

New & Improved Products

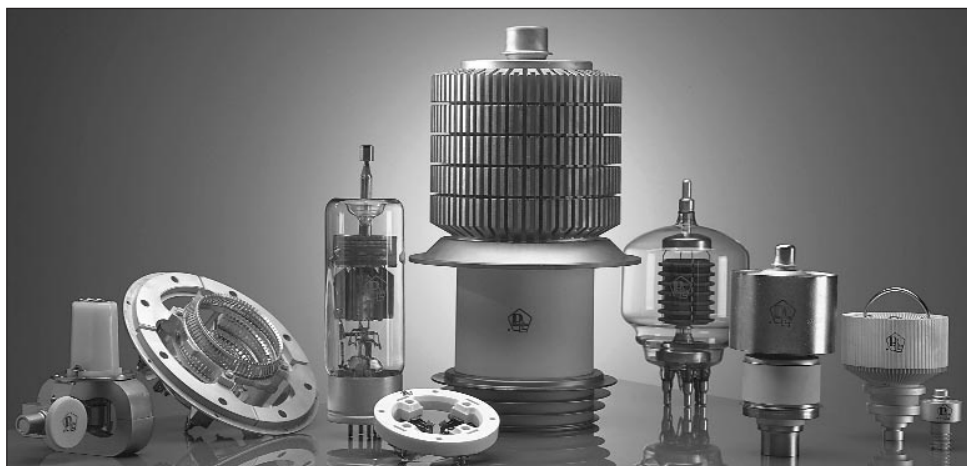
Penta continues to develop new products for a variety of electron tube markets. Latest to market are fixed vacuum capacitors for use in industrial applications, including induction equipment, heat treating, plastic sealing, RF oscillators, dielectric heating and sputtering equipment.

Variable vacuum capacitors, used primarily in broadcast applications, are in the R&D stage. Penta estimates that they should be ready to ship later this summer.

Penta also has been busy expanding its line of tube sockets, which now are available for a full line of tube types.

In addition, Penta has improved the sockets' design. The materials have been upgraded to C17500 beryllium copper, which is heat treated, and the tube sockets now feature silver-plated contacts and ceramic insulators.

For additional information on these or any Penta products, contact sales or customer service at 800-421-4219.



Selling in South America

Gary Madvin recently returned from South America, where Penta has been cultivating relationships with distributors in several countries. Says Madvin, "We are very interested in doing business with our South American neighbors. All of the business contacts we have made are enthusiastic about our approach to 'high-touch.'"

Madvin explains, "We are committed to supporting the distributors—even though, in this world, people buy direct

sometimes. We are interested in developing relationships, training people to expand their business, providing the tools and the materials to help them prosper. We'll provide those tools in the language needed. People can come to the Chatsworth facility for training. We can provide starter kits or inventory. And we will support these [long-distance relationships] by way of our Web site and E-commerce."

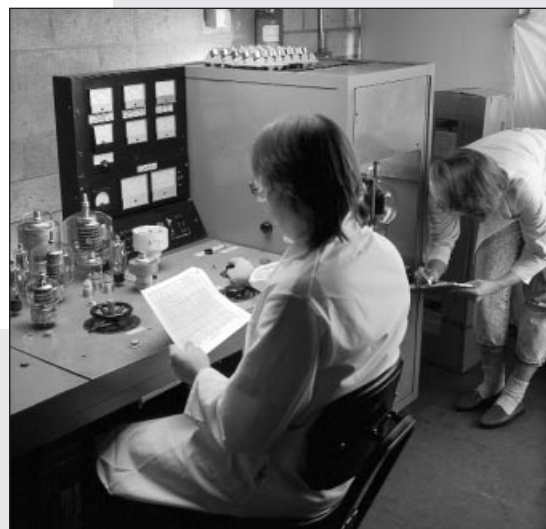
BIGGER DIGS

Last year, Penta Labs bought a new and substantially larger facility on Cozycroft Avenue in Chatsworth, CA. The new corporate headquarters was designed and built according to Penta's specifications.

This new facility is home to some of the company's manufacturing operations, as well as all of the sales and marketing functions and applications engineering.

Penta also runs a considerable share of its quality assurance and production testing operations at the Cozycroft facility. The quality assurance function includes materials testing. And, as part of the process, Penta is set up to test components that have failed in the field.

As Gary Madvin points out, the company's capital investments—both in purchasing the new Cozycroft facility and in funding improvements as part of the Chinese joint venture—demonstrate Penta's considerable and ongoing commitment to the electron tube market.



TUBE TALK™

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Penta Offers International Sales Opportunities

Currently, 40 percent of Penta's sales are international—through distributors in the United Kingdom, France, Spain, Italy, Finland, Greece, Turkey, Japan, South Africa, Brazil, Peru, Jordan and elsewhere. And Penta continues to grow its international distribution network, even as it undergoes a significant expansion within the United States.

In short, Penta is seeking distribution wherever there's existing tube business. Ideally, Penta would like to work with distributors that have tube industry experience and an established customer base, but Gary Madvin notes that Penta is willing to train and develop new dealers, as well.

According to Madvin, Penta is interested in establishing exclusive distributorships for specific mar-

kets. For example, a company that sells tubes to the broadcast market in Argentina would make a welcome addition to Penta's distribution network.

To identify potential distributors, Tim Sullivan, who organizes all of the international activities at Penta, has been working with the Department of Commerce. Penta recently completed a very successful Gold Key Search for distributors in Brazil, Peru and Bolivia, and soon will initiate another for dealers in Canada. Sullivan also will be using the Department of Commerce's Agent Dis-

tribution Search services.

As Madvin notes, Penta is focused on doing business through people—not through a faceless Web site—and through distributors, rather than selling direct. He says, "Our focus is on expanding our distribution system in every city in every country in the world that can use distribution and *hands-on* help for users. That's somewhat contrarian—resisting doing business by machine. Of course, that's not to say that we won't have the most advanced Web site and the most advanced E-commerce available soon."



Tapping Into Local Expertise

To locate the right distributors in various international markets, Penta also has tapped into a local source of expertise: the business school at California State University at Northridge (CSUN).

Dr. Deborah Cours, associate professor of marketing, is working with Penta via one of her graduate marketing classes. She says, "It struck me that this would be a really good opportunity for my class to work on a real-world marketing problem: things like international operating systems, finding a market, customer analysis and so on. ... A number of us, particularly in the marketing department, ... try to incorporate contacts with real-world businesses [into our classes]." Undergrad students also get involved

in consulting via the Small Business Institute. "We offer small business consulting ... through a class," says Cours, who is the institute's director. "Small businesses contact us and fill out a request for consulting. When they enroll in the class, the students look through the requests ... and select a client that fits their expertise and their interests. ... [The project] might be a business plan or a marketing plan. ... It's faculty-supervised to make sure it has real academic learning value, and we supervise the quality of the output so that the client receives something ... that's professional. It's experiential learning, and it benefits the community and our students, so it's win-win."



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INTERESTED IN BECOMING A PENTA DISTRIBUTOR?

If your company is interested in becoming an international Penta distributor, please contact Penta by fax at 818-882-3968.

If you're interested in domestic sales opportunities, please call Penta at 800-421-4219 or 818-882-3872.

You also can contact Penta via E-mail at sales@pentalabs.com.

Penta Launches A Joint Venture In China

While many people in the industry do little more than complain about the quality of tubes coming out of China, Penta has taken a very different tack: The company is making a substantial investment in a Chinese tube manufacturing facility. This joint venture will bring the plant's output up to the highest quality levels demanded by the U.S. market—and enable Penta to



sell these top-quality tubes for extremely competitive prices.

As part of the joint venture agreement, Penta will

provide both the engineering expertise and the capital that the Chinese facility lacks. In return, Penta will be the sole exporter of the plant's tubes.

Penta began working toward a joint venture agreement with the Chinese manufacturing facility in August 1998, and has put together a top-notch engineering team to help the plant achieve

Penta's quality goals. This team has already identified key areas that need improvement and has begun implementing several of these changes.



JOHN T. MARK JOINS PENTA'S JOINT VENTURE TEAM

As you know, engineering students are not being taught about electron tubes in college these days. So where did Penta find the kind of experts it needed to produce the highest quality tubes at its Chinese joint venture facility? In the realm of the retired, at least in the case of tube expert extraordinaire John T. Mark. Mark is serving as a consulting engineer on the Penta joint venture and is a key part of Penta's engineering team.

Mark's experience with tubes is vast and far-reaching. In fact, his resume reads like a history of the tube industry. Mark began his experience in radio and electronics as a high-speed radio operator and cryptographer for the U.S. Army Air Force from 1943 to 1946, serving in Europe. He returned home to get a B.S. in engineering from Valparaiso and did graduate work at

Franklin and Marshall, Princeton and Rutgers. While in grad school, Mark helped construct and get several Pennsylvania radio stations on the air. He also did broadcast station performance evaluation for the Federal Communications Commission.

After a brief stint as a quality control engineer for Sylvania in 1949, Mark joined RCA in 1950 as a research and development engineer on color television. In 1954, he was assigned to work on projects for the Atomic Energy Commission, designing a 1.5-megawatt 425-kc test set and a three-tube 3-megawatt 18-MHz test set, all for megawatt triodes. The last set was a 100-kW UHF TV test set for 100-kW grid block triodes.

In 1959, RCA reassigned Mark to Princeton to work on the Matterhorn project and the Sherwood project, developing very large, ultra-high-vacuum systems for

fusion research to help find a way to peacefully use hydrogen energy to produce electric power. These machines attained 2×10^{-10} mm Hg vacuum and held that vacuum for up to two months per test.

In 1963, John was made program manager to design and build the Mark I aerospace simulator to test the Agena missile for the U.S. Air Force. The Mark I was an ultra-high-vacuum tank 90 feet high and 40 feet in diameter. Later, John's department designed and built ultra-high-vacuum machines (10^{-13} mm Hg) for NASA at Lewis Research Center, NASA Langley and NASA at Ames Research Center, as well as facilities at RCA and other space research establishments.

In 1973, Mark was made manager of RCA gas laser research and development, and in 1974 manager of design and development for RCA power tubes. In 1976, he was made engineering

Translating Quality Control Into Chinese

The Chinese have been manufacturing electron tubes since the '50s, but some of the country's factories have suffered from a lack of modern technological know-how. Indeed, Penta's joint venture partner had been making tubes for years, but the quality of the plant's finished product was not up to the standards Penta desired. To raise the bar quality-wise, Penta sent in a top-flight engineering team.

John Gummer, the point man on the project, thoroughly inspected the Chinese facility, observing the equipment, the processing techniques and so forth. He and John T. Mark then helped the plant's managers implement a number of changes in manufacturing techniques

right on the spot.

When Penta's engineering team returned to the States, it identified several other areas in which the company could help improve the quality of the Chinese tubes. Once the issues had been clarified, they were prioritized, and Penta is now focused on six areas in which it can help make the most significant improvements to the quality of the finished product. The six areas are:

1) Upgrading the exhaust system. Exhaust system problems were identified as the primary reason for tube failures in a short period of time. Upgrading the



exhaust system improves the vacuum level inside the tube, which increases its lifespan. So far, the vacuum level has improved by a factor of 10—i.e., by one order of magnitude.

2) Converting the hydrogen ovens to use wet hydrogen. The oven in question is used to fire nickel sleeves, or cylinders—called cathodes when they're finished. Using wet hydrogen adds a small amount of oxide to the nickel, which

improves the bonding of the carbonate coating that is applied after the piece is fired. This, in turn, improves the reliability of the tube.

3) Building an airtight oven to dry parts. A number of parts at this facility were cleaned after they were manufactured, then left to air dry, which opened the door to recontamination. Using a still-air oven to dry the parts reduces the risk of contamination due to gas.

4) Building a larger water purification system. Because of quantity constraints, the Chinese plant used deionized water for some processing procedures. The larger water purification system will enable it to use deionized water for all processing.

5) Building additional test equipment for medium and high-power tubes. This improved equipment will enable the plant to better gauge the quality level of finished tubes, a vital step in the new quality-control process.

6) Building a long-pulse tester. It is used to check the emissions of the cathode, which indicates how well the tube will hold up under severe load. Again, this equipment is a key component of quality control.

Once Penta and its partner have all of these changes in place, Penta will be able to bring even higher quality components to market at an astonishingly competitive price.

manager for all power tubes.

Mark joined Varian in 1978 at the company's Eimac plant in Salt Lake City as chief engineer. In 1984, he was transferred to Varian Traveling Wave Tube Division in Palo Alto, CA, as general manager and chief engineer. Then, in 1987, he became engineering manager at Varian's Eimac large power tube plant in San Carlos.

Over the years, Mark also taught university continuing education courses. Topics included engineering electronics analysis, heat transfer, vacuum technology, semiconductor device physics and electron tube manufacturing. At Palo Alto and San Carlos, he also taught courses in quality control.

Needless to say, Penta is thrilled to be working with an engineer of Mark's caliber. His extensive background in manufacturing and quality control is a perfect fit for Penta and its Chinese joint venture partner.

ISO 9001 Certification

While some of Penta's competitors may talk about being ISO-certified, have you ever asked them what kind of certification they received? Many companies in the tube business have ISO 9002 certification—but that's a *distribution* standard.

Penta has received ISO 9001 certifica-

tion, which is a *manufacturing* standard. This means that all of the material used in Penta's tubes is certified to meet ISO standards for quality and "traceability," and all of Penta's testing and calibration procedures are likewise up to tough certification standards.

