# The Selection of Production Test Equipment...

To achieve the goal of quality and value, the manufacturer should evaluate his existing test equipment and consider the following questions:

## Is the test equipment designed with state of the art circuits and technology?

The same types of advances we have all seen occurring in everything from appliances to the computer apply to test equipment as well. The electronic evolution allows features to be offered in test equipment today that were just not practical a few years ago. These new features are appearing in fully automated test stations as well as basic testers.

## Should automatic test equipment be considered for the application?

For price and value, it is hard to beat individual testers built in quantity. To integrate the various test functions it can make sense to couple some individual testers together. Often a special module must be included to complete the integration. If there are a number of functions to be performed, the purchase of a custom test station might offer the best value, as it allows some or all of the individual testers to be replaced with test modules. Individual logic circuits can be replaced with a PLC or on-board computer. The individual test stations can be tied together on a network or better yet, interconnected through a host computer. This provides a wide range of choices to the manufacturing engineer designing a test system.

## Does it offer the ability to set acceptance limits around each of the parameters tested?

We always hope that the operator remains alert and applies good judgment to the test results obtained. The application of fixed tolerance limits to the test parameters aids the operator by insuring consistency in the test results. The ideal test equipment allows the operator to monitor the test results, while applying fixed tolerance limits. If one of the limits are violated, the operator must take some unique action to acknowledge the condition.

## Does it allow the automatic collection of data, so the processes can be studied and appropriate adjustments are made?

The collection of data fills several needs. It provides proof that the tests were run, enhancing customer confidence and it provides a basis for trend analysis, leading to improved process control. A feature emphasized by ISO9000.

## Are voltage regulators provided on the incoming power line to insure consistence of the performance tests conducted?

The line voltage in most industrial plants varies significantly as the assortment of machines and electrical equipment are operated. Most complex test stations contain power supplies that regulate the circuit voltages and are unaffected by any normal variation in the power line. There are two common final acceptance tests however that are effected by this variation, the dielectric tests are noted above and the operational tests. If the test procedure calls for current draw or wattage tests in an operating mode, the results can be severely affected by a variation in the line voltage. In these cases some form of voltage regulation or control is called for. If the product wattage is very low, a solid state voltage regulator solves the problem easily. As the product's wattage increases, the problem becomes much more expensive to solve. The easy solution of motor driven full range autotransformers with current sensing is not practical in most cases. Some lower cost alternatives include limiting the voltage control range to five or ten volts and/or providing a line voltage meter and alarm so the operator can make the necessary adjustments. If the products under test require different voltages, or frequencies, or require an adjustment of the line voltage during the test, computer based automatic test stations offer some distinct advantages.

## Is there a system for insuring that all products are tested to the appropriate test parameters?

A variation in the types of products tested implies a risk that the product will not be tested to the correct test parameters. To minimize this risk, clear, easy to understand procedures must be available to the inspector. Some of the more sophisticated test stations address this problem by allowing the inspector to select the test parameters by typing in the product's code number or by scanning the product's bar code. In either case the parameters applied must be identified to insure tractability of the procedure.

## How are changes to the test parameters implemented and documented?

Along with the documentation of the test procedures the changes to those procedures are also important. In the absence of computer base test stations that provide such records, the manufacturing engineer should insure that all changes are recorded along with the effective date and product serial number.

## Are the testing functions integrated?

When planning a production facility, all inspection and tests to be conducted on the product should be considered. Inspection and test data should be tied together; the tests conducted should be, as much as possible conducted at one point and with a single connection to the product.

## Do you have a system for insuring that a rejected product can not be shipped if somehow it gets back into the production flow?

As well controlled, as today's production lines are, the risk of shipping a known bad product is low, but the consequences are very high. If a computer based test station is under consideration, an interconnection to the company's main frame should be studied to avoid this possibility.

## Is there a system to verify the operation of the test equipment?

The greatest risk in production testing is failure to identify a defective product. If it is discovered that a tester is passing defective products, then all products tested since the last verification of the tester are subject to recall. For this reason it is important to verify the testers operation on a frequent basis. As a minimum, this functional test should be scheduled once per work shift. If there is any uncertainty about the test equipment, a more frequent functional test is in order. The functional test should be designed to be very easy to conduct so the test operator can perform it with confidence. The philosophy of the function test should be to verify that the tester could immediately identify any safety problem in the product under test. An ideal functional test will also insure that the test will pass good products, but this is less important as this will soon be discovered when the testing starts. When considering automatic test equipment specify that it prevents operation of the test station until a successful functional test has been completed.

## Is test data disseminated effectively?

A good testing system insures that all those in the work cell are kept informed and management and engineering is updated on a regular basis. If a manual system is to be used, the reporting can be as simple as a daily status written on a black board. If an automatic system is used, the reporting system can include an electronic score board for all to see, the automatic printing of daily production report and the weekly printing of a management summary report. The automatic systems often include an exception alarm to call attention to an event as an abnormal number of failures of a particular product or the successful completion of production goal.