The theme for 1984's International Test Conference was "The Three Faces of Test—Design, Characterization and Production." It was intended to emphasize that test is an integral part of all phases of a product's life cycle. A test approach that focuses on one area only will not result in an optimum solution unless its impact in other areas is considered. When the total picture is examined in this fashion, a more economical solution to the test problem should be realized.

There are two principal reasons for testing. They are to produce a more reliable product and to reduce costs. The International Test Conference has provided a forum in which the economics of testing has been fiercely debated. Issues such as when to test, how to test, what to test, and with what equipment are a traditional source of material for the conference. At the foundation of these debates are often economics issues.

When do you test? Do you invest heavily in extensive testing at the IC level to increase board yields, or do you cut back at the IC level to reduce those test costs and take your chances...
on poor board yield? Do you embark on a 100-percent incoming inspection program? Should you pay for burn-in to improve system reliability?

How do you test? What do you test? Testing is the means used to either move a product forward or return it for rework (or the reject bin). The techniques that are used to test products are important because they ultimately determine the accuracy and legitimacy of the measurements. Given enough time and money, a test can be derived that will make measurements accurate to fractions of a percent. However, such an approach may not be economically practical. Test techniques concern not only the accuracy of measurement but also how quickly a test can be accomplished without significantly sacrificing coverage.

What equipment do you use to test? This is probably the most visible economical issue in the field of test. State-of-the art automatic test equipment has always been costly. With the latest integrated test systems exceeding the $2 million mark, they receive much notice in capital equipment budgets. How can these high costs be justified?

This month's issue of Design & Test highlights papers from the 1984 International Test Conference that deal with the economics of test issues. It should be noted that only one of these papers was actually in the Test Economics session, thus demonstrating how the economics of testing permeated the conference. In coming to grips with the high cost of automatic test equipment, George Bowers and B. G. Pratt of IBM have performed an analysis of the total life costs of production test equipment. The authors compare the total cost of facilitating a test line with many low cost, budget testers versus a few high-priced, high-performance testers. Anthony P. van den Heuvel and Noshir F. Khory of Motorola examine the cost of performing burn-in testing compared with the savings gained through better system yield and reliability. John R. Day, formerly of Teradyne, discusses an algorithm to analyze faults in dynamic RAMs. He presents a methodology for repairing them through the deletion of defective elements and the insertion of redundant ones. Such techniques are being used to improve memory yields and thus lower their cost.

The article by Dean Bandes tells how to analyze and effectively present test data collected on the manufacturing floor. Test data must be presented in a clear, concise manner so that intelligent decisions can be made concerning the manufacturing process being analyzed. Finally, Douglas K. Shirachi discusses a number of techniques that can be used for codec testing. With the telecommunications industry experiencing rapid growth, the demand is great for sophisticated but low-cost circuits. The advent of automated analog circuits testing is helping to reduce these costs. This article should give an appreciation of some of the problems the analog test profession must face.

I hope that you enjoy reading about the important face of test that is being presented in this issue. While there is only one economics session at the International Test Conference, it certainly is an underlying theme found in many papers and sessions. May this issue be of value to you in understanding some of the economic areas of test that are so important in keeping product costs to a minimum.

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