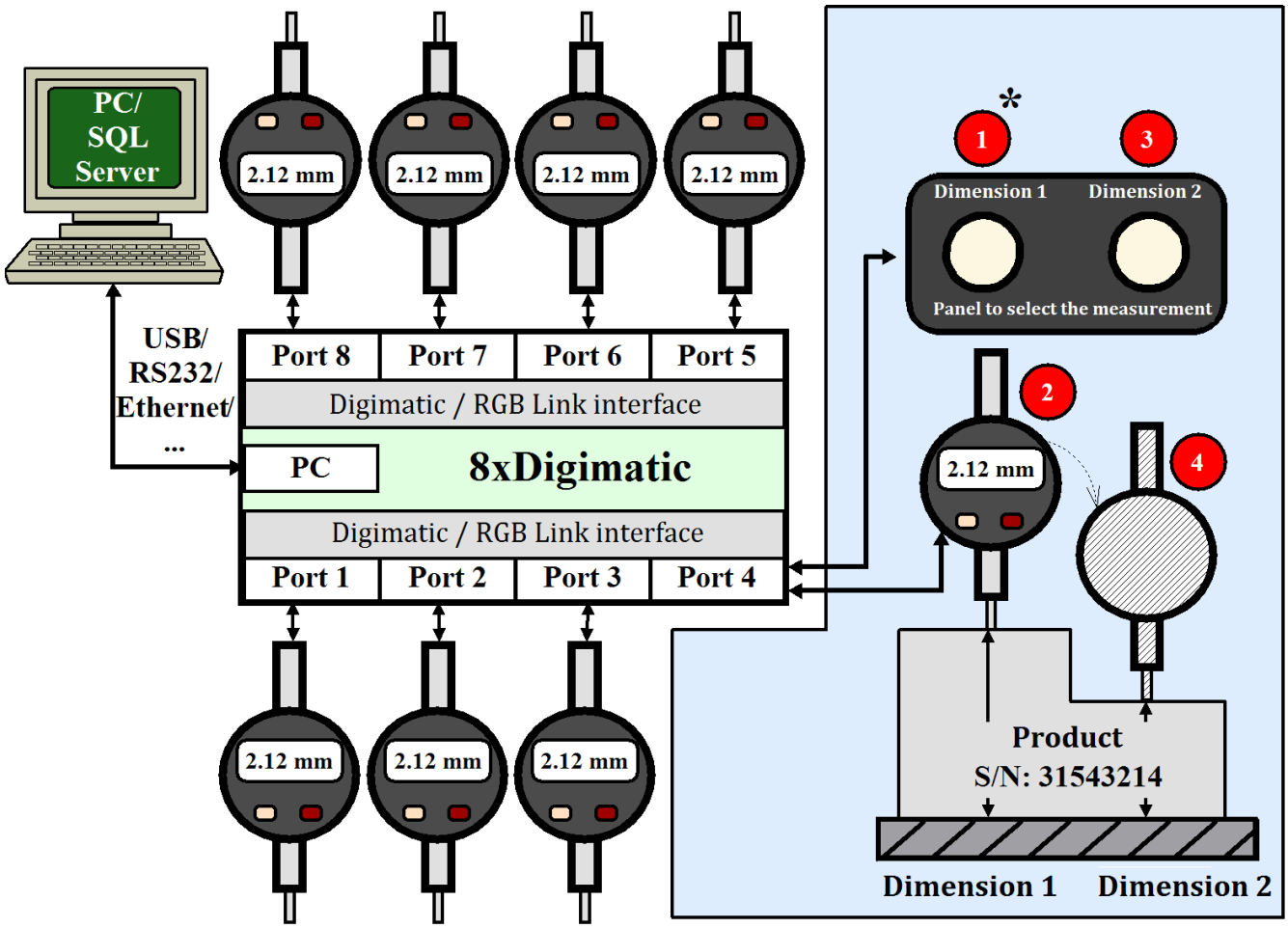

Fig. 2. Measurement of two dimensions of products using the control panel

Workplace Conification and the controls in production process

Figure 3 describes contemporary design workplace in quality control process - conification in AEROCAN CZ. After arriving at the workplace, the operator must first log in using a personal smart card. Measured values with editing options and more detailed information on the course of production in this line, are displayed on the terminal (industrial PC). The measurement notification is indicated by a flashing yellow traffic light. After the additional assessment of the required dimensions of the product, these values are instantly displayed on the screen of the terminal and sent to the MASA system. The measured value can be immediately seen by not only the operator, but also anybody else who has access to the system. Measured values can be clearly viewed through a web interface in a graph, statistical analysis and other actions can be done.

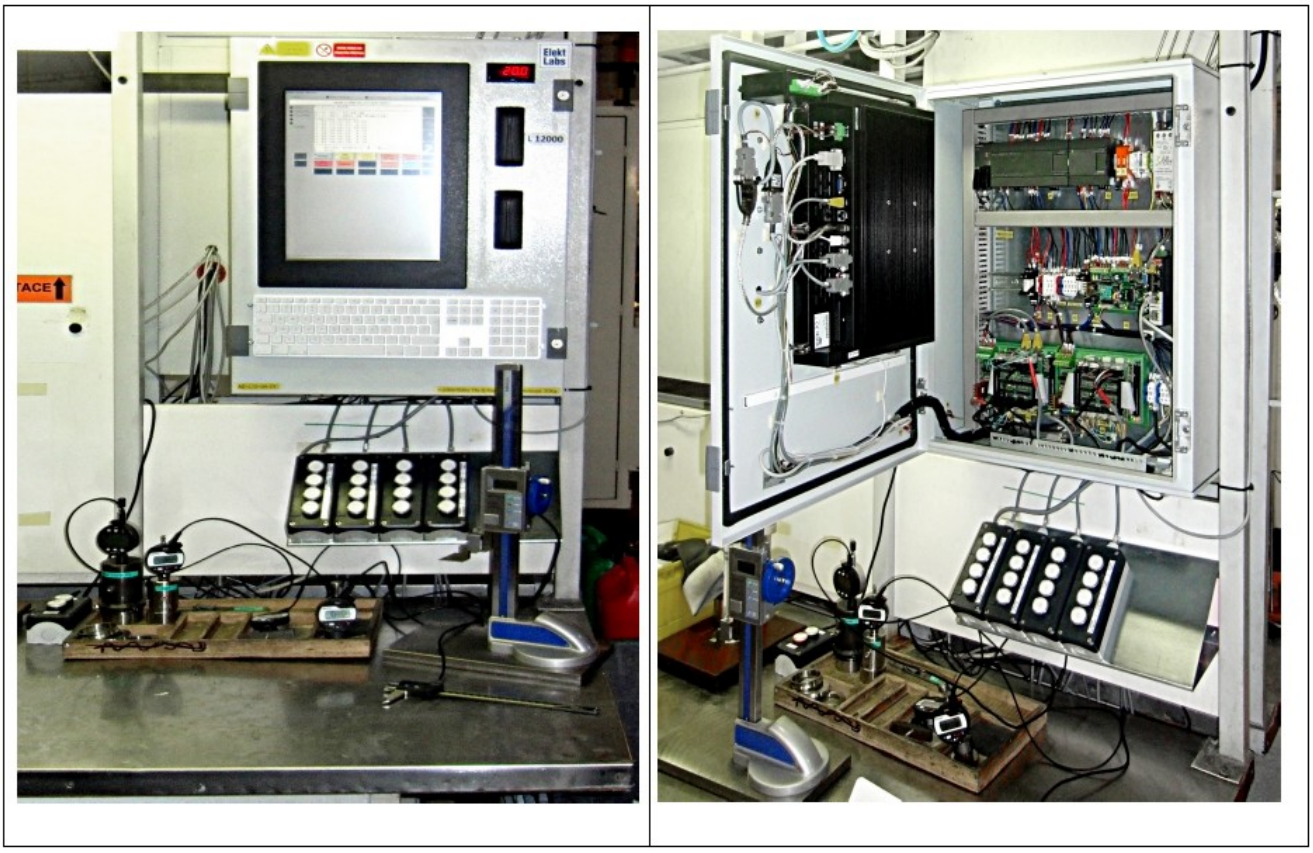

Fig. 3. The workplace quality control process in AEROCAN CZ

Conclusion

Automation in the quality control process allows instant access to measured data with statistical evaluation and long-term monitoring of the production process. The process of the measurement has become less dependent on the operators themselves and thereby limits the falsification of data from them. Additionally, operators are notified via light signal when they have to measure or if they are exceeding the limit. Ultimately, improved technological discipline and a reduction of the number of complaints were achieved. More information can be found on the company website, www.elektlabs.cz.

Author:

Milan Kořínek, Elekt Labs s.r.o.