



TechSearch International, Inc.
Technology Licensing and Consulting

China Trip Report

E. Jan Vardaman
President

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www.techsearchinc.com



Contract Manufacturing of Advanced Products

- **Historically, Chinese companies were relegated to assemble low-end products**
 - Calculators
 - Games, toys
 - Doggie doors
- **China is moving into assembly of more advanced products**
 - Palm-sized PCs
 - Personal digital assistants
 - Portable phones
- **China is developing advanced sub-assemblies**
 - Core components (LCD modules, flex circuits, TAB tape)
 - Chip-on-Board (COB) Volume production at 100 μ m pitch moving to 75 μ m pitch—similar to capabilities in Japan, Taiwan, and North America
 - Chip-on-glass (COG) Volume production at 50 μ m pitch—similar to capability in Japan



Level of Automation

- **Low labor cost focuses manufacturing on labor intensive products**
 - **Highest wages for operators \$100 per month (plus room and board) = “free” labor compared with Japan and United States**
 - **Manual insertion of components (can’t be automated); good product for China**
 - **Semi-automated Al wire bonders common = flexibility**
 - **Dispense of epoxy resin for glob top with manual systems**
 - **Manual inspection, some cleaning automated (PCB substrates) & manual (glass)**
- **Automation not precluded (could purchase equipment)**



Reliability Testing Equipment

- **Lots of state-of-the-art equipment**
 - Thermal shock chambers
 - Vibration test equipment
 - TABAI (brand) temperature/humidity chambers
 - Freezers
 - HAST ESPEC (brand)
 - High temperature storage test equipment
- **No apparent difficulty obtaining equipment**



Level of Factory Cleanliness

- **Level of cleanliness in Chinese factories lower than factories in North America, Japan, and Taiwan**
 - **Clean room for assembly only found in a few facilities (Namtai an exception)**
 - **Namtai assembly in class 10,000**
 - **Namtai COG assembly in class 5,000**
 - **Clean manufacturing practices not in use (face mask, clean room clothing) except at Namtai**



Software Tools/Programming

- **Advanced tools for PCB design are available and in use**
 - **PROTEL**
 - **AUTOCAD**
- **Programming of devices common**
 - **Workers at Whitways programming 6,000 EEPROMs per day**



Advanced Equipment Available

- **Namtai using NTT DATA CMET He-Cd laser rapid prototyping system**
 - **Allows company to make prototypes in 30 hours**
- **Whitways has x-ray inspection system to inspect solder joints of BGAs mounted on product boards**
- **Advanced test systems consigned by customers**