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Production support by LabView-based data-acquisition systems

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Abstract

Medical devices are complex products requesting high level of safety and reliability because of their sophisticated functions. Automation of the quality control and the visualization of the steps of the production processes are useful supports of the production process. Our objective is to show a way of production support by LabView system.

Introduction

During the production of a product a lot of tests and measurements are done. First the electronic boards are checked separately, then the modules which are built from them are tested separately, and finally a lot of tests are conducted on the assembled system. During these test a lot of data could be acquired from the product, but – especially at the final testing of the product – the data acquisition could be difficult, because:

• The testing time is so long, that the continuous observation of the test is not possible
• If during the measurement more instruments are used, the simultaneous and continuous observation of all of them is not possible.
• Most of the measuring devices don't provide built-in data acquisition and storage
• Although some instruments have this function, it could be difficult to synchronize the data acquired by various instruments.

The solution of these problems is such a data collection system, that in real-time collects and synchronizes all of the information, that the used instruments provide during the actual measurement and then stores them into a common database, allowing the common processing of them. By this way the efficiency of the production could be greatly increased. For us at Oncotherm it is a priority to increase both the speed and the quality of the production of our products, so we started to develop integrated data-acquisition systems to support our production tasks.

Discussion

The main element of these systems is the LabView program suite, which has been developed especially for data-acquisition and instrument control and is provided by National Instruments. It can be used for a wide range of sophisticated tasks as watermonitoring [1], control of imaging [2], or bio-signals [3], even virtual laboratories can be constructed [4].

We know the LabView application is suitable for RF-controlling processes [5] and for complicated production as well [6]. Our objective is to support a production of the radio-frequency operating medical treatment device [7].

The main task of LabView is to control the NI's own DA units, but the products of the most important instrument manufacturers are controllable with the suite too. During our projects we use both NI instruments and the instruments of other manufacturers (Tektronix, Rhode&Schwartz) too.

One of our main ambitions is to monitor of the manufactured EHY-2000 oncothermia devices during their final tests, which means lots of test treatments continuously day and night. During these test treatments important data can be collected about the general behavior and the reliability of the system, which are the key factors concerning the quality of the product.

The device sends important information about its state by RS232 serial port and the inner signal lines of the device are monitored by NI data-acquisition devices.

A typical data acquisition system consists of the following instruments and provides us the following information:

• EHY-2000:
• By serial port: time after the start of the treatment, output power, reflected power and the states of the various protection signal lines
• By direct monitoring of signal lines: the control voltage of the amplifier and the voltages proportional with the forwarded and reflected power.
• R&S RF power meter: used as an external reference for the accuracy of the power measurement of the device.

• Multimeter: used as a current meter to monitor the correct consumption of the amplifier.
By using the data provided by the reviewed instrumentation we can get a clear picture of the energetic efficiency and the general behavior of the amplifier, which
– as the most difficult part of the device – needs the most testing.
Of course, the data-collecting systems always follow the demands of the current projects, capitalizing the flexibility of the LabView-based DA systems. On the bases of our experiences until now we have more ways of improvement in this field. The most important ones are:
• Research support: integrated data acquisition during laboratory experiments, focusing to collect data from the Lab-EHY laboratory device and the 4-channel thermometer also developed by Oncotherm.
• Production support: automated testing of our products by LabView-based instrumentations

Conclusion

The LabView based production and quality control of the RF-operating medical device are feasible. By realizing this conception we can both improve the quality of our products and the affectivity and the speed of our R&D projects, so we are committed towards these ways.

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