



PICMET2016 in Hawaii



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Product Planning and Innovative Developments from the Perspective of Anticipated Market Trends in the Coming Years:
An Analytical Approach based on Machine Tools Developed for Auto Manufacturers

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Abstract




Each year Japanese product manufacturers face a growing number of challenges in the field of product planning and development. These challenges include the shrinking domestic market as a result of the aging population and declining birth rates, as well as intensifying cost competition from emerging economies.

There are a number of potential initiatives for arriving at solutions to overcome these challenges. Reinforcing capabilities to provide value-added products and services to customers is one. Other initiatives include planning and developing highly competitive products, and enhancing cost competitiveness to keep pace with emerging economies.

In this paper, I will discuss one industrial approach for planning and developing competitive products, as well as how to intensify capabilities for making proactive proposals to customers. The discussion of this approach will be based on case studies regarding machine tools developed for the auto industry in Japan.

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Firstly 

For thinking about Market trend about Product planning/Marketing Research

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3C analysis, PEST analysis and so on.

Supplier, Machine tool vendor and so on must know Set maker and End user's needs.

In this report,

-Consideration about Upfront proposal activity and human skill through machine tools developed for auto manufacturers changing earlier.
 -A case of Strategic(product/technology) Roadmap for Stakeholder's collaboration

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Subjects to be Discussed in This Report 

The future of the machine tool industry

The future of the automobile industry

Will automobiles change drastically?

Trends of automotive materials and processing technologies: Expectations for machine tools

Machine tools industry must change ?

Trends of ICT and IoT: Expectations for machine tools

Linkage and analysis and ...

Reform into a business style based on upfront proposals

Departure from the waiting model

Summary

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1. The future of the machine tool industry

Machine Tool Industry Vision 2020 in Japan:
Expectations in view of industry trends



From the perspective of the **automobile industry**, the **processing technology** sector has the following **challenges to meet**.

Source: Modified from JSAT Journal No. 1 of 2013

Short-term challenges (to be met within three years)



- CAD/CAM/CAE linkage
- **Automatic adjustment** of processing conditions
- Increase in **speed**
- **Five (or multi)-shaft** control

Medium-term challenges (to be met within five years)



- Consistent **IT tools**
- Technologies for **chip treatment and deburring**
- **CFRP** processing technology

Long-term challenges (to be met within 10 years)



- Introduction of **ultra-high speed** technology
- **Contactless inline** measurement
- Expansion in **new material** processing

2. Trends of the automobile industry

Image Regarding Next-Generation Automobiles

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Wireless

Information Security

Automated driving
Demonstration trials commenced with taxis

Weight reduction:
Introduction of aluminum, resins, CFRP, etc.

New Entries

Compliance with environmental regulations

Capturing emerging markets

Logos: TOYOTA, SUBARU Confidence in Motion, VOLKSWAGEN, NISSAN, TESLA, GOOGLE, FOXCONN, SAMSUNG

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Related Technologies Regarding the Next-Generation Automobile Industry (□: Related to processing systems)

Source: Nikkei Business Publications, Inc.: *Megatrend 2015-2024 - Automobiles and Energy*

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Strategies of Major Automobile Manufacturers

TOYOTA

- Places the focus on **South Africa, fuel cells and hydrogen** in its next worldwide strategy.
- Operations in Japan center on **development in Japan** and development commenced in **North America, China and Thailand**.
- Increases supply of **globally popular models from Thailand**.
- Operations in Indonesia are mainly for meeting domestic demand.
- Speeds up a shift to **CFRP and resins** for upscale models.

NISSAN

- Continues to step up its actions in the European and Chinese markets.
- Increases synergy with Renault.
- Continues its efforts on **electric vehicles**.


HONDA

- Downgrading its worldwide strategy?
- Will reduce its factories?
- Faces a challenge of developing commercially successful models.

VW

- Continues to step up its actions in Europe, China and ASEAN.
- Suffers the lingering impact of the diesel scandal.
- Is rumored to be using more manufacturing equipment made in Japan.
- Works to boost efficiency at **factories in line with Industry 4.0** (from Eastern Europe to Southern Europe?).

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To be Learned from Nissan Motor's Safety Technologies 


Nissan Motor has worked to develop a technology (Zone Body Concept) for protecting humans inside the vehicle in the event of a crash.

This means that **the body materials required vary depending on the zone.**

Crushable Zone:
This zone is crushed to **absorb crash energy** in order to reduce the impact on passengers.


Safety Zone:
The high strength cabin experiences minimal deformation in the event of a crash to maintain the survival space for passengers.

Crushable Zone:
This zone is crushed to **absorb crash energy** in order to reduce the impact on passengers.



Zone Body Construction

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Summary of This Section: 

Improvement in machining technologies and cultivation of new customers

More raw materials that cannot be processed using conventional machining technologies

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Making competitiveness, if can be processed.

-Anticipatory development with another stakeholder.
-Responding to new customers: Emerging manufacturer and EMS.

Electronics manufacturing service (EMS):
Contract manufacturer(s) of electric machinery, e.g. Foxconn

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3. Trends of Automotive Materials and Processing Technologies: Expectations for machine tools

Examples of Requirements from Machine Tools and Processing Technologies on the Basis of Trends of Next-Generation Automobiles



Engine



Magnesium alloys and titanium alloys adopted for weight reduction
-> High efficiency processing of extremely fragile materials, hard-to-machine materials, compound materials, etc.

Camshaft



Reduced friction and increased transmission efficiency
-> Shape feedback machining, mirror finishing of curved surfaces, surface micromachining, high precision profile processing

Change in processing	Elements in machine tools
Greater difficulty in processing / thinner wall thickness	- New materials with high attenuation properties - Chip recovery technology - Flexible chuck technology
Higher precision	- Intelligent technology - Main shaft with automatic load control - Automated vibration control - Technology for guaranteeing machining precision
Smaller sizes / increased complexity	- High precision spindles - High precision positioning - Ultrasonic processing - High speed feed mechanism - Bed with low heat generation and low thermal expansion

Impact of 3D Printers



Impact of 3D Printers, today:

- production and verification of prototypes
- production of small lot items in some cases, and others.

The automotive industry uses 30 3D printers to make full-scale bodies for use in verifying design, wind noise and other aspects.



EV: using 3D printer for making body.

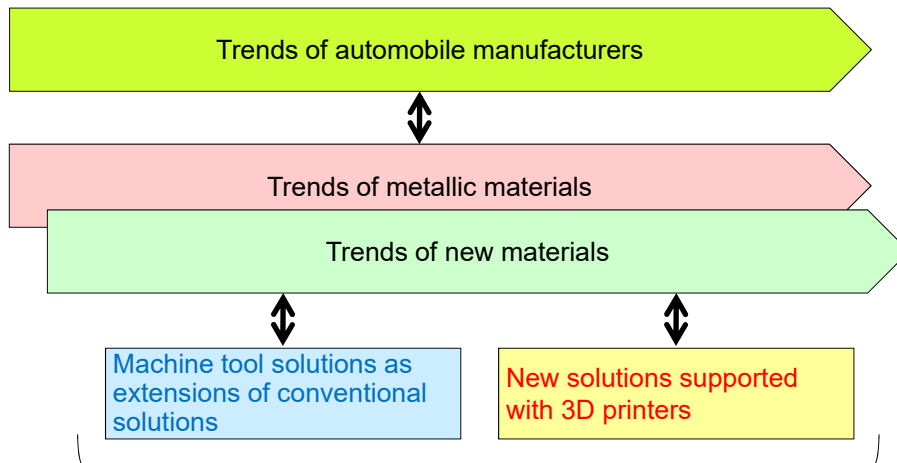
Near the future:

- used for metal molds;
- maintenance parts;
- for the production of small lot items.

Many influence for the metal mold and the machine tool industry.

Summary of This Section:

Making full use of 3D printers as a solution



Solutions required in the future from the machine tool industry (proper selection between machine tools and 3D printers depending on the purpose)

4. Impacts of IoT and ICT on the Machine Tool Industry

Rolls-Royce and GE Earns from Products and Services



- Rolls-Royce and GE has recently shifted from its traditional business model of just selling its products to a model whereby **it will be associated with customers for its lifetime.**
- Air carriers are working to **cut fixed maintenance expenses.**



Reference: The *Nikkei* newspaper

- **Contracting with air carriers** that own aircraft equipped with its engines.
- **Monitoring the status of the operation of engines** in nearly 4,000 aircraft (temperature, oil pressure and vibration noises...).

- **Advising on the timing of maintenance**
- **Commissioned to perform maintenance.**
- **Optional service of monitoring engines .**

In the future, automobile manufacturers will demand **machinery that is ready for ICT, IoT and Industry 4.0.**

- > Demand for production data as big data subject to feedback.:
- production plan data
 - quality data
 - operation data
 - information on the timing of maintenance

New value is required by big data:

- Customer's process enhancement and product planning
- apply and expand to other industrial sectors

- **Creation of value other than simple production** is required with an eye toward ICT, IoT and Industry 4.0.
- **The functions of using big data, analyzing** them from an AI-like perspective and returning results will be indispensable.
- No value creation will be possible without uncovering **customers' latent needs** in a broad sense.
- **Network engineers** will need to be retained in the company.

5. Reform into a business style based on upfront proposals

Toward Development for Upfront Proposals



Upfront proposals refer to a practice of studying customers' latent needs to make proposals on products and technologies that surprise customers before they make requests.

The actions listed below are among the keys to the achievement of upfront proposals.

1. Joint creation of a product or technology roadmap involving the customer
2. Intensive study of the customer upon which a focus is placed and consideration of its latent needs
3. Creation of an upfront proposal structure:
Collaboration with business partners
4. Development of human resources for upfront proposals:
Studies of customers and skills to make proposals
5. Acceleration of the development and encouragement of prototyping-type development


Summary of This Section



- It is essential to contribute to **customers' creation of value**.
- **Customers' latent needs** cannot be learned without **learning their operational processes**.
- It is desirable that customers' data be **automatically acquired** and analyzed.

6. Summary

Summary of Entire Presentation



We will continue to explore the impacts of the trends of automobile manufacturers and materials on the machine tool industry and conduct activities for **finding business opportunities in these moves**. I think it's effective of using Strategic Roadmap.

Trends of automobile manufacturers and materials


- Automated driving technologies
- Readiness for new materials (magnesium alloys, titanium alloys, CFRP, etc.) for weight cuts and environmental compliance
- Acceleration of digital shift
- Demand for a shorter period of development or faster development
- Acceleration of entries into emerging economies
- Divided into upscale vehicles and popular vehicles


Other moves that are coming into view

- Machine tool manufacturers follow automobile manufacturers in entering emerging countries.
- Big data analysis
- ICT
- IoT
- Industry 4.0
- AI
- TPP/FTA

Business opportunities for (and impacts on) the machine tool industry

- Readiness for aluminum, resins and CFRP and prior preparations to boost **customers' confidence**
- Automation and remote monitoring
- Machining that **cannot be performed by competitors**
- > Readiness for new materials
- Intellectual property and patent business
- Reduction in prototyping attempts with **the use of 3D printers and prototyping-based development**






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