

Training From the Start

The time to begin thinking about training is in the research and development stage of a new product.

By Ted Cocheu

Conner Peripherals is one manufacturing company that incorporates training into the research and development stage, when it comes to producing new products.

Conner Peripherals manufactures 3.5-inch hard disk drives for personal computers. Conner's products are sold directly to the manufacturers for installation into their systems before the systems are sold to end users.

The training department has played a key role in Conner's unique product development cycle and in the production training and certification process that parallels the development cycle.

Getting a new product developed and into production could be complicated by distance: Conner manufactures products in Singapore. But the company smooths the transition early in the game by bringing teams of



trainers to the U.S. from its facility in Singapore.

In general, Conner operates on four main principles for introducing new products:

- staying close to key customers from product inception through delivery
- establishing new technical standards that others can use
- aspiring to technical leadership and trying to provide a constant influx of new, innovative products
- trying to launch new products from research and development into volume production faster than the competition.

Specifically, Conner's strategy for manufacturing new products involves a rather unorthodox, three-phase product development process:

- research and design
- product and process development
- volume production.

See the box, "Product Development Process," for a summary of what each phase involves.

Phase 1: Research and design

All technology research and new product design is done by a small

Cocheu is director of development and training at Conner Peripherals Inc., 3081 Zanker Road, San Jose, CA 95134-2128.



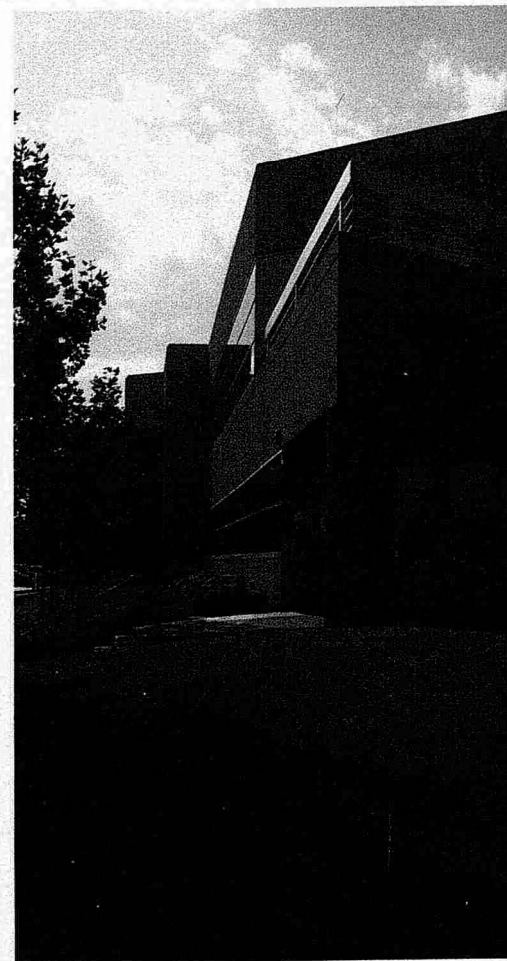
group of engineers in Longmont, Colorado, completely isolated from corporate headquarters in San Jose, California. The engineers work hand-in-hand with key customers to define the information storage requirements of the computer systems the customers will be using. Conner sells its designs upfront and builds in commitments to the products at the beginning of customers' product design cycles.

The role of the R&D group, which

Conner Peripherals uses a three-phase process to develop products and the processes for manufacturing them. The company makes hard disk drives for personal computers and work stations. ▲

Conner is based in San Jose, California, but has manufacturing facilities in Singapore. ►

has about 60 people, is not to design completed products. It is to develop the required technology and build initial prototypes that demonstrate



Product Development Process

Conner Peripherals' unusual product development cycle has three parts. Here's a summary of what each phase includes.

Phase 1: Research and Design

- customer commitment
- technology application
- product design
- prototypes.

Phase 2: Product and Process Development

- product finalization

- development of processes and methods
- supplier selection
- early production ramp (the production ramp is the time it takes to get a product into volume production).

Phase 3: Volume Production

- quick production ramp-up
- high volume
- high quality and reliability
- low cost.

that the designs can meet customers' requirements.

Because prototypes are built by hand or under the direct supervision of the design engineers, training plays a role, although minor, in Phase 1. Production personnel and small groups of manufacturing and test engineers from the San Jose facility go to Longmont to be trained on the products before Phase 2.

Phase 2: Product and process development

Phase 2 begins when R&D transfers a new design to one of the product and process development groups in San Jose. There, manufacturing processes are developed to turn designs into products. The goals are reliability

and high quality.

During Phase 2, customer qualification units are built and customers' initial production requirements are determined. About 1,200 people are involved in product and process development, including corporate support functions.

Training plays a strategically important role in Phase 2. It occurs in three areas:

- Production associates in San Jose are trained.
- The training procedures for each product are documented.
- Trainers from the facility in Singapore are transferred to San Jose to be trained as part of the process of transferring products into high-volume manufacturing from Phase 2.

Phase 3: Volume production

As soon as a new product has demonstrated performance and maturity in Phase 2, it is transferred to the volume production facility in Singapore. If all work in Phases 1 and 2 has been done properly, production levels can accelerate very quickly in Phase 3.

About 3,500 people work in the high-volume production facility in Singapore. There, the trainers who were trained in San Jose train and certify all production associates on specific operations. Then the associates can move on to work directly on the production line.

Training and certification

The training and certification process, which parallels the three phases of the new product development cycle, involves seven major steps:

- on-line training
- process validation
- skills certification
- Manufacturing Training Instruction development
- skills verification
- transfer training
- off-line training and certification.

Step 1: On-line training

The new product design undergoes rapid evolution in Phase 2. In actual practice in disk-drive development, the product design and the production processes are developed concurrently. Design changes from engineering are modeled on the production floor. Continuous feedback between the two groups quickly improves the product and process.

Assembly processes, tools, and the product itself all undergo constant change. Such changes make off-line, or vestibule, training impractical in Phase 2. Production associates in Phase 2 are trained on-line by supervisors. The training department directs and oversees the on-line training process to ensure overall quality and consistent training. During peak hiring periods, supervisors and the training staff collaborate to perform the training on-line.

Step 2: Process validation

A major problem that most manufacturing trainers face is having to train and certify people without access to adequate process documentation. At Conner, process engineers

America's Fastest-Growing Start-Up

By Melissa McDaniel, a publications intern at the American Society for Training and Development, Alexandria, Virginia.

Erupting onto the *Fortune* 500 in only its third year of production, Conner Peripherals has established itself as America's fastest growing start-up company. In 1989 Conner surpassed the \$500 million annual revenue mark faster than any other start-up company in history.

The San Jose manufacturer of hard disk drives for personal computers and work stations recorded a profit of more than \$11 million on revenues of \$113 million in its first year of production. In 1988, sales increased to \$257 million with profits of \$19.8 million. Last year, revenues surged to \$709 million, an increase of 175 percent.

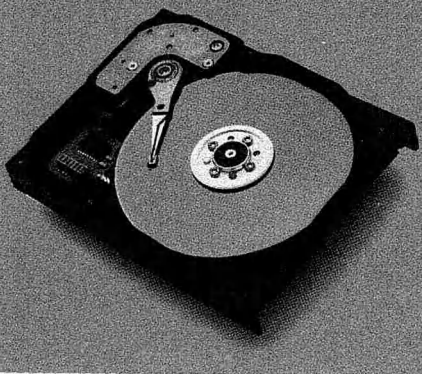
Conner owes its early success to its partnership with Compaq Computer Corp., its first and biggest customer. When Conner Peripherals founder Finis Conner had trouble interesting venture capitalists in his new firm, Compaq invested \$12 million, getting 48 percent of Conner's stock in return.

Even more significant than the financial investment was Compaq's role as Conner's customer.

The firms worked together closely on the new disk drive design, a process that guaranteed a market for Conner's product. Sales to Compaq accounted for 90 percent of revenues in 1987.

Since then, Conner's sales have broadened to include such Compaq competitors as Toshiba, Zenith, NEC, and Olivetti. Compaq's share in the company has dropped to 31 percent, and last year sales to Compaq accounted for only 29 percent of revenues. Ironically, Compaq held the previous record as America's fastest growing start-up company.

Now, the industry is waiting to see if Conner will pass another milestone this year. Sales for the fourth quarter of 1989 totaled \$226 million. If Conner continues growing, its revenues should reach \$1 billion in this, its fourth year of operation.



are required to develop complete Manufacturing Process Instructions (MPIs) for every product.

Conner found when MPIs were first used to train and certify people, there were often discrepancies between how operations were described in the documentation and how they were actually performed by associates on the production line. Several reasons became clear.

One reason was that process engineers, the production personnel, and the training department sometimes interpreted the MPIs differently. Another reason was that some steps described in the MPIs were inaccurate or had become obsolete. Also, some of the documented procedures were sometimes performed improperly on the line.

To solve the problem, the training staff came up with a procedure called process validation. Using process validation, a trainer takes the MPI onto the test floor and compares a specific process, step-by-step, with the operations that are actually performed by experienced production associates. The trainer "red-lines" any discrepancies on the MPI and discusses them with the responsible process engineer. Each item is examined to determine whether it is a performance problem or an inaccuracy in the MPI. If it is the latter, the engineer corrects the MPI before a trainer uses it to certify people's skills.

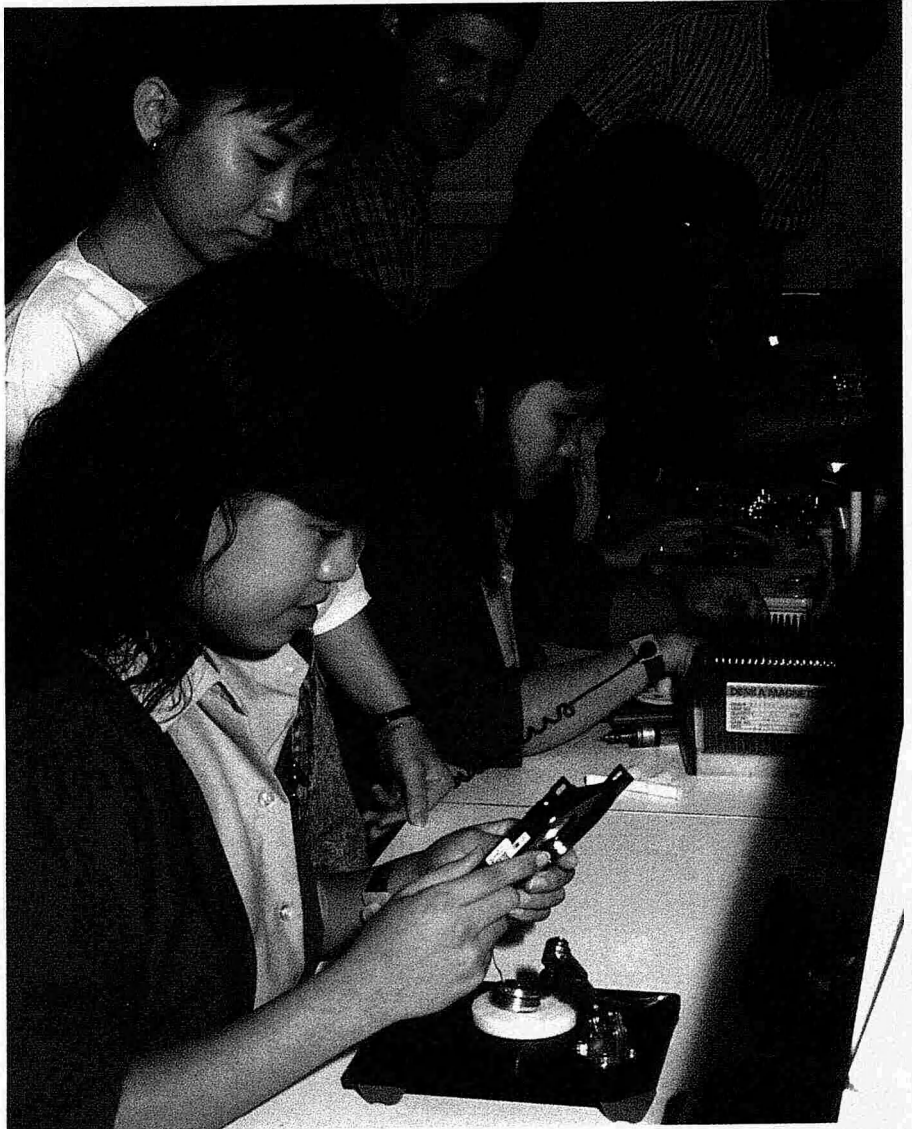
Step 3: Skills certification

Conner's customers demand a high level of integrity in the production process, and they insist that only certified operators be allowed to work on their products. Therefore, once the processes have been validated for a new product, the MPIs are used to certify operators' skills.

Skill certification has two goals: to ensure that people know how to perform their operations according to the applicable MPIs and to ensure that they can do them repeatedly without deviation or error.

The certification procedure is rigorous yet simple. In order to receive certification, associates must perform their operations five times consecutively without deviation from the MPI. (See the figure.)

To begin certification, the trainer observes the associate performing the operation once. Any problems or per-



formance discrepancies are discussed with the associate at that time.

The associate is then required to perform the operation five more times, consecutively and without deviation from the MPI. If any deviations are observed, the associate is asked to stop, is given feedback, and is asked to try again. The associate must start from the beginning and perform the operation five times consecutively without deviation. If the trainer notices any deviations in the second round, he or she halts the certification procedure and notifies the employee's supervisor.

The trainer and the supervisor then determine which of the following three courses of corrective action is most appropriate: further training, transfer to another operation, or disciplinary action. Most experienced associates obtain certification on the first or second try.

A rigorous certification process ensures that Conner employees can perform various operations successfully. To be certified in a task, an employee must complete it five times in a row without deviating from process standards.

Step 4: MTI development

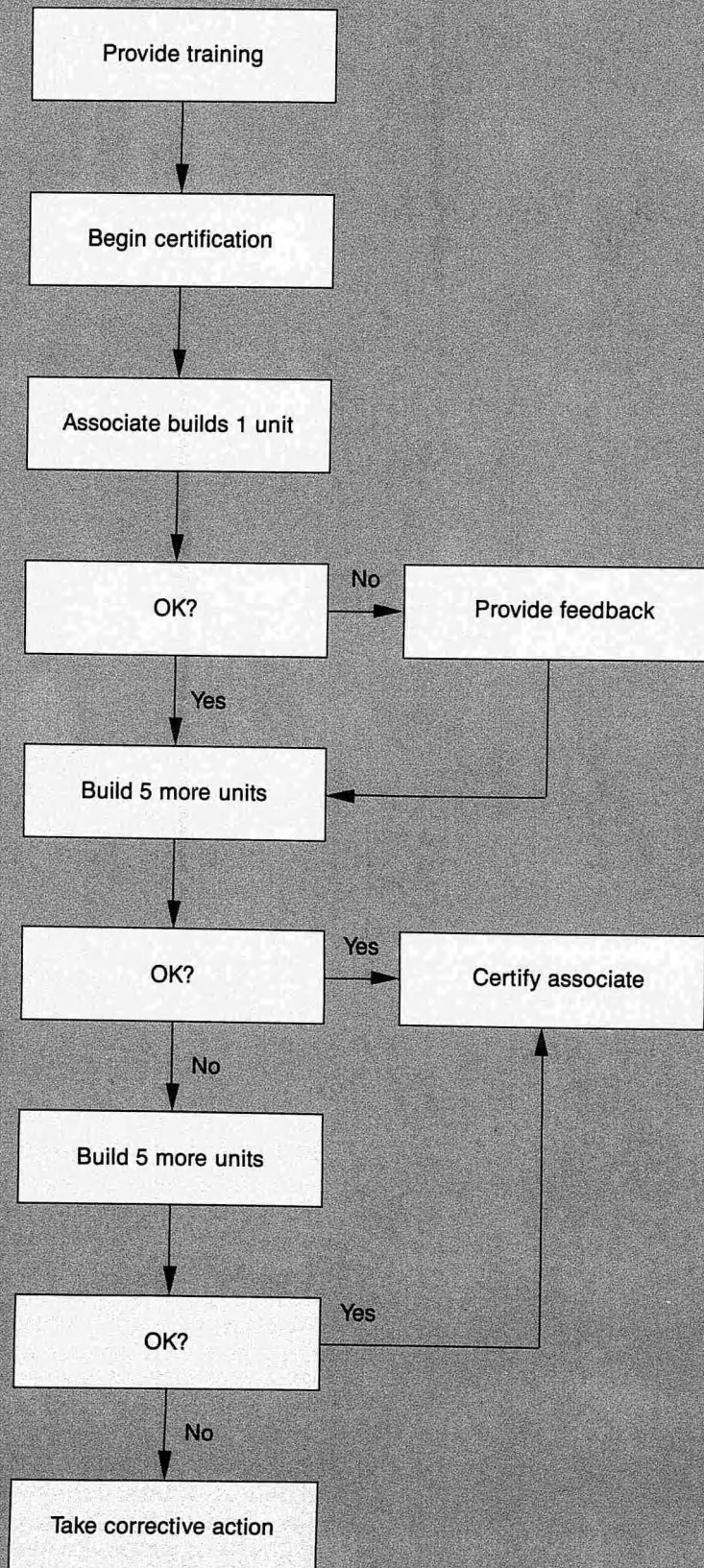
To ensure the transferability of each product into high-volume manufacturing in Phase 3, the corporate training department develops Manufacturing Training Instructions (MTIs).

In contrast to the MPIs, which specify how each operation is to be performed, MTIs describe how to train people to perform the operations. MTIs become the instructional standards for the trainers to train production associates during high-volume manufacturing in Phase 3.

All MTIs must be divided by sections into the following areas:

- purpose

Certification procedure



- application or objective
- applicable documents
- required training materials
- operator requirements
- training instructions
- parts rejection and disposition
- operator certification.

Step 5: Skills verification

A nagging question often arises after the initial certification of an associate's skills: How long should the certification remain valid before recertification is necessary? Three situations can lead people to require recertification:

- Changes in the production process render associates' skills obsolete.
- Skills become rusty over time.
- Associates willingly or inadvertently perform their operations contrary to the MPI.

The original Conner certification policy, which was designed to solve those problems, required that all associates be recertified on their workstations every six months. The six-month rule had two major flaws.

The first problem with the original policy was that six months, or any prescribed period, is essentially arbitrary. People's skills may or may not become rusty in six months. An associate's skills are more likely to become obsolete due to changes in the production process and equipment than due to the passage of time. Recertifying people twice a year, whether they needed it or not, was drawing off valuable resources and using up production time, with little justification.

The second problem with the certification procedure was that it did not differentiate between ability and willingness to perform. Certification or recertification can indicate only whether a person has the necessary skills. Whether a person chooses to perform properly on the job is a management issue, not a skills issue. Conner found that recertification did not necessarily guarantee that people would practice their skills well or consistently on the job.

Conner has revised its approach to recertification and made two important changes. It now requires engineers to put significant changes into updated MPIs, if the changes might mean retraining or recertification. The training department is then notified, and appropriate actions are taken.

Conner also includes skills verification as part of the regular production

process audit procedure—a procedure in which quality assurance auditors monitor the production process and check for work performance standards.

Quality assurance auditors regularly observe each associate to see if he or she is performing the operations according to the MPIs. Any performance discrepancies are brought to the supervisor's attention. Supervisors work with associates to correct performance errors; they can request additional training for an associate if needed.

If an associate is cited three times for performing contrary to the MPI, Conner revokes that associate's certification for the operation. The associate must be reassigned to another operation in which he or she is certified. Then the associate must be recertified on the operation in question.

A comprehensive database is maintained to keep track of the status of everyone's certifications. The database is also helpful in reassigning people according to their skill areas when production schedules change.

Step 6: Transfer training

The teams that are temporarily transferred from Singapore to San Jose to learn about new products and how they are manufactured include production managers, engineers, technicians, trainers, and production associates.

The trainers from Singapore arrive in San Jose a week early, so that they can be trained and certified as trainers by the corporate training staff.

The transferred trainers then train and certify their own teams under the supervision of the corporate staff. They use the MTIs in their training in San Jose and become familiar with the process documentation. The transfer teams can then start up initial production in Singapore while additional materials are ordered and new staff is hired, trained, and certified.

Step 7: Off-line training and certification

In the volume production phase, the trainers from the facility in Singapore do all training off-line, in classrooms designed to simulate the

production environment. Tools are ordered for classrooms as well as for production lines.

New associates are trained for a week and become skilled in three operations. Trainers certify the associates before they are assigned to the production floor. Conner allows them to work only on operations for which they have been certified.

To maintain valid certification, associates must work on each operation for a minimum of 40 hours per month. Supervisors rotate people to different operations to keep their skills and knowledge current. Rotation also adds variety and interest to the jobs. A quality assurance program continually verifies that people's knowledge, skills, and performance meet standards.

Conner has introduced three generations of new products in three years using its three-phase product development cycle and the production training and certification process. Because training is an important element from the beginning, Conner considers it a bottom-line contributor to the company. ■

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