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SOME RESEARCH ABOUT THE ACTIVE CONTROL PROCESS OPTIMISATION

Barbu Braun
„TRANSILVANIA” University of Brasov
Brasov Grivitei, no. 91, ap. 9, Brasov
Romania

Paul Beca
National Institute for Research and Development in Precision Mechanics, Bucharest
Romania

Ciprian Olteanu
„TRANSILVANIA” University of Brasov
Grivitei, no. 54, ap. 36, Brasov
Romania

Cristiana Marinescu
National Institute for Research and Development in Precision Mechanics, Bucharest
Romania

Gheorghe I. Gheorghe
National Institute for Research and Development in Precision Mechanics, Bucharest
Romania

ABSTRACT
The paper presents the way in which there it was put into practice the active control process optimisation, in case of waterwheel pump metallic cases active surface precision work. There are presented not only the issues, but also the experimental results about the manufactured probe's dimensional control.
Regarding the touching issues achievement on the optimisation, the paper insists about some different aspects: The first one refers to the gauge implementation for the active control insurance, having the possibility of the aided by PC dimensional measuring. There is described the way in which it proceeded in order to obtain the highest dimensional precision as soon as possible.
The second part of the paper presents who there were obtained the experimental data about the aided by PC dimensional control, but especially some aspects on the data processing by the point of view of statistics.
Key words: *active control, statistics, precision, software interfacing*

1. WHY THE ACTIVE CONTROL OPTIMISATION?
It is known that nowadays a difficult paradox must be solved: How to reduce the energetic consumption while to satisfy the more and more demand for products and services? Due to the fact that normally to ensure the quality but especially the necessary quantity for both products and services, that invokes to have a greater and grater energy consumption (water, electric power, fuels and so on). The main problem is that the earth resources are more and more limited. Due to this reason appears to be important how could we use with the maximum efficiency the resources.
The same aspect is also about the manufacturing, where all the processes require a to use a lot of energy. So, in these conditions to increase the efficiency during the production cycles is strictly recommended.
The dimensional inspection could decisively influence the manufacturing efficiency, because a proper and efficient dimensional control process eliminates to rejects or the cases in which to ensure the quality of a component some technological operations must be repeated. Besides, an optimised

dimensional control process leads to a drastically times reducing, so to increase the cadence in the production. In this mode it is evident that for a larger quantity of finite products the necessary energy consumption could be the same as for a half quantity of finite products, in case of a non-efficient production operation, especially about the control dimensional.
The dimensional testing of some functional components during their manufacturing process could be a good solution to increase the control efficiency. But the main condition is to have a performing active control [1]. To carry out this goal, two solutions could be adopted: the numerical command machines implementing or the aided active control aided by PC. The second solution could be more flexible, grace to the programming of the processes for a very large range of situation about the probe's geometry, measuring parameters, measuring devices and so on.

2. THE IMPLEMENTATION OF THE CONTROL GAUGE

Our research was realised together with the **National Institute for Research and Development in Precision Mechanics, Bucharest, Romania** about the ***waterwheel pump metallic cases***, which active surfaces precision work must be inspected.

In the present the study is in progress, grace to a research contract between our Department and the Institute for Research and Development in Precision Mechanics, Bucharest. This research project contains two main steps: the to developing of the control and manufacturing gauge by the Institute for Research and Development in Precision Mechanics and the dimensional control process optimisation, which is ensured by out Department team.

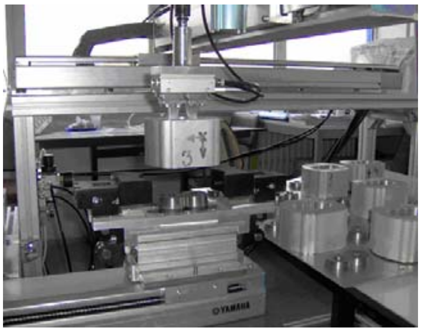

Figure 1. The developed manufacturing and control gauge by the National Institute for Research and Development in Precision Mechanics, Bucharest, Romania

About the dimensional measuring devices there is used a pair of non-contact displacement transducers with laser beam, for the inspection of the plane – parallelism deviation of the opposite active surfaces of the waterwheel pump metallic cases.

3. THE USE OF THE VIRTUAL INSTRUMENTATION TO ENSURE THE ACTIVE CONTROL PROCESS

About the dimensional inspection quality insurance, in our research we proposed to develop a flexible program to improve the active dimensional control performances, about two main aspects: the efficiency increasing of the process and the ensuring of the measuring accuracy. The programming environment is Lab VIEW.
About the efficiency, in our actual research study, we conceived and developed a flexible program to measure the required geometric parameters and to simulate the active control process, via the virtual instrumentation.
The actual stage of the proposed program allows to measure the form deviation in each pair of points of interest, situated to a direction scanning vector of the two active surfaces. Our application is adapted to measure the form deviation in equidistant pair of points, which number can be establish by the user, as the situation asks.
The main problem in our research is that both displacement transducers could not be yet synchronized. For this reason, in this stage, our proposed program allows to acquire the measured data

from a single laser displacement transducer, measuring a single surface, considering that the probe is aligned along the other surface of interest.

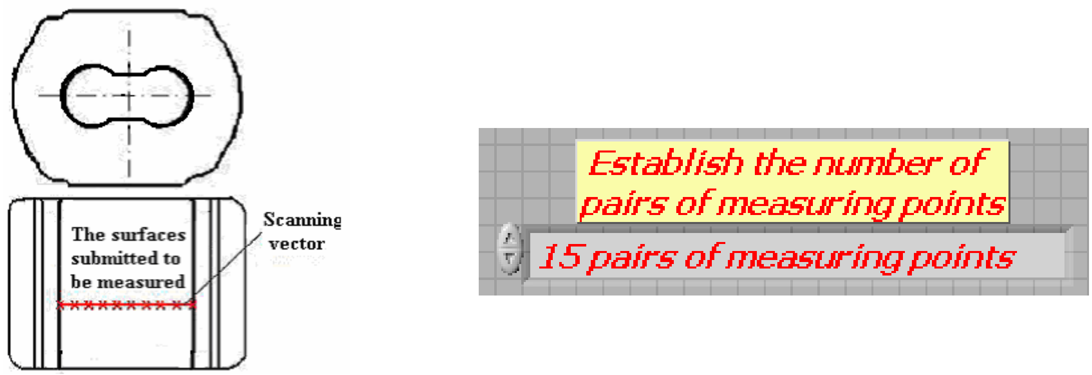

Figure 2. The establishing of the number of pairs of equidistant measuring points

Due to the fact that the dimensional measuring is made continuously and the used transducer have a high data transfer ratio (57600 bps), for a single measuring cycle the number of readings is about hundred or thousand order

The program processes the previously acquired data so that it could display the corresponding plane parallelism deviation for each equidistant pair of measuring points. It is possible by dividing the number of readings to the number of pairs of measuring points and taking into account the nearest data values.

Besides, the user can establish all the necessary geometric parameters of the probes, so the proposed program can be adapted to small or large series manufacturing: distance between the plane – parallel surfaces, length of the measured surfaces, distance between two successive pair of measuring points).

About the metrology, some parameter to ensure the active control can be establish, in order to sort the tested probes during the process. The parameters to be set are the following: the number of precision classes and the minimum and maximum tolerances for the plane parallelism deviation.

To extract from files the previously measured data, two *Read from file* functions were defined, the first to acquire the data in case of measuring in dynamic mode and the second to extract the data in case of static mode.

To respect the order of reading from files, in any case in which a program running is performed, a delay between the two readings is required. For this reason, we programmed the reading of the measured data in static mode at 6 seconds after the reading from the file containing the data in dynamic mode (in case of active control).

A numerical display of the processed measured data extracted from both files can be seen in the figure 3, a correspondence between form deviation values and the current pair of measuring points being considered as one of the most important information. Data about the minimum, maximum, averaged and global form deviation are also displayed.

In figure 4 there is presented the displaying of some information that could help the operator to change some parameters about the tested component manufacturing during via the active control or after the dimensional inspection [2].

As metrological results, the proposed program can generate some information on the measuring accuracy, by comparing the data obtained in static mode, as reference with the data obtained in dynamic mode. If the measuring errors are greater than the maximum accepted value established by the user as input measuring parameter, the virtual instrument urns ON a state led that inform the operator that the measuring in dynamic mode is irrelevant. Information about the measuring errors statistics are also displayed, as the following: numerical results about the averaged and maximum values of the measuring errors and graphical diagram representing the measuring errors distribution reported to each pair of measuring points.

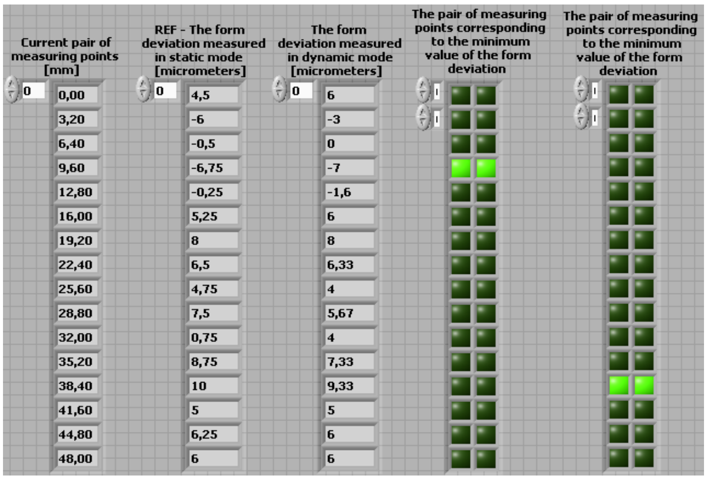

Figure 3. The measured form deviation values for both dynamic and static modes per each pair of measuring points

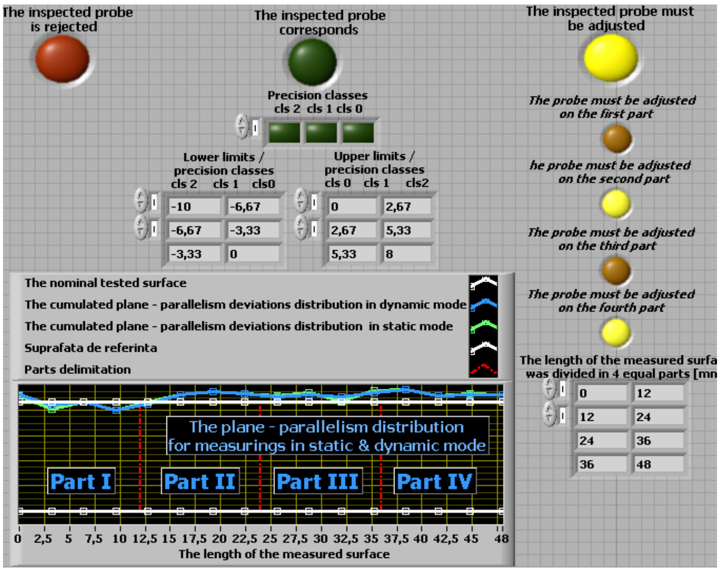

Figure 4. Aspects regarding the obtained results on the active / passive control process

3. CONCLUSIONS

Our proposed program could serve to increase the flexibility and quality in manufacturing process, in which the operator can intervene on the manufacturing process. The presented application could be improve so that the operator could be replaced by some ordering elements commanded by the aided by PC active control. For this reason to program the interfacing with the communication devices seems to be the main interest.

4. REFERENCES

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