



China Machine tool industry under the background of Globalization

全球化背景下的中国机床工业

Prof. Dr. -Ing ZHANG Weimin

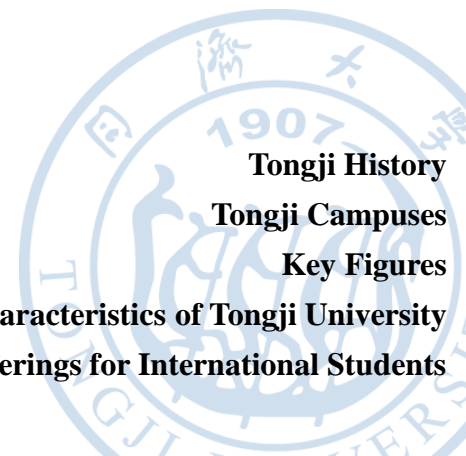
MAG Stiftungslehrstuhl für Fertigungstechnologien
Chinesisch-Deutsches Hochschulkolleg der Tongji-Universität

同濟 TONGJI UNIVERSITY

TREASURE THE SAME ROOT
SHARE THE SAME GOAL



Tongji History
Tongji Campuses
Key Figures
Three Characteristics of Tongji University
English Course Offerings for International Students



55,000 Students

21,000 BA/BSc, **10,000** MA/MSc, **3,300** PhD, **2,437** International Students

3,300 Teaching & Research Faculty and Staff

830 full professors, **1,470** associate professors, **2,828** teachers

6 academicians from the Chinese Academy of Sciences **7** academicians from the Chinese Academy of Engineering

250,000 Alumni



9 Disciplines

science, engineering, medicine, economics, management, liberal arts, law, philosophy, education

1.16 Billion RMB Research Budget

40% public and **60%** industrial projects

409 Degree Programs

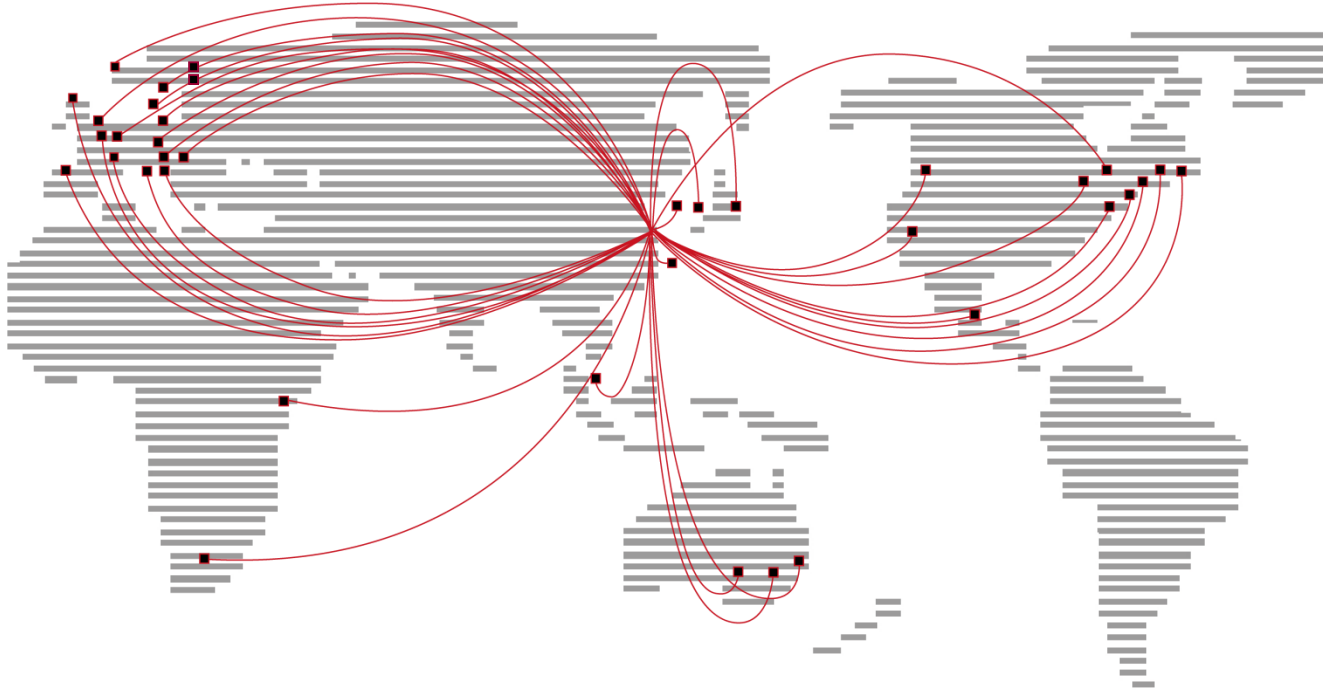
81 Bachelor's programs, **218** Master degree programs, **94** PhD programs, **16** postdoctoral stations

More than 40 Organizations

more than **33** Colleges, **6** Uni. Hospitals

2. International Exchange & Cooperation

More than 100 partners from all over the world in Germany, France, Italy, Finland, Spain, Denmark, Australia, Ireland, UK, US, Japan, Korea, etc.





College of Aerospace Engineering and Applied Mechanics
College of Architecture and Urban Planning
College of Automobile Engineering
College of Civil Engineering
College of Communication and Arts
College of Electronics and Information Engineering
College of Environmental Science and Engineering
College of Materials Science and Engineering
College of Mechanical Engineering
College of Ocean and Earth Science
College of Software Engineering
College of Stomatology
College of Traffic and Transportation Engineering

Department of Applied Mathematics
Department of Chemistry
Department of Physics
Film School
Institute of Railway & Urban Rail Transit
International School
Law School
School of Design and Innovation
School of Economics and Management
School of Foreign Languages
School of Liberal Arts
School of Life Sciences and Technology
School of Marxism

School of Medicine
School of Political Science & International Relations
Women's School
Sino-Australian Institute of Technology
Sino-French Institute of Engineering and Management
Sino-German College for Graduate Study
Sino-German College of Applied Sciences
Sino-Italian Campus
UNEP-Tongji Institute for Environment and Sustainable Development
World Heritage Institute of Training and Research for the Asia and the Pacific Region under the Auspices of UNESCO

Links with Counterparts in Europe

1.Sino-German Platform-CDH-CDC

CDHK – Sino-German School for Postgraduate Studies (Master degree)

CDHAW – Sino-German College of Applied Sciences (Bachelor Eng.)

CDIBB – Institute for Vocational Teachers' Training

CDFK – Sino-German Friendship Hospital

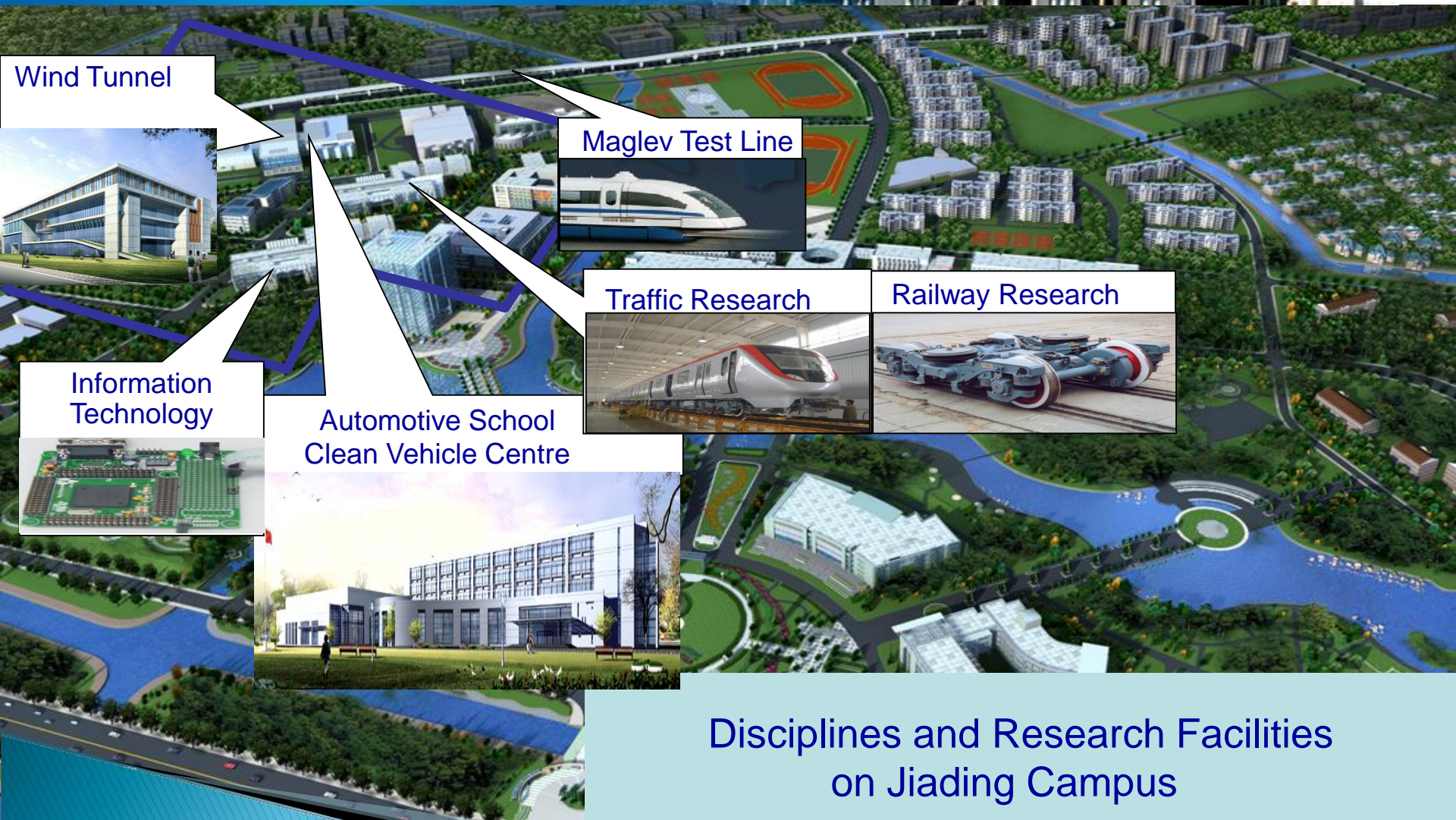
CDHK – Sino-German College for Graduate Study (Master degree)





机械与能源工程学院

School of Mechanical Engineering Tongji University



Wind Tunnel



Maglev Test Line



Information Technology



Automotive School
Clean Vehicle Centre



Traffic Research



Railway Research



Disciplines and Research Facilities
on Jiading Campus





机械与能源工程学院

School of Mechanical Engineering Tongji University

Shanghai VW Proving Ground



制造区备用地
Manufacture Spare Land

Suppliers

Suppliers

制造区 (零部件)
Manufacturing Park
(Spare Parts)

Tongji Jiading Campus

赛车区
Circuit District



OEMs

制造区 (整车)
Manufacturing Park
(Whole Car)



安亭镇区
Anting Town District

贸易区
Trade District

教育区
Education Park

新镇区
New Town District



发展备用地
Development Spare Land

Shanghai Vehicle Quality Certification and Approval Center





CDHK – Überblick

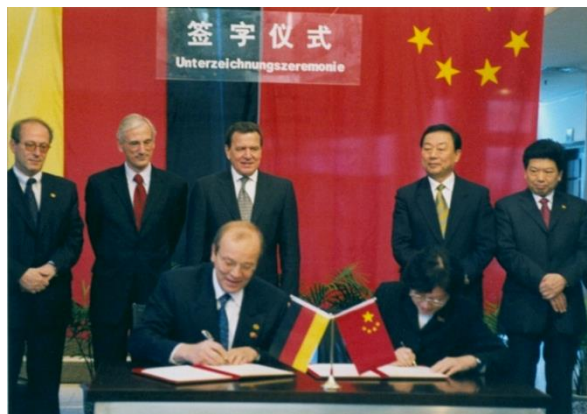
- Gemeinschaftseinrichtung von DAAD und Tongji-Universität
- „Leuchtturmprojekt“ des chinesisch-deutschen Bildungs- und Wissenschaftsaustausches
- Einziges Bildungsprojekt auf Grundlage eines Staatsvertrages
- Einmaliger Förderzeitraum von mehr als 10 Jahren
- Einmalige Zahl von fast 30 Stiftungslehrstühlen, die von mehr als 20 namhaften Unternehmen finanziert werden





CDHK – Hintergründe

- 1993 | Initiative von Bundeskanzler Kohl: Gründung einer binationalen universitären Ausbildungsstätte
- 1997 | Notenwechsel zwischen der Bundesrepublik Deutschland und der VR China, Beauftragung von DAAD und Tongji-Universität mit der Umsetzung des Projektes
- 1998 | Eröffnung des CDHK



CDHK – Partner



ThyssenKrupp



Allianz 

安联保险集团

Stifterverband
für die Deutsche Wissenschaft


ROHDE & SCHWARZ



Bayer



LUK  FAG

SCHAEFFLER GROUP



SIEMENS 

HANIEL GROUP

DMG

METRO


KÜHNE-STIFTUNG



 上海大众汽车有限公司
SHANGHAI VOLKSWAGEN


SUPPLY CHAIN

FESTO

MBtech
Mercedes-Benz technology

SIEMENS

Daimler Fonds

Hans L. Merkle-Stiftung
im Stifterverband für die Deutsche Wissenschaft



Kooperation Maschinenbau

Die Brücke nach Deutschland!

Die Brücke nach China!



中德学院
Chinesisch-Deutsches
Hochschulkolleg



Universität
Stuttgart



TECHNISCHE
UNIVERSITÄT
DARMSTADT

tu technische universität
dortmund



TECHNISCHE
UNIVERSITÄT
DRESDEN



同濟大學
TONGJI UNIVERSITY

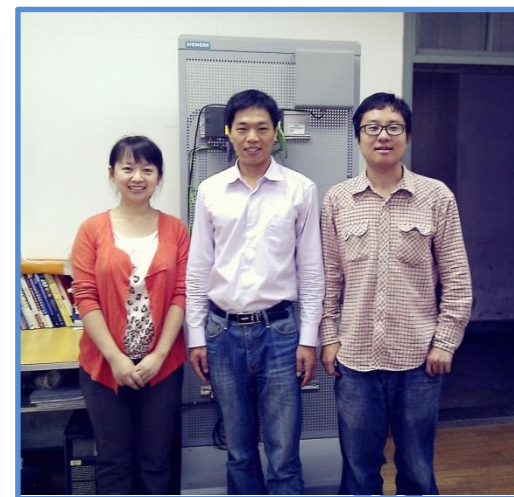


amtc
Advanced Manufacturing
Technology Center
先进制造技术中心



Überlick

- **Labors:** SIEMENS SINUMERIK Laboratory
SCHLEIFRING Grinding Laboratory
SMTCL-Laboratory
- **Masterstudenten:** 30
- **Doktoranden:** 9
- **Austauschstudierenden :** 8 deutsche Studenten



Research

Research areas:

Production Management

- Process planning
- Process organization and its problem-oriented assessment
- Logistic analysis for production process
- Digital Factory



Advanced Manufacturing Technology

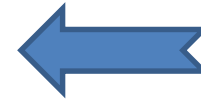
- HSC-machining
- Rapid Prototyping
- Green Manufacturing



Production Service

- Product Service System
- Module based service design and customized configuration
- Network oriented organization and process



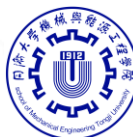


AMTC at a glance

- **Joint institution for teaching and research in production technology of:**
 - KIT
 - the SME (School of Mechanical Engineering) and
 - the CDHK (Chinesisch-Deutsches Hochschulkolleg)
- **Roles and responsibilities**
 - **Overall responsibility, strategy and project responsibility:**
Prof. Fleischer from the KIT (Karlsruhe Institute of Technology) as visiting professor at Tongji University
 - **Local operations responsibility:**
Prof. Shen Bin and Prof. Zhang Weimin

Functional Location

- **Teaching**
 - Master program for both local and foreign students
 - Doctor program for both local and foreign students
- **Research**
 - Government projects
 - Enterprise projects
 - International cooperation projects
- **Service**
 - Machining process
 - Production process
 - Structure design



Main Contents

- I. China machine tool industry
- II. Background of Chinese manufacturing industry
- III. Research activities about machine tool energy efficiency and productivity
- IV. Globalization strategy of SYMG

Background of China manufacturing industry

- General situation of Chinese manufacturing industry | 中国制造业概况^[1,2]

40% of added value of national total GDP
总增加值约占全国GDP的40%

80% of whole industry manufacturing
整个工业生产的80%

90% of total exports
占出口总额的90%



Manufacturing industry is a major contributor to the economic development of China
制造业是中国经济发展的主要贡献力量

[1]中国工业能源交通50年统计资料汇编[M],中国统计出版社,2000.

[2]中国国务院新闻办公室.中国21世纪议程-中国21世纪人口, 环境与发展白皮书[R],2000.

Werkzeugmaschinenmarkt



component

Einkauf



Werkzeugmaschinen



Laserbearbeitung

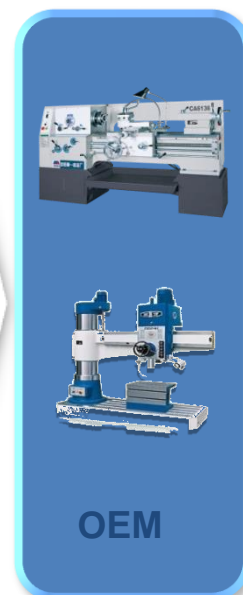
Robotor

Huge

Verkauf



service



OEM



Energie



Automobil

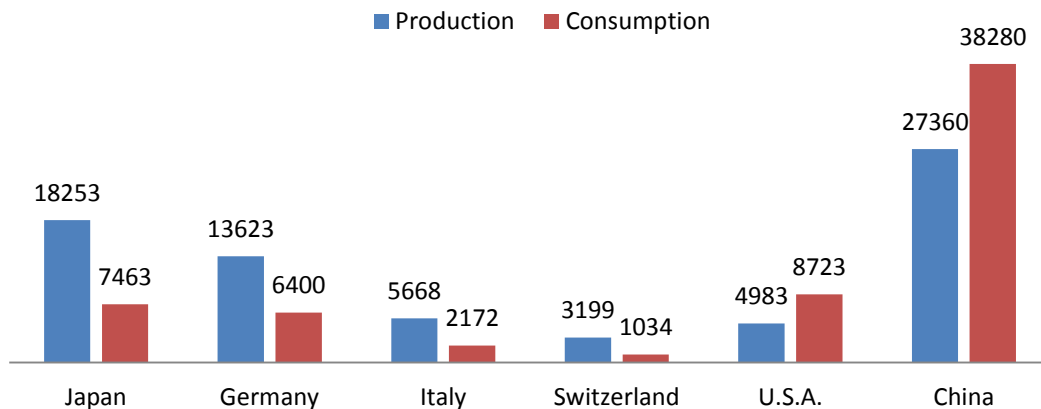


Flugzeug



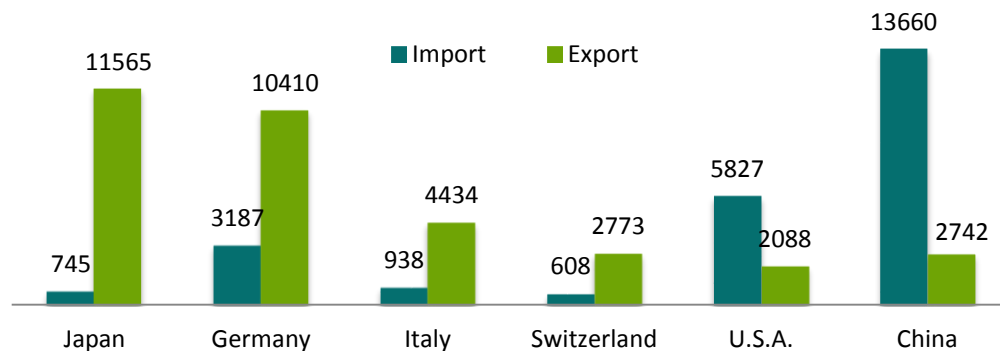
China machine tool industry

Machine Tool Production and Consumption in 2012



China is the world's largest producer and consumer of machine tools, contributing **29.4% of the global output value** and **45.1% of the global consumption** of machine tools in 2012.

Machine Tool Trade in 2012



China is also **the world's largest importer**, and **the sixth largest exporter** of machine tools in 2012.

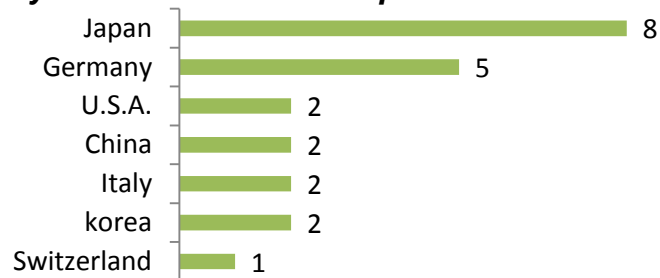
(Data Source: U.S.A. Gardner Publications Inc.)



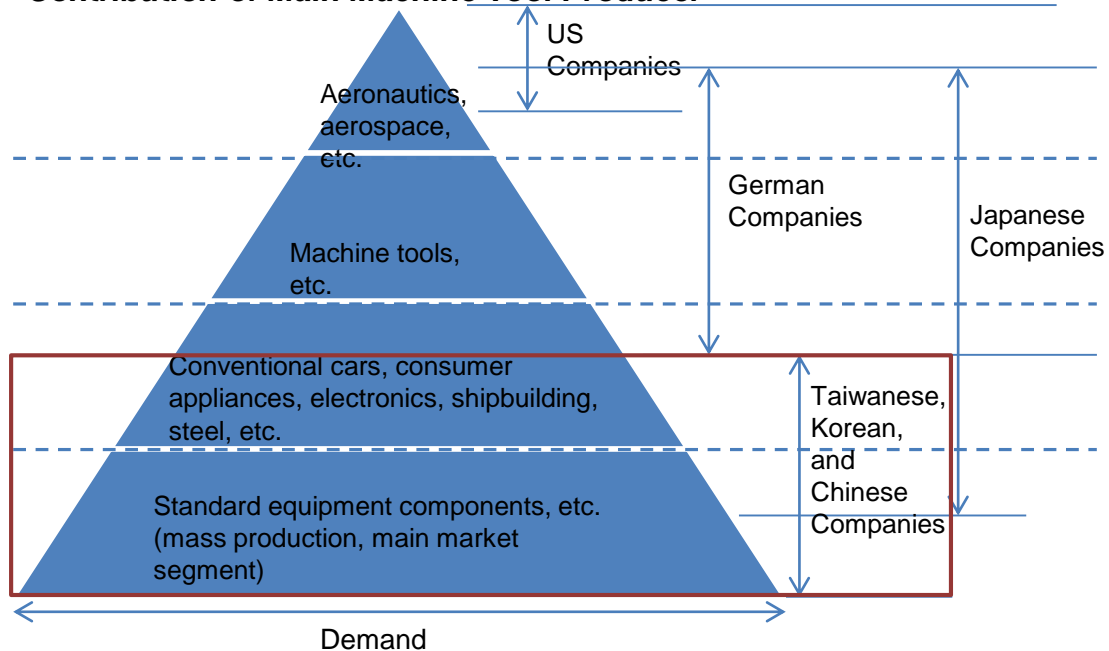
Top 20 Machine Tool Company of the World

No.	Company	sales volume	Country / Region
1	Shenyang Machine Tool Group	2782.7	China
2	Yamazaki Mazak	2525.0	Japan
3	TRUMPF	2392.1	German
4	Dalian Machine Tool	2380.6	China
5	Amada	2335.6	Japan
6	Komatsu	2261.9	Japan
7	Gildemeister	2213.1	German
8	JTEKT	2012.2	Japan
9	Mori Seiki	1968.5	Japan
10	Okuma	1785.2	Japan
11	Makino	1402.8	Japan
12	Schuler	1351.5	German
13	MAG	1259	U.S.A./German
14	HYUNDAI WIA	949.2	Korea
15	Agie Charmilles	905.3	Switzerland
16	Grob	896.0	German
17	Doosan	763.0	Korea
18	Index	675.8	German
19	Gleason	625.0	U.S.A
20	Brother	618.1	Japan

Country Distribution of the Top 20 Machine Tool Company



Contribution of Main Machine Tool Producer



China machine tool industry produce a huge number of cheap machine tool to meet their own needs and the needs of the world.

中国机床工业生产了大量的廉价机床满足自身及世界的需求。

Wachstum des Chin. WZ Markts

Trend

- Technik—Kundenori., Intelligent
- Markt —schnelle
- Starke Konkurrenz

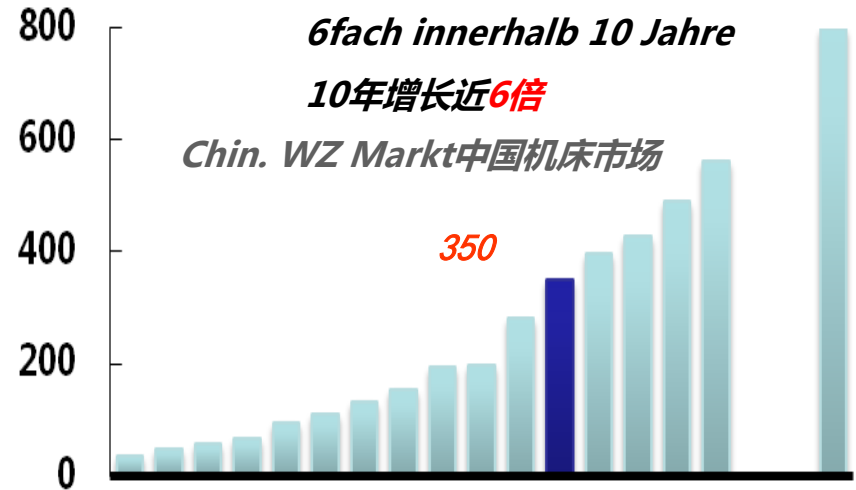
10T St.



Produktionswandlung 中国工业化 会改变工业的生产方式



100Million US Dollar 亿美元





数控机床高速精密化技术创新战略联盟项目

NC WZM - Strategische Innovationsverband der Technologie für Hochgeschwindigkeit und Präzision

- **National Science and technology support program**

国家科技支撑计划

- **Issue number: 2012BAF01B02**

课题编号: 2012BAF01B02

- **Subject name:**

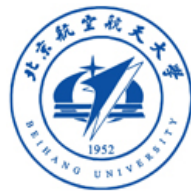
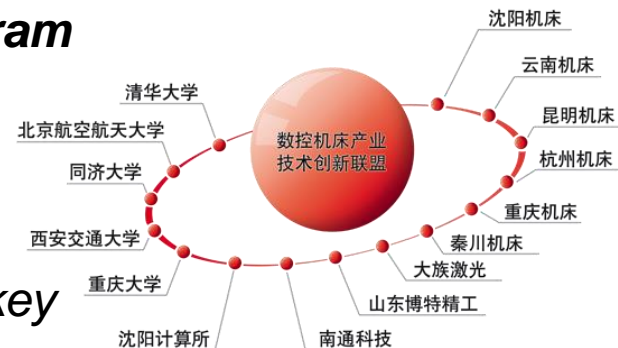
课题名称:

- **High speed and high precision CNC machine tool key technology development and application of green manufacturing model;**

高速精密数控机床绿色制造关键技术开发及应用示范

- **11 units share responsibility**

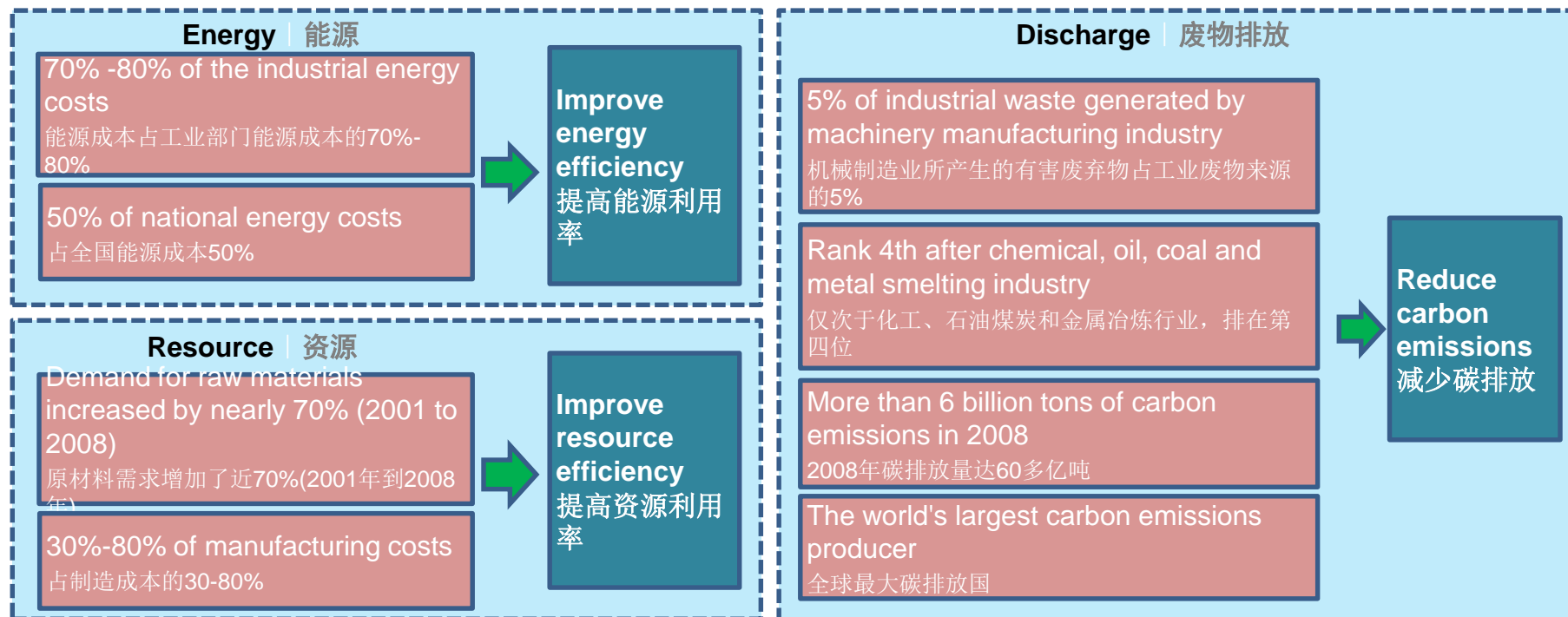
11家单位共同承担





Background of China manufacturing industry

- Main problems | 面临的主要问题^[1]



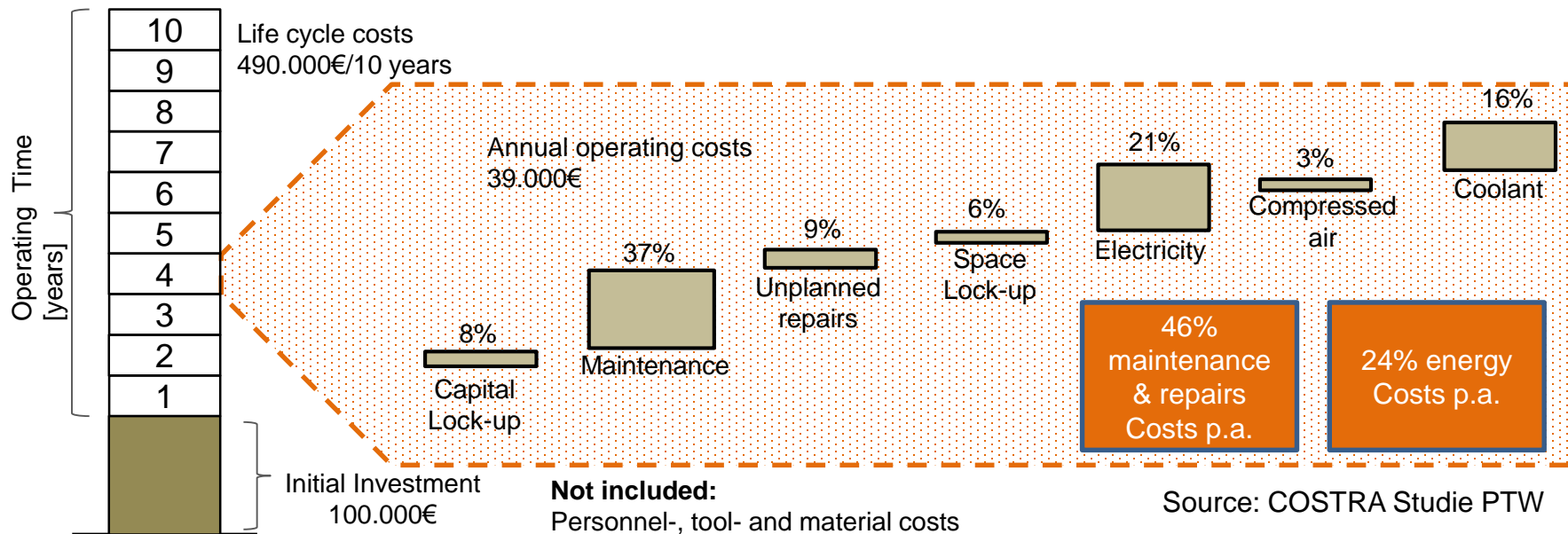
Sustainable Manufacturing

Goal: Machine Tool with high productivity and high energy efficiency

[1] National Bureau of statistics of China . China Statistical Yearbook 2005 (M). China Statistical Yearbook .2005.11.



Annual operating costs of a machine tool



To achieve this goal “Machine Tool with high productivity and high energy efficiency” maintenance & repairs and Energy Efficiency are the two most important topics.

Research activities about machine tool energy efficiency and productivity:

Classification of cutting machine tools (Energy efficiency)

Co-Service (Efficiency enhance)

Milling force prediction (Possibility to avoid chattering)



Research interests:

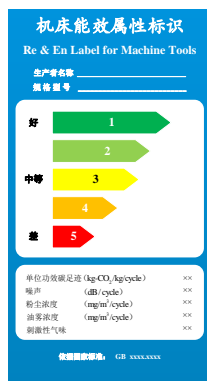
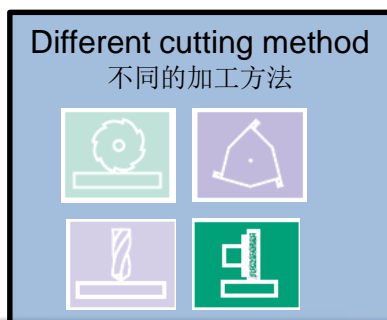
研究方向:

- Lightweight design of high speed precision machine tools**
 高速精密机床的轻量化设计
- Energy saving technology of high speed precision CNC machine tool**
 高速精密数控机床的节能技术
- Green process technology for high speed precision CNC machine tool**
 高速精密数控机床绿色工艺技术



Classification of cutting machine tools :

切削加工中的机床分级研究:





Classification of cutting machine tools

45,000kWh/year⁽¹⁾
(165,000kWh/year⁽²⁾)



10 X 10000km/year
(277g CO₂/km)



4500€/year



**In the huge energy consumption of machine tool,
only 22% of the energy are used to cut off material!**

- ⇒ 整个能效 78% 用于
机床基本负荷
- ⇒ 只有 22% 用于
切削加工
- ⇒ 时间效率提升
38% 大批量生产
15% 小批量生产

exhaust
spindle
feed
drive
pumps
(cooling,
lubrication)

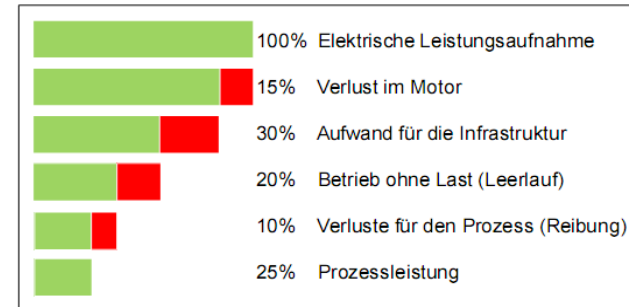


illumination
air
cooling
hydraulics
control system
chip conveyor
electric / pneumatic clamping



⁽¹⁾7.5kW bei 6000 h/a (PTW TU Darmstadt, 2008)

⁽²⁾22kW bei 7500 h/a (IWB TU Muenchen, in Fertigung S.:30-32, 9-2009) 1kWh equals 0.63kg CO₂



(Quelle: FhG, IWU 2009)

Energy saving potential analysis

Classification of cutting machine tools

- Guide user to buy a more efficient machine tool
- Promote machine tool company produce more efficient machine tool
- Support the government environmental policy
-



Co-Service

Kooperativ erbrachte Dienstleistungen als Enabler für den optimalen Betrieb komplexer Werkzeugmaschinen

扩展中德合作间的技术优势 基于复杂机床最优运营的协同服务支持



中华人民共和国科学技术部
Ministry of Science and Technology of the People's Republic of China

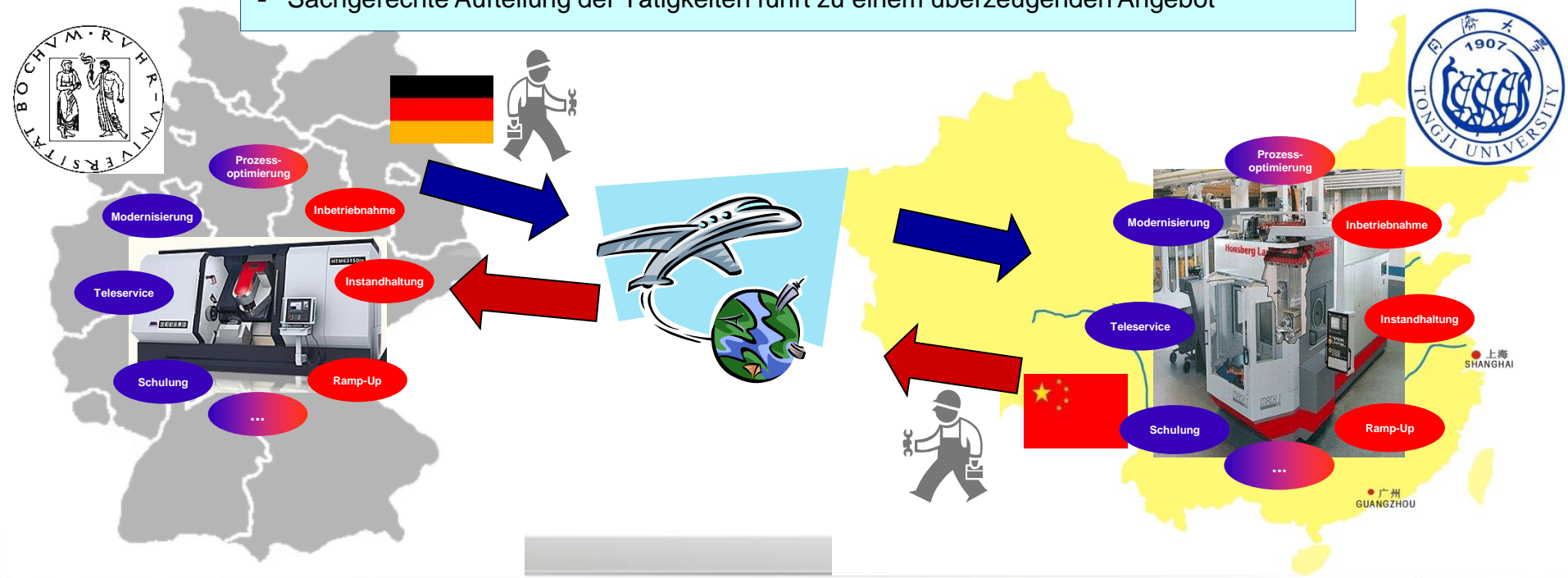


GEFÖRDERT VOM

Bundesministerium
für Bildung
und Forschung

Project motivation

- Kein Anbieter kann alle nötigen Dienstleistungen weltweit alleine erbringen
- Kooperation ist zwingend nötig
- Sachgerechte Aufteilung der Tätigkeiten führt zu einem überzeugenden Angebot



Maschinenhersteller

Vermarktung hochproduktiver
Fertigungseinrichtungen



Kunde

Optimale Nutzung der
Technologiepotenziale

- Erschließung neuer Absatzmärkte/创建新市场
- Ausbau der Kundenbindung/建立与顾客紧密联系
- Anwendungs-Know-How und Kundenorientierung/提供面向顾客的专业知识(Know-How)的应用
- Umsätze mit ergebnisstarken Dienstleistungen/加强面向顾客终端产品的服务运营
- Sicherung eines ertragreichen Wachstums保障盈利高效成长
- Neue Märkte durch life-cycle-orientierte Geschäftsmodelle/建立基于面向产品全生命周期的商业模式，并开拓其相应的市场份额

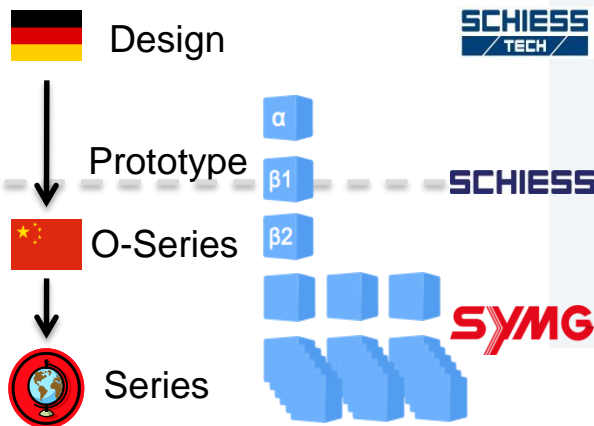
- schneller Anlauf von hochkomplexen Fertigungssystemen/迅速掌握使用复杂工艺设备
- Konzentration auf Kernkompetenzen/专注于核心能力
- qualifizierte Betreuung durch die Hersteller/获得提供商高效服务支持
- optimaler Betrieb der erworbenen Maschinen/现有机床更新升级
- Verbesserte Kostentransparenz über den Life-Cycle mit neuen Geschäftsmodellen/运用新商业模式提高在产品生命周期中成本的透明度

CO-SERVICE



Globalization strategy of SYMG

- Co-Operation
- i5 CNC system
- i-plattform





The key for future global improvements and success will be:

Co - Operations

Co - Operations

- International
- Intercontinental
- Intercultural
- Interdisciplinary



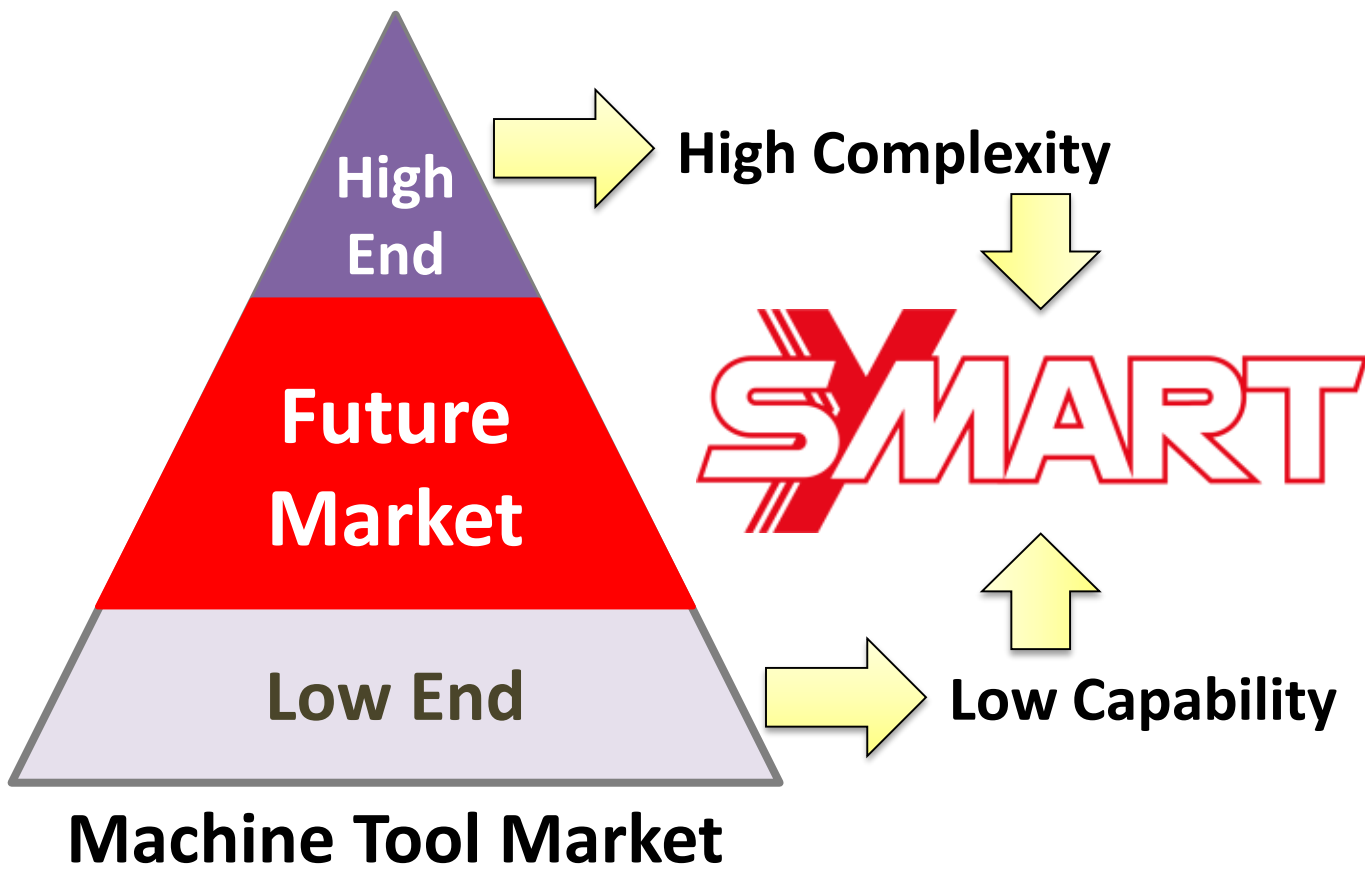
Introducing the New Generation

1. Developed in Germany
2. Manufactured in China to German standards
3. For customers worldwide



Why Develop in Germany?

- ✓ Experienced construction engineers
- ✓ Collaboration with institutes
- ✓ Access to key suppliers
- ✓ Application experience
- ✓ Direct Market - feedback



- S**imple
- M**aintenance-friendly
- A**ffordable
- R**eliable
- T**imely to market & profit



- Co-Operation
- i5 CNC system
- i-plattform

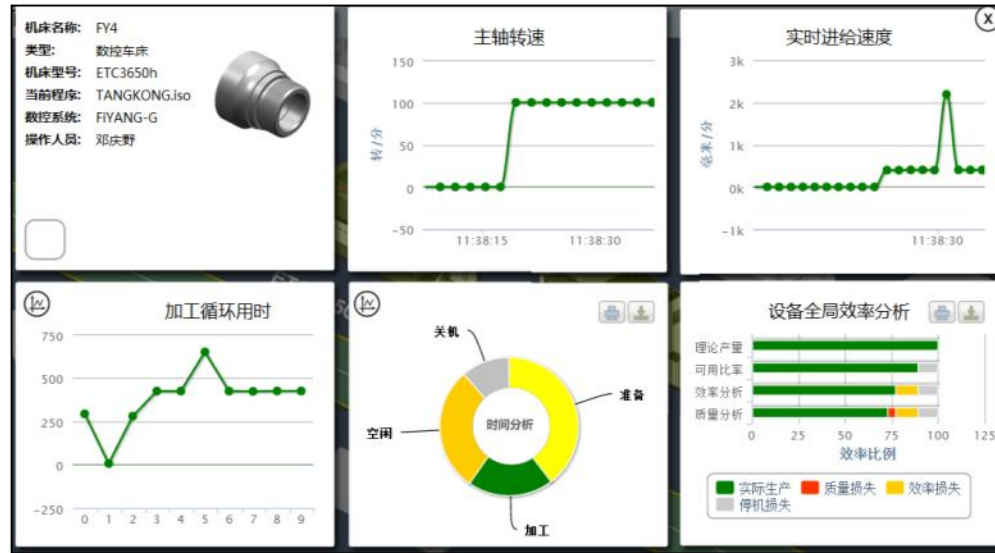
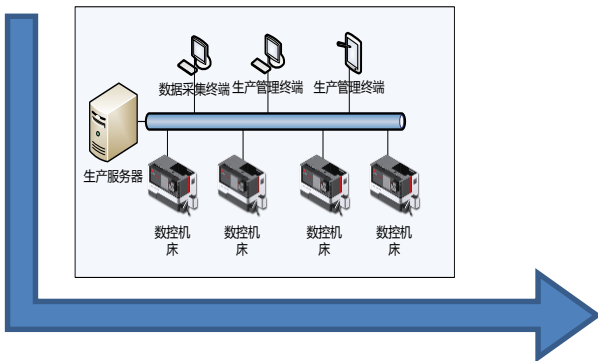
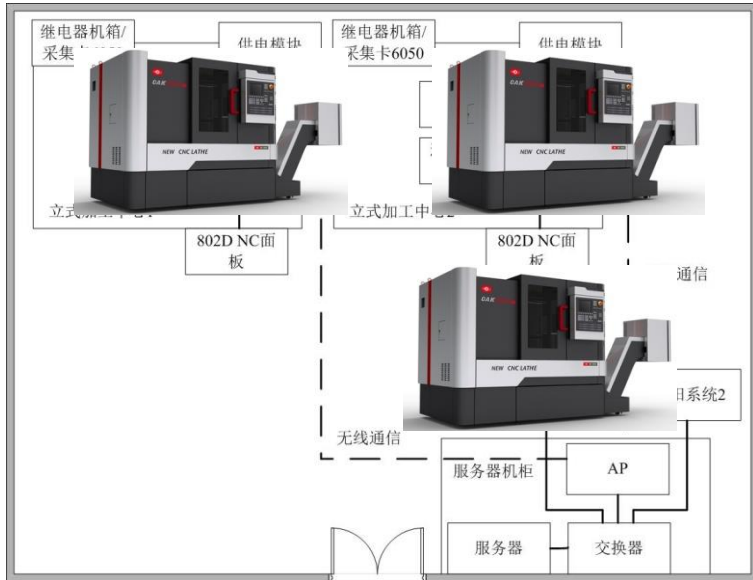


intelligent machine
 internet
 information
 industry
 integrate management

Industry 4.0



- Co-Operation
- i5 CNC system
- i-plattform





—您身边的工业服务管家

Ziele und Geschäfte

目标与业务

三大战略支柱



Bewirtschaften **经营**

金属切削机床WZ
工艺系统产品Techno.
二手机床Geb. WZ
工业原材料Material

Service **服务**

技术服务Techn.
人才服务Human Res.
陪产服务Ramp up
咨询服务Beratung
制造效率服务Produktivität
客户工业品销售Verkauf
产品全生命周期服务PLM

Finanzierung **金融**

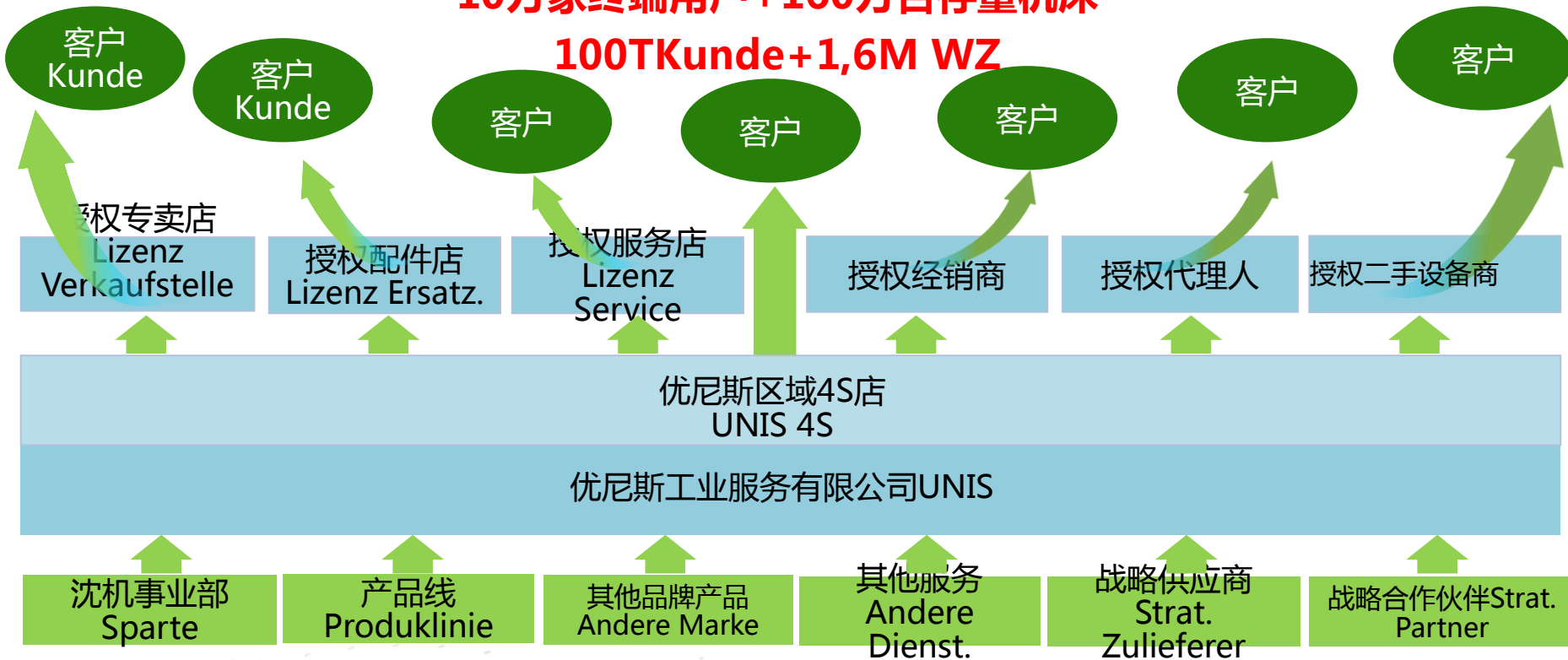
融资租赁Finanz. leasehold
生产力租赁Produktivität leasehold
售后回租After Sales leasehold
担保业务Bürgschaft
以物融资mortgage

服务客户+整合资源=全价值链成员多赢模式

Kunden+Res.intergration=Wertketten Win-Win Pattern

10万家终端用户+160万台存量机床

100TKunde+1,6M WZ



主渠道转型方向

Umwandlungsweg

在传统业务基础上拓展新型业务，转型为工业服务商
Umwandlung zum Serviceanbieter

传统业务Klass.

4S店

机床销售



备件销售



售后服务



新型业务Neue Geschäfte

仓储物流中心
Logistikzentr.



置换翻新中心
Update



包装改制中心



金融服务中心
Finanz.



改造中心



备件中心



售后服务中心



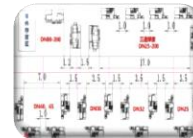
大客户系统
解决方案Grosskunde



行业解决方案
(教育) Branch



技术解决方案





Thank you very much

for your kind attention!