Finest China?

Right: Siwei Zou, head of SE Electronics, proudly displaying one of his Shanghai-based factory's newest mics. Top: Shanghai's impressive city skyline by night.

Siwei Zou • SE Electronics • Mic Manufacturing In The Far East

Chinese manufacturing has brought the price of microphones down to levels unthinkable a few years ago. But does the quality suffer accordingly? We visited one of the biggest mic companies in China to find out...

Paul White

Chinese microphones have made a huge impact on the project-studio recording market over the past few years, and many currently popular brands are built or partly built there, including models from SE Electronics, Groove Tubes, M Audio, Rode, Marshall, SM Pro Audio, ADK, Red5 Audio, Nady, Superlux, and Audix. The reason some mics which are sold under different names look almost identical is that they are often OEM models 'badged' for specific companies.

In November last year, I was fortunate enough to travel to Shanghai to visit the new SE Electronics microphone factory with representatives of Sonic Distribution (distributor of SE Electronics products in the UK) and to see other microphone manufacturing facilities in the Shanghai area. Having heard so much about Chinese manufacturing practices in the past, it was very interesting to see the facilities first-hand, and learn something of how mic manufacturing came to be such an important part of Shanghai's economy. Indeed, the whole history of mic manufacture in China is fascinating.

> **"In some companies, virtually all the capsule components are made by hand."**

Some 40 years ago, 797, a Beijing-based Chinese government military facility (which was secret and referred to only by number) started to manufacture capacitor mics based on technology and expertise brought to them by East German engineers. These microphones were destined for the domestic broadcast market, as imports from the West were not permitted at the time. Around 10 years after they started manufacturing, the 797 specialists were asked to train engineers to build microphones in Shanghai at Feilo, another large government-owned electronics company.

After the Cultural Revolution of the 1960s, imports from the West were once again permitted. Chinese mics now became very difficult to sell on the domestic market, as Chinese users now wanted to buy big-name European and American microphones. Eventually, the government sold off most of its microphone divisions into private ownership, where they had to survive on their own by exporting their products. Today there are around 12 significant microphone companies in China, most of which seem to be traceable back to the original two companies, Feilo and 797. ▶

Shanghai now boasts several major microphone manufacturing companies, including Feilo, SE Electronics, Marshall, Shuaiyin, Feng Lei and Everlux. All of these companies build complete microphones, as well as other OEM parts for third-party companies.

The SE Electronics story starts with Mr Siwei Zou, a talented classical musician from Shanghai, who won a top place at the Shanghai Conservatory and went on to become a highly successful player, conductor and composer. His music took him to America, where he played and taught, eventually becoming an American citizen. In addition to being a musician, he had his own recording studio and became very experienced in using microphones, though it seems he was also something of a business entrepreneur — he apparently made money out of everything from supplying seafood to restaurants to shipping containers of elderly US chickens to China! Perhaps it was because of this unusual combination of musical ability and business acumen that one of China's major government-owned mic manufacturers asked his help in developing a viable line of microphones that would be attractive to the US market.

Mr Zou clearly relished the opportunity to be involved in a business more closely related to music, and went on to supervise the development of a successful range of microphones that was sold through his own company, SE Electronics, which has its registered office in California near San Francisco. When the manufacturing company was later privatised, Mr Zou decided to set up his own factory to build the SE microphone range so that he could be in full control of the design and quality-assurance aspects of the project. Mr Zou told me, "I want to make the best microphones but still make them affordable compared with the established European brands. It's not just about the money but a passion for making the best possible product".

The Big Picture

In addition to Mr Zou inviting me to see his new manufacturing facility in Shanghai, I was also able to visit other microphone factories in the area, including Feng Lei and Shuaiyin. Having seen the way microphones are constructed in Europe, in highly automated factories with operating-theatre-style pressurised and filtered clean rooms for capsule assembly, the Chinese way of doing things is something of an eye-opener. In some companies, virtually all the capsule components are made by hand using drills, lathes and other basic power tools — even the perforated back plates and tiny screw holes around the capsules are sometimes drilled by hand. Intriguingly, everyone seemed to use the same white, laminate-topped work tables!

Capsule assembly taking place at one of the former government-owned factories in Shanghai.

Other companies may contract out the manufacture of some precision parts, but there's always a lot of manual assembly work done in house. Capsules are invariably assembled in ordinary workshop rooms where the components are cleaned using only a hand-held 'squeezie' air bulb during assembly, in much the same way that now-'classic' early European mics were made. The only common factor shared by all microphone manufacturers seems to be that the experienced people who hand-assemble the capsules are skilled, highly valued employees. Despite the obvious limitations in facilities, these factories are capable of building microphones that perform extraordinarily well for the price.

While the whole manufacturing process seems ridiculously labour-intensive, labour costs are still extremely low in China, so manufacturing this way still appears to be cheaper in many cases than investing in automated production machinery. Even such electronic test equipment as exists is quite old, and computerised testing, other than for checking the final frequency response and sensitivity of the finished microphones, is a rarity. Interestingly, all the companies I visited, including SE Electronics, used exactly the same design of mic testing chamber.

One thing that surprised me is that many

The new SE Electronics factory.

of these companies, who might be considered rivals in the West, actually produce OEM components or even complete microphone assemblies for each other, while virtually everyone's microphone bodies and flight cases are made by the same two companies outside Shanghai. Apparently China produces well over 10,000 microphones per month, around 60 percent of which are built in the Shanghai area. I have to say that I find it somewhat ironic that while numerous other companies are building microphones or using components from China and then trying to put over a 'made somewhere else' image, Mr Zou, who has his registered offices in the US, is making no secret of the fact that his microphones are entirely built in China. Indeed, he's very proud of the fact.

Quality Matters

I asked Mr Zou whether there was any truth in accusations (mainly from the suppliers of 'serious' US and European studio microphones) that Chinese microphones use substandard electronic components, and in what I soon recognised as his normal candid manner, he explained: "On the very low-priced models, it is not possible to buy the best parts — the companies who make them must use inexpensive parts, because the cheapest mics leave their factories for maybe 15 or 20 US dollars. Some of the very cheap microphones are not even individually tested — they will make random tests on a batch, and if some of the models that are shipped are faulty, they are simply replaced.

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Where the microphones are tested, the tolerances are often closer to ±4 percent, even though the spec might be ±2 percent."

Mr Zou went on to say that it is not his intention to engage in competition at the very low-cost end of the market, and the new SE Electronics range, which has all been redesigned with new capsules and electronics, will not include a replacement for the SE1000 entry-level model. OEM work will be scaled down and none of the new SE microphone range will be available badged by other manufacturers. This, he said, would enable him to use high-quality components and manufacturing methods, and every microphone would be individually tested.

Testing mics at the SE Electronics factory. All the factories in Shanghai we visited seemed to be using the same make of test chamber (on the left).

The SE Electronics Factory

The new SE Electronics factory turned out to be located on an upstairs floor of a rented industrial unit in Shanghai. It was quite small compared to the other microphone factories I'd seen so far, but although its facilities were still basic by western standards, it seemed well organised and clean with everyone, including the managers, wearing lab coats, and foot and hair covering.

Mr Zou set up the new factory early in 2003, and his approach is slightly unusual for a Chinese company, as he subcontracts all the precision metal parts to specialist companies who have the necessary computer-controlled milling machines to manufacture them to a consistent quality. He also imports the mylar for his diaphragms from the US, and the parts for his printed circuit boards come from Panasonic in Japan. The basic circuit board design is also Japanese, whereas he says many of his competitors use a much older British circuit design. The SE microphone bodies and grilles are made by a different company to the one that seemingly handles everyone else's mic-body business, and yet another specialist facility is used for applying the gold coating to the mylar diaphragms.

Capsule assembly at the SE factory.

All the SE capsule and printed circuit board assembly is done by hand, in house, and although SE's factory didn't have any Western-style pressurised assembly rooms either, the capsule-assembly room had all the window edges sealed with tape to prevent dust

from getting in, and the familiar air puffers were in evidence for dust removal during assembly. Knowing the dangers of staff poaching, Mr Zou informed me that he pays his key staff higher-than-average wages to reduce the risk of losing them to the competition, and he also has a lifelong contract with his main capsule assembler! He's also made arrangements with top Chinese microphone engineers and design consultants to train his in-house staff, and he verifies every design change by conducting extensive listening tests — which is also where his classical music training and good ears are put to use. An anechoic chamber at Shanghai's university is hired for making measurements on prototypes, though he would eventually like to build his own. "None of the other companies really have anyone who knows about music and sound — they test by the numbers! In addition to the written specification, we conduct a listening test on every mic we build." His approach to product development seems to be getting top engineers and consultants involved at the design stage, fine-tuning their work using listening tests as well as measurement, and then using well-trained staff to do the assembly and quality control work.

The factory is mainly open-plan but with a separate area for engineering and development, the sealed area for capsule assembly (two people worked in there) and an area for final testing. Several computers were in use in the design department where computer-aided design (CAD) drawings for the capsule parts and other metalwork were being prepared. No metalwork is done in house, whereas some of the other companies I visited had lathes, drills and coil-winding machines in evidence.

Fine-tuning the virtual plans for one of SE's mics in a computer-based CAD package.

In the SE factory, microphones are tested using a sweep tone, first as bare capsules, then again as finished microphones (including a listening test) after being soak-tested for 72 hours. Each mic is now supplied with an individual frequency plot, and the tolerance they're aiming for is ±1dB.

Some of SE's new microphones being assembled (including the twin-valve Gemini, in pieces on the left), which should be launched at the 2004 Winter NAMM show.

"I'm planning to make some big changes over the next year by adding a pressurised clean room and getting some more advanced test equipment", Mr Zou told me, "and I'd like to get the tolerances down to ±0.5 percent."

The New Designs

SE Electronics showed prototypes of some of their new range of microphones at the AES show in New York back in October 2003, but they also had some new designs under wraps that they were planning to launch at the Winter NAMM show 2004 (which should be happening at around the time you first read this — look out for more on this in next month's *SOS*). Their immediate new solid-state range will comprise the SE2 (cardioid-pattern stick mic with half-inch capsule), the SE3 (also a half-inch cardioid design built on a different chassis and fitted with pad and roll-off switches), the SE2200A (a one-inch cardioid model) and the Z5600A 1.07-inch capsule multi-pattern mic (with nine patterns). Their tube mic range will comprise a single-tube model and the Gemini, which is unique as far as I'm aware in that it utilises two dual-triode valves (12AU7s) and a solid-state, transformerless output stage. Though the mics all have new capsule designs and housings, they are still recognisably SE products, but now combine a distinctive grey finish with the more usual plated brass, and there's a new logo.

My overriding impression from my trip was of Mr Zou's energy and enthusiasm — he has a genuine interest in microphones, and though he is a businessman, he approaches his products as a musician, which can only benefit the end result! SOS