Effective quality control needs a customized test strategy. Test equipment for a function test or end-of-line test usually delivers more than just a "pass" or "fail" – it can also supply a wealth of other useful data.

A Clear View of the Future

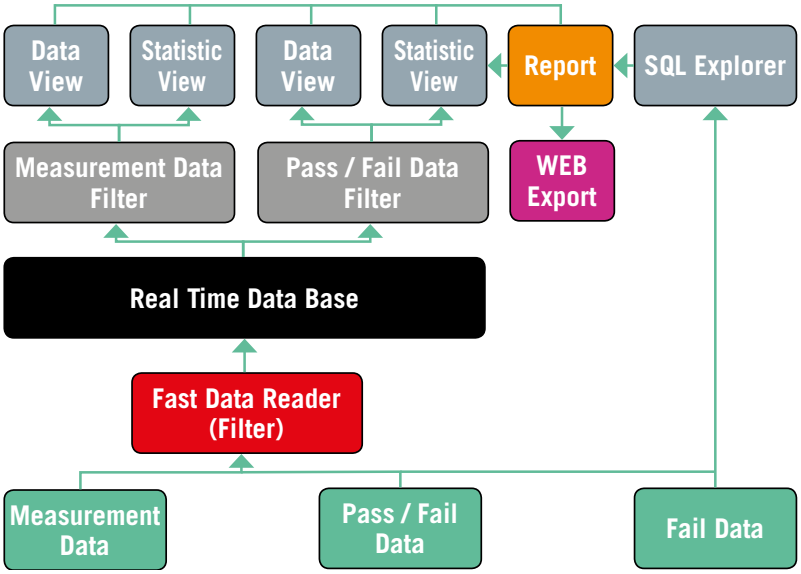
Collected data from end-of-line or function tests constitutes valuable material for production managers. Measured currents and voltages give direct indications of the behavior of electric and electronic components like capacitors, coils and resistors, and they supply information about the behavior of other components – such as the power consumption of an electric motor, which can provide indications, for instance, about the condition of its bearing. Or the time taken by a heating unit to reach a specified temperature can be taken as an indicator of its functionality. From the measurement and recording of specific physical parameters, test planners draw conclusions about the functional capability of the test samples. One aspect of interest is to recognize changes early on.

The slow drifting-off of measured values, for instance, can be so minimal to begin with that the test object is passed as satisfactory. However, the extrapolation of trends of this kind may be evidence of undesirable developments. Incidentally, this applies not only to the test objects, but also to the test equipment itself.

The gradual drift of an important parameter may be an indication of a fault in material or production. However, it is equally possible that in the testing unit itself, undesirable changes may be taking place which are detrimental to the test results. Test activities produce enormous quantities of data. Many test operators try to tame the data flood with self-generated Excel charts. The analyses – whose quality depends greatly on the talent of the generator – have the disadvantage that they do not run parallel to the measurements, but always constitute a "backward look".

Thanks to its own practical experience, metrology specialist MCD Elektronik recognized this problem very early on and developed a software tool, the "MCD Data Manager". Originally designed as an additional module for its own in-house development, the MCD TestManager CE, today the MCD Data Manager is a powerful tool, useful to all test engineers and their colleagues in production. The Data Manager can be operated in direct combination with the TestManager. However, its numerous interfaces mean that it can also be operated in »

Figures MCD Elektronik



System architecture of the MCD Data Manager

other test environments. The program analyzes measured values and generates statistics and reports. Thanks to the use of a fast real-time database, the analysis of the measured data is available almost in real time, after a brief processing time. Analysis can be either user-controlled or automatic. A wide range of filter functions allow the data material to be viewed from different perspectives. In addition, an SQL interface gives direct access to the data material, thus also making it possible to implement non-standardized, user-specific queries and analyses.

The integrated Report Module supports the user in generating his own analyses. These are stored in project files and can be uploaded at any time. For most firms, it is important to be able to adapt the appearance of reports freely to the company's own specifications, including the company logo. Export to superordinate management systems is also possible; various formats such as Word, Excel, PDF, Text, XML, HTML and many more are available for this. Conversely, the MCD Data Manager can also be completely remotely controlled through software from an external software system. An integrated script engine enables all analyses and reports to be automatically generated and stored. The data can also be made available as WEB reports at online-workplaces as required.

Different situations call for special views of the data. For this purpose the MCD Data Manager offers various filters, including serial number of the device under test (DUT), test mode, test duration, or a specific time window. The results are presented in list form, but can also be displayed in graphs with various parameters, e.g. "Top Errors".

Early problem diagnosis

As well as the availability of currently measured data, in most cases "trend analysis" offers a reliable look at the future. For this the Data Manager calculates a key trend indicator using statistical algorithms.

An indicator of this kind clearly shows up a development / change in the production process or the test process. In this way an undesirable alteration in the test object can be anticipated and prevented. However, the problem may often lie in the test procedure itself.

For trend analysis of the recorded values, statistical evaluation and filtering of the individual measurements takes place first. Thus for the trend calculation, only DUTs tested as PASS are analyzed ("golden devices"), in order not to distort the relevant trend by actual faults. Trend analysis can be focused on freely adjustable areas and different areas can be compared. The trend analysis itself is performed by a weighted approximation of the measured values.

Many Uses in Daily Testing

There were good experiences with the optical swash circumference testing of contact pins. This test checks whether the contact pins of a test item are bent. For this purpose the distance between the tip of the pin and a reference point is measured and the measured value is stored in the database.

During the commissioning of test equipment, an analysis of the database by the MCD Data Manager was very helpful. With the help of statistical evaluation (normal distribution) it was possible to analyze the distribution of the measured values, and thus the degree of precision achieved. On the other hand, the trend analysis function was helpful in determining and testing the stability of the values. The early diagnosis of "drifting" values was a very important criterion during commissioning, in order to ensure the stability of mechanical contact with the DUT.

As well as pure trend analysis, statistical comparison (sometimes including parameters which may at first seem unrelated) also plays a decisive role in the optimization of a production line. For this, the Data Manager offers the possibility of comparing measured values, automatically optimizing the limit values for a measuring point, and simulating the effects this has on production as a whole. Thus, by using the Data Manager in the production of audio amplifiers and optimizing several tolerances at the inline testing stage (i.e. before final assembly), it was possible to reduce the end-of-line (EOL) failure rate by 20 percent.

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