



# CAR ENTERTAINMENT : IMPROVE DEVELOPMENT EFFICIENCY WITH SPEOS

**Pioneer**

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### CHALLENGE

Pioneer was willing to shift to a digital evaluation process to get out of a validation based on physical models in order to reduce the labor hours and the number of LED light sources previously required. A virtual engineering process was required by Pioneer to optimize the lead time and quality of lighting design.

### APPLICATION

#### 1. GPS

Satisfying both design and cost requirements



#### 2. Audio system

Realizing design specifications



### RESULTS & EFFECTS

Pioneer has succeeded in reducing development workload and improving efficiency. They managed

to eliminate the backtracking when designing illumination structures initially using a simple analysis. Additionally, they performed a calculation of absolute brightness value proving the efficiency of the system.

For the light guide plate, reduction in workload through design standardization has been achieved. As a result, Pioneer has triumphed over satisfying both design and cost requirements in their product development.

### PIONEER IS A REAL PIONEER OF IN-CAR ENTERTAINMENT DEVICES

In 1937, Pioneer's founder, Nozomu Matsumoto, successfully develops the A-8 dynamic speaker. Since then, the company has been dedicated to audio/sound system from home use to B to B supply.

The car audio and/or GPS you have in your car, would never have come to you without Pioneer's innovative production.



1990  
World's first GPS car  
navigation system



1975  
World's first component  
car stereo

World's first series (source: Pioneer official website) Although the company has extraordinary technology in the audio/sound industry, Pioneer has been facing difficult challenges in today's demanding market – the illumination of a device.

#### USE CASE I: GPS CONTROL BOARD

The company first investigated the color harmony of

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the control dial on the GPS unit. Although Pioneer is the expert in this field, figuring out the best lighting harmony taking into account the luminance uniformity was one of the difficulties at that time. However, thanks to SPEOS, Pioneer finally solved the issue and accomplished the result that the designer intended.



Thoroughly checking the illumination performance efficiency has brought a big benefit to Pioneer which reduces the number of LED light sources.

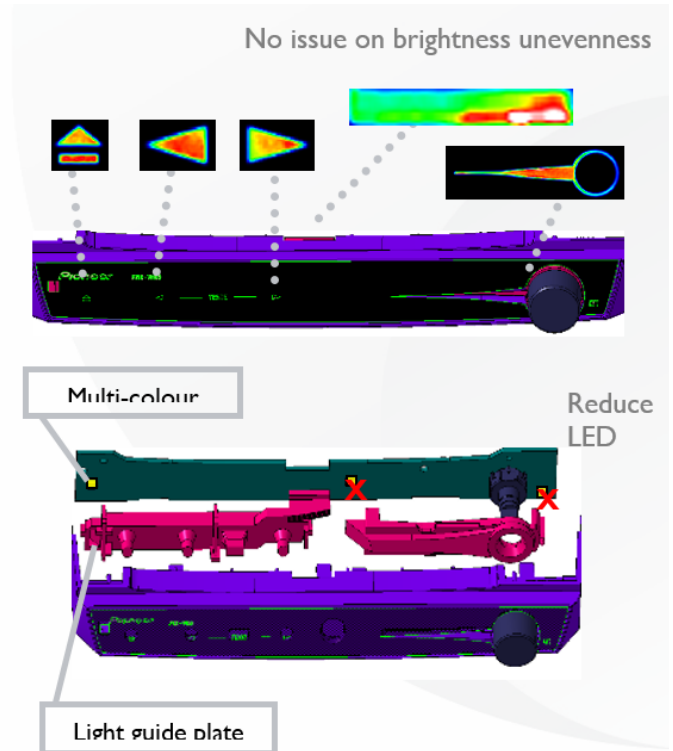
#### USE CASE 2: CAR AUDIO DIAL

To achieve an attractive design, SPEOS takes an important role in car audio dials as well.

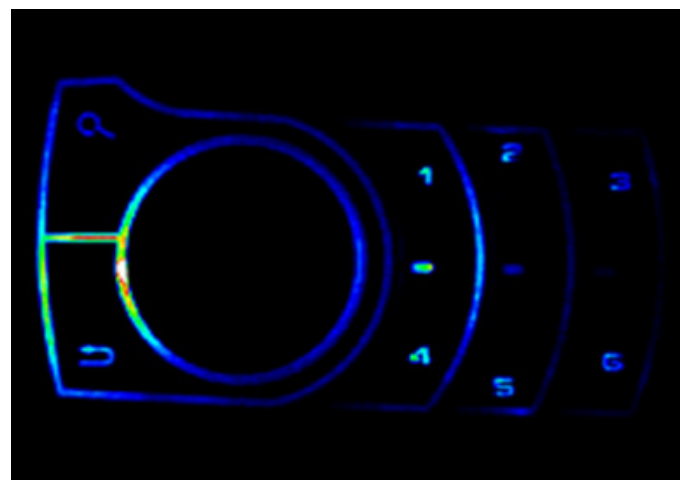
#### I. Design Idea



At first glance, the dial area appears to have a uniform illuminating light ring surrounding it, satisfying Pioneer's goal.



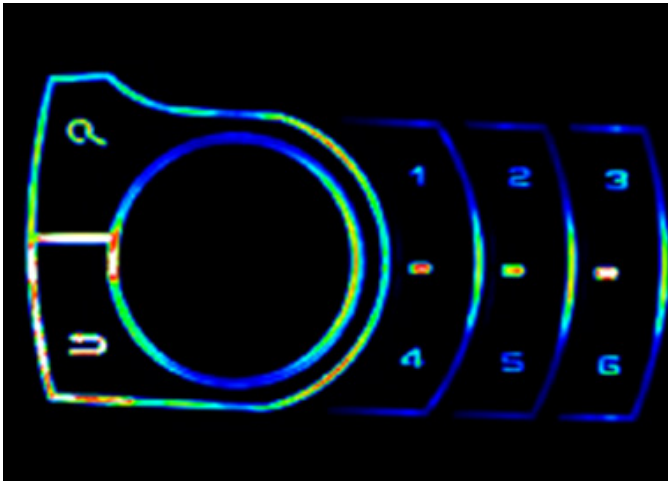
#### II. First Simulation Result



Simulation & Uniformity is not achieved around the dial

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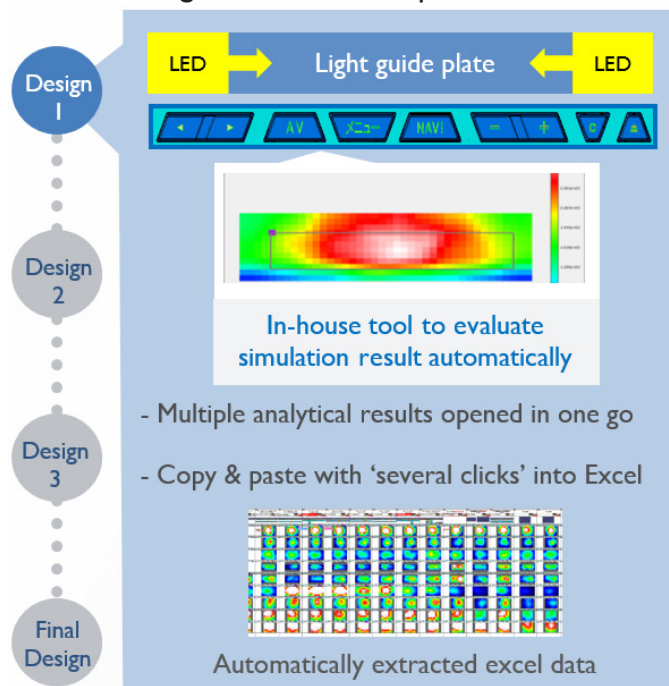
### III . After Improvement



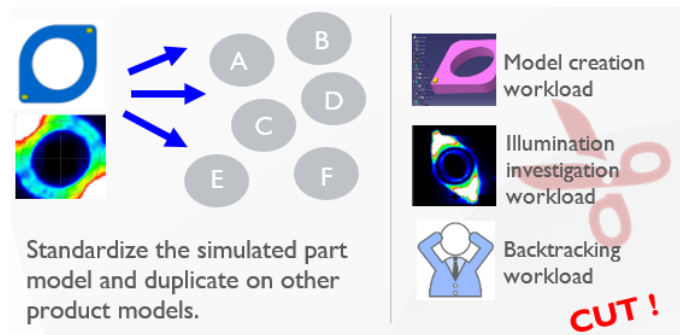
Good uniformity is obtained !

### USE CASE 3 : OPTIMIZATION

In order to validate possible design variation, Pioneer takes advantage of the SPEOS optimization tool.



And to reduce multiple design creation..



## VISION FOR THE FUTURE

Since 2006, Pioneer has been using SPEOS to improve design efficiency by digital validation and promoting designer analysis. The firm has been working to reduce workload through automation and standardization, as well as utilizing SPEOS throughout the development process from the simple analysis of the concept design to calculating absolute values for brightness in the detailed design stage.

In the future, Pioneer plans to improve development efficiency by extending the analysis to more products and establishing appearance evaluation techniques.

## ABOUT

### PIONEER CORPORATION

A world-leading Japanese company specializes in digital entertainment products, based in Kawasaki, Kanagawa, Japan. Founded in 1937 in Tokyo developing the A-8 dynamic speaker by hand., Pioneer played a role in the development of the Laser Disc player, the first automotive Compact Disc player, the first detachable face car stereo, Organic LED display and more. **For more information:** [www.pioneer.jp](http://www.pioneer.jp)