Watch Business 3D Systems and Styling Design Innovation

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Watch Design Group
Seiko Epson Corporation
1. About Seiko Epson
2. 3D Systems for Watch Business
3. Watch Design Process Innovations
Epson's Core Technology

Roots
Since 1942
- Mechanical watch
1964
- Tokyo Olympics
- Crystal meter
- Printing timer

Growth
1968
- Mini printer
1969
- Analog quartz watch
- LCD digital watch

World firsts

Watch Devices
- CMOS LSI
- LCD
- Crystal oscillator

Color Imaging Information Related
- Micro piezo print heads
- Digital color image processing
- DURABrite ink
- High-temperature polysilicon TFT panels for 3LCD projectors

Energy Saving Electronic Devices
- Low-power CMOS LSI
- Low-power LCD Module
- Low-power full-color MD-TFD
- Photo etching milling technology
- High-frequency SAW technology

Micro-mechatronic Precision
- “Saving” technology
- High-precision milling
- Surface mount technology
- High-precision implementation
- Digital control technology

NOV, 2004
Corporate Innovative Recognition Award from “IEEE”.
The company was cited for its leadership in pioneering development of watches based on quartz crystal oscillators and for the resulting contributions to energy saving technologies in the electronics industry.
2. 3D Systems Watch Business

Watch Business 3D Systems Establishment

3D CAD/CAM
Total Product Information System

Globalization and Front-End
3D CAD/CAM Business for Watch Business

- **S-CAD (Solid Modeler)**
- **CG**
- **All Japanese Models 100% CAM Data**
- **ICP Project**
- **FRONT ACTIVITIES**
- **“GLOBAL FRONT”**
- **Designers & 3D Modelers moved to UG**
- **UG for Oversea Factories**
- **3D Digital Design for Oversea R&D/manufacturing**

- **Drafting/Manufacturing CAD**
- **Mini CAD (In-house)**
- **S-CAD (Solid Modeler by NUL)**
- **CV (Surface Modeler)**
- **Prototyping**
- **U-GRAPHER (Movement Design)**
- **UG Styling/Outer Design**
- **Outer**

**Dates:**
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
Digital Engineering for Watch Outer

Key Technologies: 3DCAD, CG, CAM, RP, PDM, Simulation
3. Watch Design Process Innovations

- Innovations -

Quick Virtual Development Process (QVDP)
Establishment and Operation
3.1 Design Environment

SEIKO EPSON
(Design/Supply–Manufacturing/Movement Dev.)

Development Offices
in Japan

OEM

Hong Kong branch

SEIKO WATCH
(Planning/Design/Sales/After Service)

Design Center

SEIKO
Domestic/Overseas
3.2 Prior Work Situation and Problems

--- Problems ---

Slow
Expensive
Difficult to improve styling quality
3D systems not used at design divisions

--- Serial Development ---

Before
2D design job
6D outer modeling job
First Prototype
2D design change
3D outer modeling job
Second Prototype
"Better, faster, cheaper products"

- Use NX as the common 3D language, share 3D information with all processes, and shorten development times.
- Use 3D_Virtual_Simulation to minimize prototypes and increase product quality.
- Shorten the distance and time between product and market by communicating with 3D content.
- Reduce development costs (prototyping and fixed cost)

2D = Estimate

3D = Conviction

Limited Innovation

Total Innovation
3.4 Innovation Plan

From "serial" to "parallel"

- Planning
- Sketch
- 3D design
- Outer styling
- Engineering
- Virtual confirmation
- Physical model prototype
- Decision, approval
- Touch and feel on RP model
- NX data

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3.5 Innovation Plan

Before

2D design
3D outer modeling
First Prototyping
2D design change
3D outer modeling
Second Prototyping

45-50% time reduction (min.)

Design, outer styling, 3D virtual work
Technologies/Design/Supply

Proto

After
QVDP
QUICK VIRTUAL DEVELOPMENT PROCESS

Intended to convey styling concepts directly to the market

Relies on NX 3D data to speedily reproduce a high-quality 3D model of the final product that reflects the stylist's sense and technical details. It should be high quality, speedy.
**QVDP Process**

**Planning**
- Plan decision
- Working out the idea

**3D Modeling**
- 2D concept design
- 3D modeling
- 3D CG
- Rendering
- Render image editing

**Rapid Prototyping**
- Data check
- NX path, programming
- Milling
- Painting

**Presentation**

**Prototyping**

**Evaluation & decision**

*Styling designer handles the ENTIRE process*

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Key Points in QVDP

2D Design

3D Design

RP

Use the Models

QVDP
HANDED
BY ONE PERSON!

Before

Sketch

3D Design

Use the Models

RP
QVDP Process

Styling designer handles the ENTIRE process

Planning
- Plan decision
- Working out the idea

3D Modeling
- 2D concept design
- 3D modeling
- 3D CG
- Rendering
- Render image editing

Rapid Prototyping
- Data Check
- NX path, programming
- Milling
- Painting

Presentation

Prototyping

Evaluation & decision

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**Working Out Ideas**

This process has a big influence on the 3D modeling process.
QVDP Process

Styling designer handles the ENTIRE process

Planning
- Plan decision
- Working out the idea

3D Modeling
- 2D concept design
- 3D modeling
- 3D CG
- Rendering
- Render image editing

Rapid Prototyping
- Data Check
- NX path, programming
- Milling
- Painting

Presentation

Prototyping

Evaluation & decision

Styling designer handles the ENTIRE process
3D Design

• Create faces or solid parts based on defined curves
• Major Influence on basic mechanical quality
• Give consideration to total balance. Repetition for completing.
QVDP Process

Styling designer handles the ENTIRE process

Planning
Plan decision
Working out the idea

3D Modeling
2D concept design
3D modeling

3D CG
Rendering
Render image editing

Rapid Prototyping
Data Check
NX path, programming
Milling
Painting

Presentation

Prototyping

Evaluation & decision

Styling designer handles the ENTIRE process.
Computer Graphics

- Material selected for each part. CG created on NX.
QVDP Process

Styling designer handles the ENTIRE process

Planning
- Plan decision
- Working out the idea

Rapid Prototyping
- Data Check
- NX path, programming
- Milling
- Painting

3D Modeling
- 2D concept design
- 3D modeling
- 3D CG
- Rendering
- Render image editing

Presentation

Prototyping

Evaluation & decision
RP Data Creation

Check surfaces

• Create milling path

• Preview
QVDP Process

Styling designer handles the ENTIRE process

Planning
- Plan decision
- Working out the idea

3D Modeling
- 2D concept design
- 3D modeling
- 3D CG
- Rendering
- Render image editing

Rapid Prototyping
- Data Check
- NX path, programming

Milling
- Painting

Presentation

Prototyping

Evaluation & decision

Styling designer handles the ENTIRE process
• Milling data is sent to the machine via a PC printer port.
Milled Chemical Wood

- Rough milled
- Semi-finished
- Finished and painted, front & back
**QVDP Process**

**Planning**
- Plan decision
- Working out the idea

**Rapid Prototyping**
- Data Check
- NX path, programming
- Milling
- Painting

**3D Modeling**
- 2D concept design
- 3D modeling
- 3D CG
- Rendering
  - Render image editing

**Presentation**

**Prototyping**

**Evaluation & decision**

*Styling designer handles the ENTIRE process*
Rendering and Prototype

• Final evaluation using renderings and rapid prototype
Styling designer handles the ENTIRE process.

**QVDP Time**

Planning

*Plan decision*

*Working out the idea*

3D Modeling

*2D concept design*

*3D modeling*

*3D CG*

*Rendering*

*Render image editing*

Rapid Prototyping

*Data Check*

*NX path, programming*

*Milling*

*Painting*

Presentation

Prototyping

Evaluation & decision

2 days

6 days

4 days

6 days

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QVDP Results

Efficiency

Speed was increased by at least 50%
Quality was increased by a minimum of 100%
Smooth communication and sharing of issues enterprise-wide

Cost

Reduced prototyping, labor & travel expenses by 50% or more

Contents Use

Increased presentation quality.
Nice sales materials.
Virtual data used at sales sites
Leaflets & promotion videos
Contents Use
What we stylists need to do today

Advances in 3D software are putting 3D representation capability in the hands of many.

Stylists have to master 3D software and realize sophisticated creative jobs quickly.
Thank You