

Elements of the Endicott Interconnect Quality System

High quality performance and reliability doesn't happen by accident or chance. High quality is achieved through a fundamental commitment to attain a certain preferred standard at all levels. W. Edwards Deming recognized this and Endicott Interconnect Technologies agrees. That is why Deming's 14 points are clearly evident in our quality system. Our system is an inherent part of our synergistic approach to product development including advanced engineering and design, manufacturing and reliability. Within this system we have established 5 great pillars of strength:

- Education and Training
- Problem Avoidance
- Communications
- Control Systems
- Management and Business Systems.

Each pillar adheres to the fundamental principals of quality as outlined by Deming, Juran and other recognized experts.

Education and Training

This subject was so important to Dr. Deming, that it was reflected directly in two of his 14 points, and indirectly in almost all of the others. At Endicott Interconnect we too have a strong belief in the value of education and training. Education and Training produces empowered, knowledgeable and proactive employees. An organization can achieve its goals in lean operations and quality or reliability, only when its employees practice these principles. At Endicott Interconnect our Education and Training in quality includes that:

- All Endicott Interconnect employees are educated in the Quality Management System. Each person must embrace the organization's commitment to quality and understand their role in ensuring the value our quality provides to our customers.
- All new employee are introduced to the Quality Management System in a module given during orientation classes
- Every Employee receives general QMS education
- Project Representatives attend a 2 day Internal Auditor Class
- Quality System Coordinators attend a 5 day Lead Auditor Class which is RAB approved

Our comprehensive training program includes:

- Process Control Concepts
- Tools (hardware and software)
- Process operation training
- Training and certification in applicable standards such as IPC standards.
- Safety training
- Chemical and environmental training

Problem Avoidance

Problem avoidance is fundamental in our approach to quality and reliability thinking. Our overall quality process is based upon DMAIC and PDCA systems, and includes reliability thinking as a key element. To attain consistent levels of high product performance and reliability, we integrate our verifications and reliability analysis into our fundamental engineering procedures and product development practices. In this manner we are able to greatly minimize product defects and maximize product performance and reliability.

Proactive Approaches

Our proactive approach to problem avoidance includes elements such as:

- Products, Materials, and Processes are thoroughly analyzed by cross functional engineering teams, prior to introduction into manufacturing, to reduce or eliminate opportunities for error and improve customer value.
- Modeling and testing
- Pre-Analysis
- Product/Material Qualifications
- Process Qualifications
- Process Controls
- Reliability Assessments

Verification and Validation

Our manufacturing processes are rigorously qualified to ensure that they are capable of consistently meeting and exceeding specified requirements in a volume manufacturing environment. Product attributes are produced by capable, controlled processes and verified by applicable tests and inspections. In addition, the following quality control elements are implemented.

- First Article Metrology
- Chemical Process Controls
- Product Technology Monitoring
- End of Line Inspection & Electrical Test
- Maverick Lot Control

PTH Reliability

The PTH can be the weakest link in printed wiring board reliability. We have invested extensively in design and process elements to ensure outstanding reliability in our plated through holes. Elements of our PTH reliability program include;

- Latent Defect understanding and avoidance
- Electrical reliability testing
- CITC (PTH reliability) testing as a process monitor and qualification technique

- Product specific Yield Improvement / Tracking

Communication

ISO 9000 focuses on communication – knowing you have the right document, the right level, and understand your responsibilities in the process. In his book *Out of the Crisis*, Deming, made reference to numerous examples of quality problems that had elements of communication problems at their roots. Our extensive use of electronic systems in our documentation and control systems provides us with an efficient effective way to ensure good communication.

Documentation

All of our processes are documented. These processes are practiced in accordance with the principals of ISO9000. Process documentation is on-line, ensuring the use of current and up-to-date information and allowing inclusion of multimedia visual aids and linkages to related documents.

Electronic Routings

Electronic routings and bills of materials ensure that the latest level requirements are always available to the manufacturing process and that extensive detailed traceability is maintained.

- Archived Routing/Process History
- Electronic Change Approval and History
- Electronic Specifications
- Easy to read - easy to follow
- Includes hot links, images and videos for clarity
- "On-line Change Notification"

Control Systems

Process Controls

Appropriate process control strategies and tools are in place throughout the Endicott Interconnect manufacturing operation. The foundation of our process control strategy is an in-depth understanding of the relationship between process parameters, product attributes, and the impact of those attributes on the form, fit, function, and reliability of the product. We don't stop at SPC. Throughout our facility, wherever possible we have implemented machine level control. Our well maintained advanced process machines are capable of controlling process parameters far tighter than traditional SPC would normally enable. This reduces opportunity for error and produces tighter process control. Wherever possible, we have maximized our use of this technology, enabling us to hold excellent process capability and predictability. The elements of our process control strategy include

- Appraisal and Compliance Audits
- Process Monitoring / Control
- Statistical Process Control
- Closed Loop Machine Control
- Feedback /Feed Forward System
- Scheduled predictive and preventative maintenance programs
- Scheduled on-line calibration tracking and reporting
- Remote process status visibility for our engineering teams.

Product Shipment Controls

In addition to qualification and process controls, Endicott Interconnect maintains the test and inspection resources to ship product in compliance with applicable IPC, JEDEC, or customer product specifications.

- Product Must Pass Specified Quality Audit
- Certificate of Compliance (COC) Included, if required
- End of Line Product Monitors Must Pass
- Customer Concurrence For Off-Spec or Product Waiver

Advanced Quality Assurance Capabilities

Endicott Interconnect offers additional proprietary testing for high reliability applications. These include methods to evaluate PTH reliability, signal line integrity, resistance to electrical leakage, and other application specific test and inspection strategies

Management & Systems

According to Deming, Management and Systems is what its all comes back to in the end. Each of his 14 points were directed at management. At Endicott Interconnect, we have developed systems that ensure consistent, customer focused quality for products and services that help reduce cycle time. Beyond that we have established a management system and business philosophy to sustain our quality and improve our performance.

Customer Focused

- Customer feedback is tracked and reviewed. Measurements are interlocked with our customers. Failure Analysis and Root Cause/Corrective Action generation are integral to our close loop process for Continual Improvement.
- Shipped Product Quality Levels (SPQL) are tracked and reported
- Customer quality concern focal point is assigned to each account
- Customer quality problems tracked in our on-line systems through resolution
- Failure analysis is performed as needed
- Root cause / corrective action documentation is completed on-line
- Regular management quality reviews are held
- Customer measurement interlock meetings are held

Continual Improvement

- Cross Functional Teams share best practices across the Endicott Interconnect product offerings. Industry benchmarking is also integral to the introduction of best practices.
- Matrix management is utilized- business process / business area
- Best practices are incorporated across business
- Strengthen Business processes are strengthened
- Variability is minimized

Ownership

- Everyone Owns Quality
- Engineering owns Process Capability
- Manufacturing Owns Process Control

Commitment

At Endicott Interconnect we utilize a cross-functional team approach. There are core groups responsible for various functions. Management is completely committed to supporting the teams and each team is totally committed to success of the business.

Data Systems Linkage

Quality and process data is collected at both the individual workstations, and through centralized process control tools. This data is stored and archived to ensure that it is available to our engineering and manufacturing teams on demand. In addition to real time process control, this system allows us to perform post process analysis, historical reviews and optimization studies, along with enabling data mining and traceability.