



Taiwan Fine Machinery Industry

**Mechanical & Mechatronic Systems
Research Laboratories (MMRL)
ITRI
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Taiwan's Manufacturing Industry

- Taiwan dominates global EMS* industry-

- **Manufacturing contributes 86% of Taiwan's industrial annual production (405 billion USD)**
 - **The largest is ICT manufacturing (134 billion USD)**
 - **The 2nd largest is Metal processing (116 billion USD)**
 - **The 3rd largest market share in Chemical industry (106 billion USD)**
- **Taiwan is the world's largest 3C (Computer, Communication, Consumer) provider**
 - **Annual production is over 4.3 trillion NTD**
 - **Taiwan occupies 92% of worldwide NB manufacturing**
 - **World's 5 major manufacturers are Taiwanese company (Foxconn, Quanta, Wistron, Compal, Inventec)**



3C products with short life time



Main 3C product manufacturers from Taiwan

*EMS: Electronic Manufacturing Services

Vision of Taiwan Machinery Industry

- **Significant contribution on industrial development and economic growth**
 - **high industrial relevance, high production value and high employment rate**
 - **close relevance with petrochemical, vehicles, metal products, optoelectronics, semiconductors, FPD and green energy industries for process and automation equipment**
 - **30.2 billion USD production with 20.1 billion USD export (@2015)**
 - **17,000 companies accounting for 11% of total number of manufacturing firms**
 - **325 thousand employees accounting for 12% of total number of manufacturing labors**

Industrial Cluster of Machinery Industry

• Cluster effect

- North : mold, textile machine, IC & FPD equipment
- Central : machine tools, machine parts, woodworking machine, rubber & plastic machine
- South : rubber & plastic machine

• Enterprise scale

- employees > 100 : 2%
- 30 < employees < 100 : 18%
- employees < 30 : 80%

North (40% Production Value)

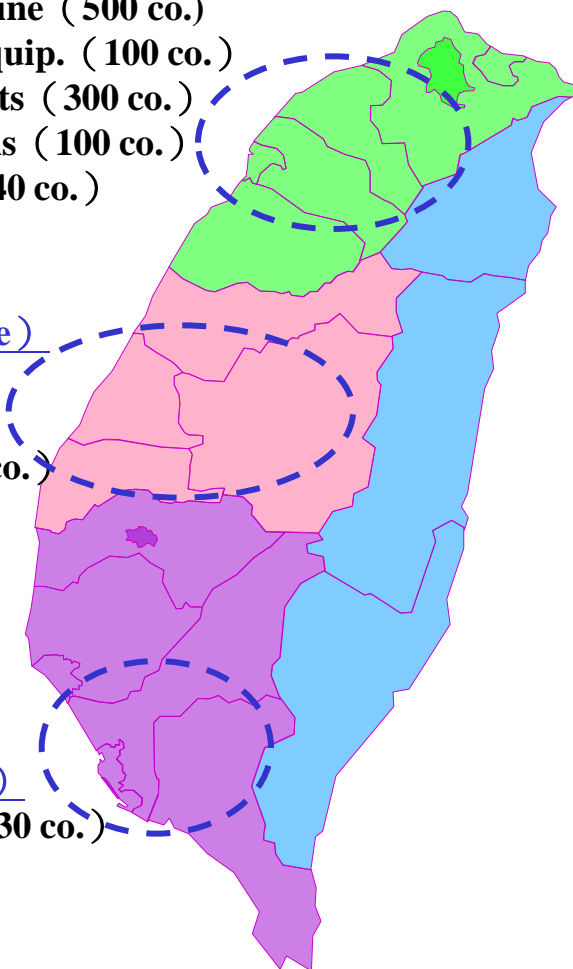
- ◆ Mold (1,300 co.)
- ◆ Textile machine (500 co.)
- ◆ IC & FPD equip. (100 co.)
- ◆ Machine parts (300 co.)
- ◆ Machine tools (100 co.)
- ◆ Others (3,640 co.)

Central (41% Production Value)

- ◆ Machine tools (480 co.)
- ◆ Machine parts (1050 co.)
- ◆ Woodworking machine (220 co.)
- ◆ IC & FPD equip. (40 co.)
- ◆ Others (5,433 co.)

South (19% Production Value)

- ◆ Rubber & plastic machine (230 co.)
- ◆ IC & FPD equip. (60 co.)
- ◆ Machine tools (70 co.)
- ◆ Machine parts (150 co.)
- ◆ Others (2,379 co.)



Industrial Challenges

- **Severe labor shortage**

Nearly 73,000 labor shortage reported in manufacturing industry (Aug. 2015)

- **Electronic component : 16,000 (21.5%)**

- **Metal product : 9,000 (11.3%)**

- **Machinery equipment : 7,000 (8.5%)**

**41.3% of
Manufacturing
Industry**

- **Imported-equipment dominate high end market**

- **Stability and precision improvement** are needed for upgrading Taiwan made machines

- **High end controller and software** are needed for global competition

- **Improvement of high end robot and automation are requested**

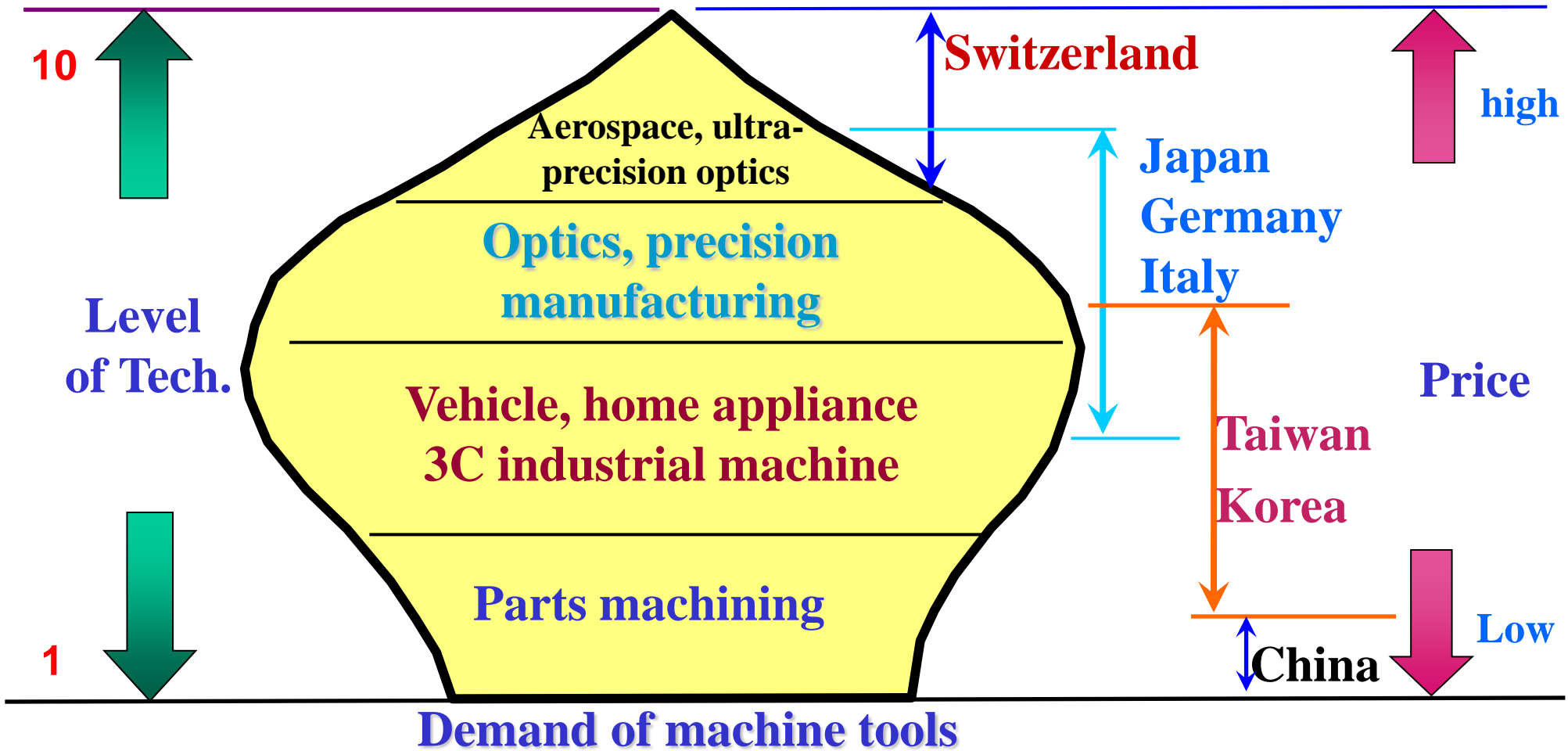
- **For application in 3C & precision metal machining**



Status of Taiwan Machine Tools Industry

- 2015 production value was **4.49 billion USD** (**7th** in the world) and export was **3.18 billion USD** (**4th** in the world)
- Industrial scale : 1,100 companies with 55 thousand employees

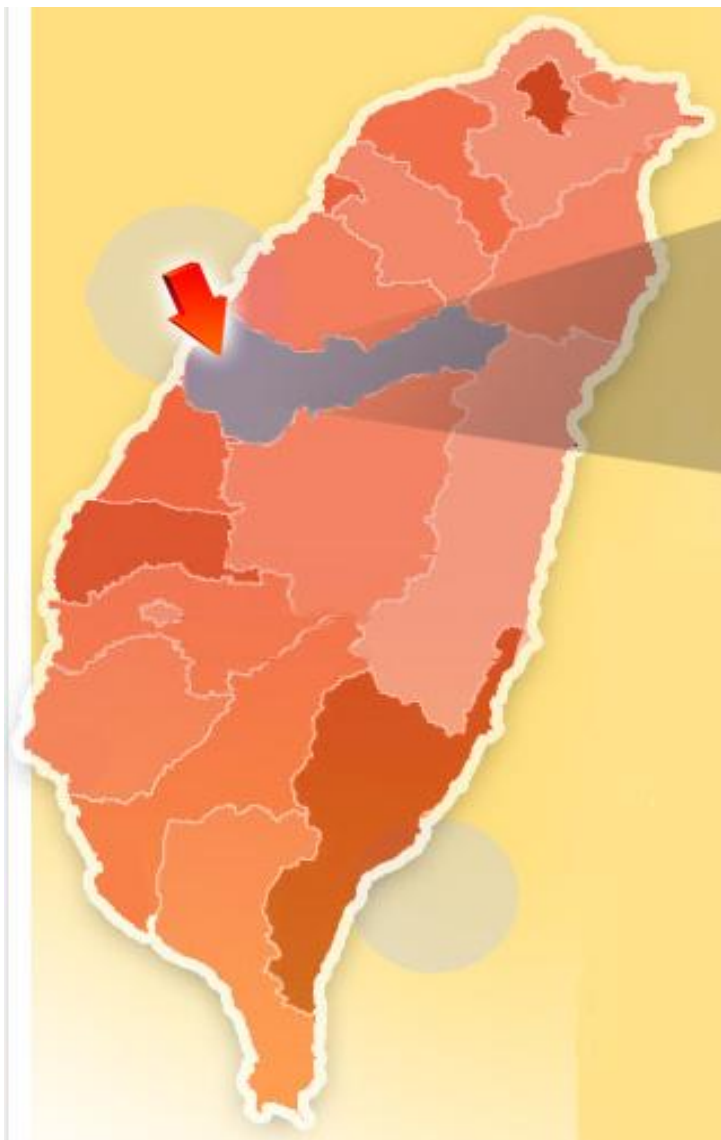
Competition of Machine Tools



The 60 km that Affects the Whole World

The world's number one of Precision Machinery Belt

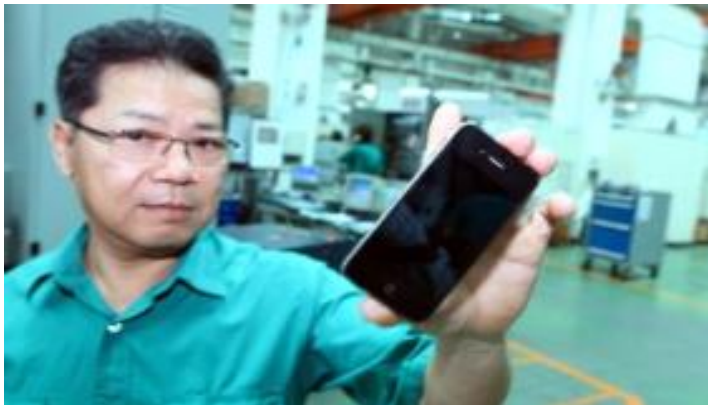
- Within 60 km range from Shengang to Nantou, the Precision Machinery Belt consists of 1500 manufacturers and tens of thousands of small factories that contributes half of the iPhone parts production.
- Only this place in the world can meet Apple product's manufacturing requirement.
- Even Google Solar, Siemens biotechnology, Porsche T/M gear must rely on their precision technology and flexibility.



Change iPhone to Fashion Boutique

Quick Jet Machine Co. – Defensive industry level of precision

The small company with only 130 employees that controls half of the iPhone 4 stainless steel frame production. iPhone 4 was the world's thinnest and most stylish phone, can not be 24% thinner than the iPhone 3 without the company's machine.



**Use nuclear-weapon level machine
to produce the iPhone frame thin line**



**Stainless steel frame
processing equipment**

Make iPhone 1/4 Thinner

YCM - Rapid production of precision drilling machine

Drilling thirty tiny holes on iPhone, iPad and assembling the whole accessories, the iPhone Tapping Center supplies for over 60% of the global demand.



YCM Tapping Center



Google & Siemens Rushed for Cooperation

HIWIN – World's top 3 precision transmission equipment maker

TSMC's semiconductor devices, Apple's iPhone, Siemens MRI, Google's solar power plant systems all use HIWIN's **Ball Screws**



Even blackhand cave has clean room



Ball Screw

The top brand of Chinese-speaking regions

FFG – 48 brands with 82 production sites

- The first company with revenue over one billion in Taiwan's machine tools industry (est. 3.3 billion @ 2018).
- The company will produce 45,000 sets of machine per year in 2018 and become the world's largest machine tools maker.

FFG, Fair Friend Group



ITRI Mechanical R&D Briefing

Core Technology and R&D Focus of MMSL & IMTC

• Core Technology

- Intelligence
- Miniaturization
- Green energy



Ultra-precision machine



5-axis machine tools

• R&D Focus

- Machine tools
- Robot & automation
- Green machinery
- Electric vehicles



Industrial robot



Thin-film process equipment



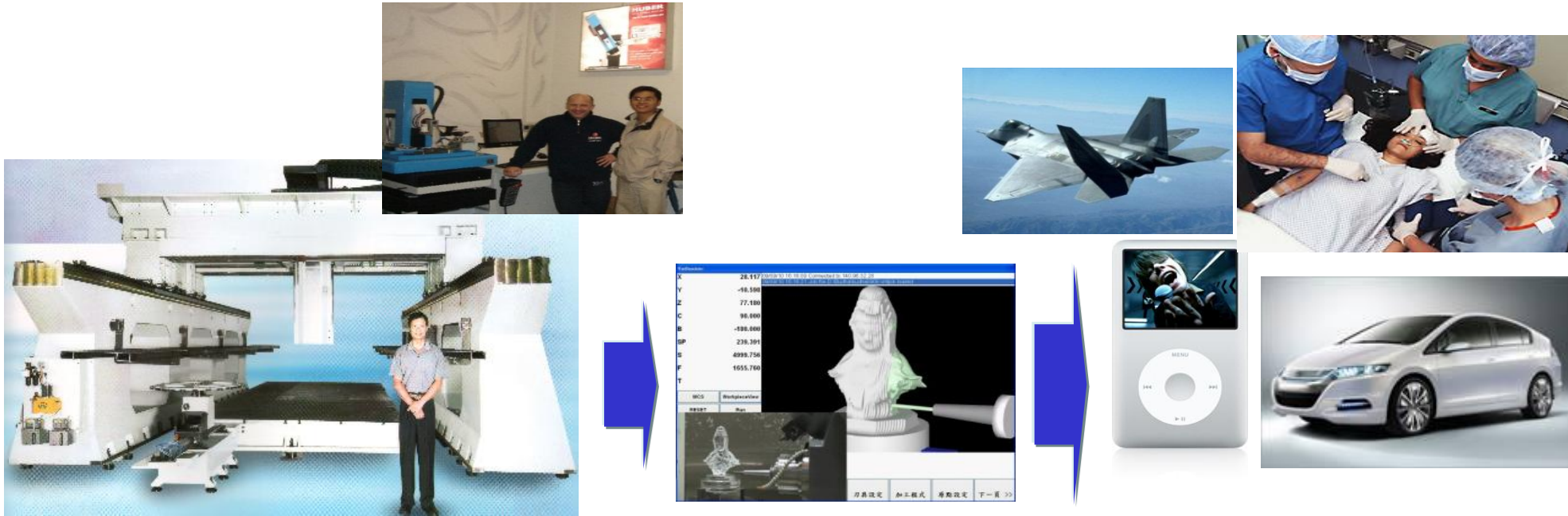
Service robot



Electric vehicle

Industrial Needs

- High-end machine tools : **sub-micro** precision
- Controller : high-end controller with **open architecture**
- Process software : value added software for **smart factory**

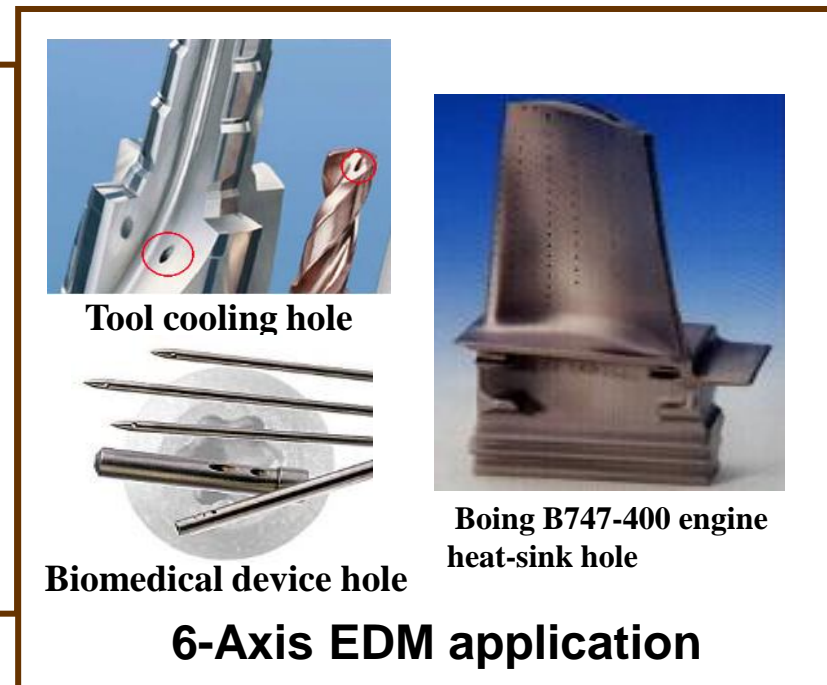


Machine tools (cutting/milling/EDM/hybrid...)

Machining work-piece and end products

Industrial Development & Consortium

- **Leading 10 top Taiwanese makers to form a consortium (induced investment > 1 billion NTD)**
- **Forming consortium of “Advanced Linear Type Machine Tools”, “Turning & Milling Hybrid Machine Tools”, “A+ Flagship WEDM”, “New Generation of 5-Axis Machine Tools”**
- **Promoting Taiwan to be world’s top 3 WEDM production country (next to Switzerland & Japan) by initiating EDM & controller development.**



Conclusive Remarks

- Surging demands for **precision machining** and **flexible manufacturing**
- **Open architecture** controller and **application software** add great value on the machine tools
- **Energy saving** machines and processes are strongly required under cost & environmental pressure
- International collaboration with **Open Innovation Platform (OIP)** will certainly enhance the development of advanced technologies



Spot Lights of Taiwan



Taipei 101 (Taipei)



Taroko National Park (Hualien)



Palace Museum (Taipei)



Sun-Moon Lake (Nantou)



**Kenting National Park
(Pingtung)**