

# Center for Quality and Reliability Engineering (QRE)

Rutgers, the State University of New Jersey, and Arizona State University

**Working on methods and approaches to improve the quality and reliability of vital products and systems, including both hardware and software and their interactions**

*A National Science Foundation Industry/University Cooperative Research Center since 1996*

## Center Mission and Rationale

The Center for Quality and Reliability Engineering (QRE) provides university researchers with the opportunity to benefit from the knowledge, experience, interests, and resources of our industry partners. The partners offer expertise and resources relating to critical problems of concern to industry, such as efficient methods to improve product quality and reliability and optimal design of testing plans for the product. The Center provides technical expertise, along with the research resources of two major academic institutions, Rutgers University and the Arizona State University.

The mission of the Center is to conduct research and develop models and prototypes for evaluating system performance and for improving the quality and reliability of components, products, and systems. Our goal is to provide timely, high-quality, and cost-effective research, development, training, seminars, and workshops in the quality and reliability engineering areas. The Center has a reliability testing facility that can be used to assess the quality and reliability during the life cycle of products.

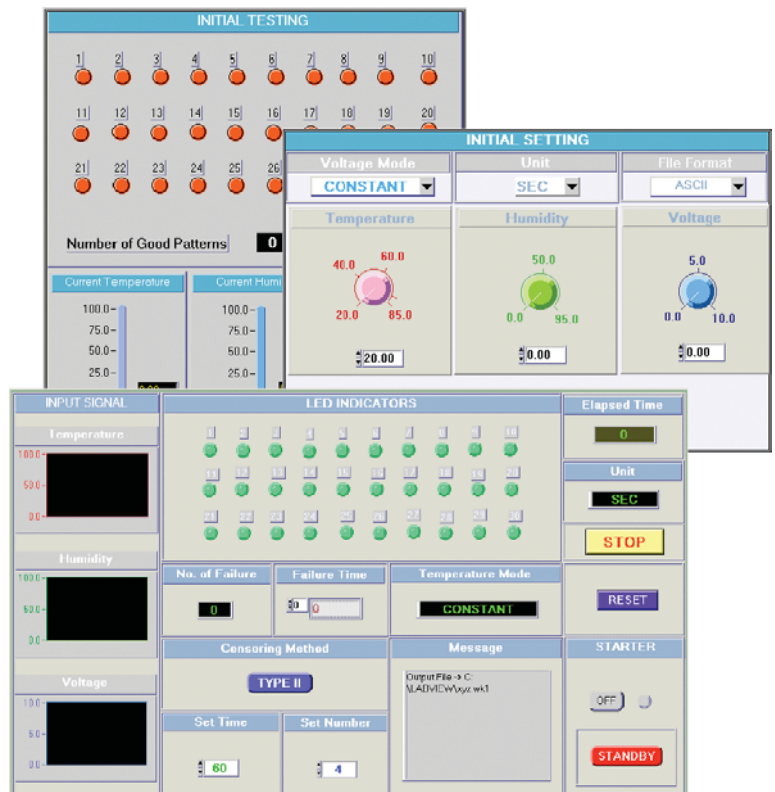
The (QRE) Center is a national resource for research, technology evaluation, development of quality and reliability tools, quality and reliability testing, education, and information transfer.

The QRE Center is dedicated to the vigorous pursuit of new techniques that will lead to high-quality and highly reliable components, products, and systems. In the current environment of growing public demand for higher-quality products and services, along with rapid technological changes, the QRE Center plays a key role in serving the interests of private industry, government agencies, and academia. As a joint project of two major universities, the QRE Center is educating a new generation of technical personnel for careers in the quality and reliability engineering field.

## Research Program

The primary research activities of the center involve: 1) the development of new methods for improving product quality through design of experiments and response-surface methodologies; 2) development of approaches for estimating reliability of complex systems; 3) innovative research for monitoring and controlling manufacturing processes; 4) test plans for accelerated life testing of highly reliable components; 5) methods to assess the reliability of both software and hardware; and 6) education and technology transfer. Areas in which the Center is currently conducting research include:

- Control of the Startup Period in Batch Processing
- Repairable Systems Reliability: Planning and Assessment Tools
- A General Reliability Model for Accelerated Life Testing: Statistics-Physics Relationships
- Product Testing and Process Control in a Multistage Productions System



Monitoring an accelerated life test

- Reliability Prediction Based on Degradation with Multiple Changing Stresses
- Optimal Allocation of Stress Levels and Sample Sizes in Accelerated Life Testing
- Hybrid Acceptance Sampling Plans
- IC Manufacturing Process Control
- Statistical Methodology for Characterization, Control, and Optimization of Industrial Processes

### **Special Center Activities**

The Center is integrating the research activities into the development of academic and continuing education programs. Undergraduate and graduate students are exposed to the R&D activities taking place at the Center. In addition, the graduate programs at both Rutgers University and Arizona State University offer tracks at the Masters and Doctoral levels in Quality and Reliability Engineering.

### **Facilities**

The QRE Center has a wide array of materials testing equipment, roundness measurement equipment, temperature and humidity chambers, vibration tests, and failure analysis equipment such as scanning electronic microscope (SEM) and voltage stressing equipment. LABVIEW and STATGRAPHICS software are available for students' use.

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