PERCEIVED QUALITY AND PERCEPTUAL ROBUSTNESS

Perceived Quality at CEVT AB

Presenter:
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AGENDA

• My background

• Introduction to CEVT – China Euro Vehicle Technology

• Perceived Quality at CEVT

• Robustness of switches/controls

• Methods used

• Geometry assurance in connection to Quality?

• Q&A
MY BACKGROUND
Introduction to CEVT
Started 2013 as a joint R&D center between Geely and Volvo Cars

Now an innovation center for Geely Group that keeps some 2000 people in several countries busy.

A Swedish registered company, owned by Geely, located at Lindholmen Science Park in Gothenburg.

Locations:

**Gothenburg:** Over 600 full-time and 800 consultants and recruiting.

**Hangzhou:** Over 500 full-time and recruiting.

**Trollhattan:** satellite office with 30 working seats
CEVT China

CEVT China is located inside the Geely Research Institute.

There are over 500 full-time employees and recruiting. From November 2016, the office will move to Cixi, Ningbo City.
The Geely Group

Zhejiang Geely Holding Group (ZGH)

- Geely Auto (GAH)
- Volvo Cars (VCC)
- London Taxi Company (LTC)
- Minitime Group (Education)

CEVT
This is what we do at CEVT
Creating products for a global market
R&D Portfolio

> **Architecture Development**
Creating new modular architectures and key components for C-segments cars.

> **Top Hat Development**
Creating complete, customer focused vehicles based on the new architectures.

> **Shared Component Development**
Creating technical solutions applicable to both brands and customer profiles.

> **Complete Vehicle Design**
Creating beautifully designed vehicles that expands the customer segment.

> **Advanced Engineering and New Technologies**
Deliverables to

- Architecture and components
- Shared Component Development
- Top Hat Development
- Shared Component Development
- Complete Vehicle Design
- Advanced Engineering and Technologies
Perceived Quality in CEVT – What do we do?
PERCEIVED QUALITY

Perceived Quality sets requirement on complete vehicle appearance.

The aim is to secure that the customers first impression lasts.
GEOMETRY AND APPEARANCE QUALITY

- Fit and finish
- Ball corners and radii
- Ratholes and see-through in split-lines
- Visible fixations
- Weld-points
- Engineering execution (clips, joining’s, mouldings etc.)
PAINT AND SURFACE FINISH

- Orange peel
- Colour matching
- Paint defects
- Surface finish defects
- Ghost lines
ILLUMINATION

> Best visual support and comfort for all users and situations
> Harmony between illuminated areas and symbols
> Harmony between Color, Materials and Illumination
> Control of shadows, reflections, glare and leakage
> Perfect timing and synchronized light sources
MATeRIAL QUALITY

- Harmony (gloss, color and grain)
- Execution
- Material content
- Absence of defects
- Touch and feel of switches and controls
ROBUSTNESS OF SWITCHES AND CONTROLS

- Many switches interior

Subjective feeling:
- Europe vs China. Customer preferences?
- Requirement?

Example. Touch requirement switches door

SWITCH-FEEL CHARACTERISTICS
Methods and tools

How do we ensure a good quality from design sketch to physical car?
PQ MAIN DELIVERIES DURING PROJECT DEVELOPMENT

- Benchmark
- Set CV Requirements
- Product Attribute Profile targets

- First geometry requirement release
- Non-nominal visualizations

- DPA[2] execution @UPV0, UPV1 and UPV2 Freeze
- PQR2 @DSM5
- PQR3 @AA1
- Non-nominal visualizations
- Surface finish demerits decided

- PQ – Physical @ VP and TT
- Support audit action @ test series

Issuer: [Emelie Sundqvist]; [Perceived Quality]; [Perceived Quality and Perceptual Robustness];

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DPA – Appearance Quality Evaluation

Purpose

> Purpose with DPA[2] is to evaluate and check that engineering execution is performed in accordance with Appearance Quality Requirements.

Viewing angles

> Complete vehicle with combination of variants is loaded in Teamcenter Visualisation software
> All closures and other adjustable components are animated.
> Ocular evaluation is performed on frozen data, viewed from customer relevant positions.
> All issues in DPA[2] are summarized and addressed in a Report Out.

Instructions

> DPA[2] is performed on frozen data after each engineering loop, V0-V1-V2

Figure 1. Explaining figure of eye position front row following vehicle.
Virtual reviews and visualizations

Autodesk VRED visualisations
Geometry assurance in connection to Quality
Geometry assurance

Cross Functional Team

Dimensional Engineer
- System design
- Geometry demands
- Tolerance calculation

Manufacturing Geometry Engineer
- Geometry pre-planning
- Early verification
- Launch

GE (Geometry Engineer)
- Running production
- Keep the site
- Reduce spread
- Preventive maintenance

SQM (Supplier Quality Management)
- Quality of incoming material
- Supplier connection

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Geometry assurance

> Geometry assurance means that we, at first, need to understand and reduce the effect of variation, then specify relevant geometric demands. Later during production we need to reach those demands with controlled material and process to gain a desired product.

> How can we do that?
In the real world, nothing is nominal like the digital CAD model. Everything is affected by variation.

That’s why focus on geometry quality is important during the entire development process, to be able to reach a desired vehicle.
All components contribute to Perceived quality
Geometry requirements

Perceived Quality Geometry Requirement
3±1,5 mm

Although components are not visible for customer it is extremely important to be within specification. It will contribute to both nominal set-up and variation in visible split-lines.
How about the final result?

To be continued...
Thank you all for listening!

Questions?

Emelie Sundqvist