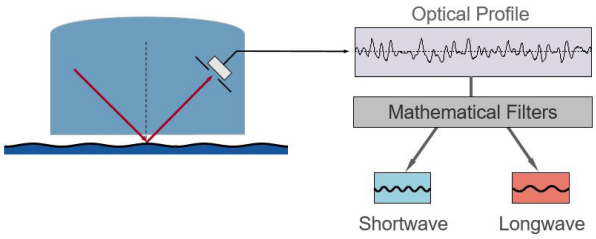
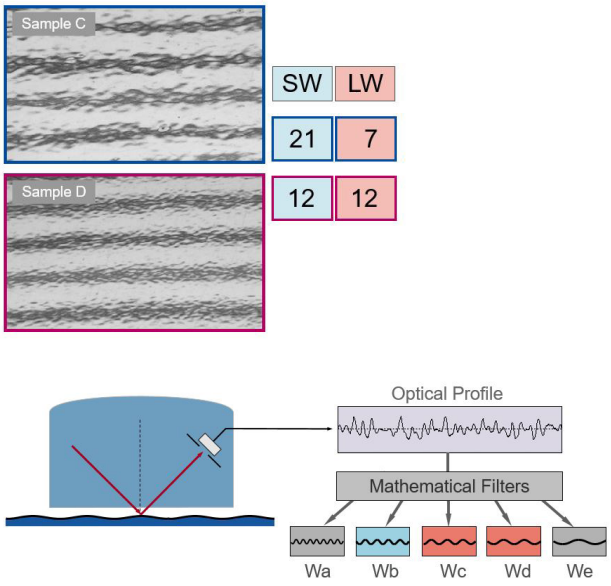
A new sight on Orange Peel: wave-scan with new scales for dominant wavelength information

It all started with LW and SW in the early 1990s. BYK-Gardner´s well-known wave-scan analyzes waviness based on wavelength range and its intensity.



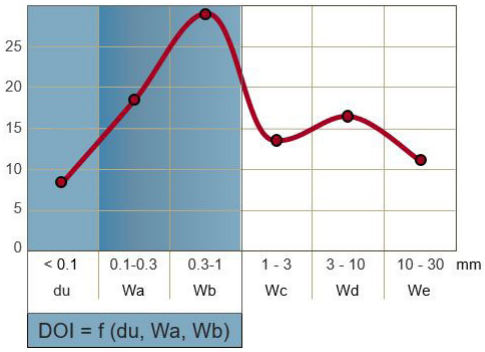
Picture 1: Waviness principle: LW - SW

The LW-value integrates waviness in the range of 1.2 – 12 mm and the SW-value sums up fine textures in the range of 0.3 – 1.2 mm. As material and process parameters changed, these integrated parameters were not always sufficient to differentiate various surface appearances.

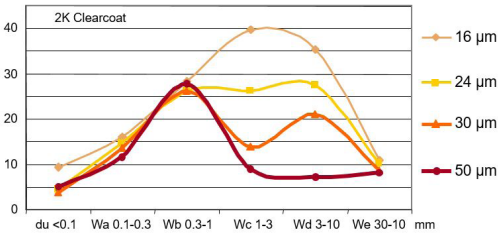


Picture 2: LW - SW

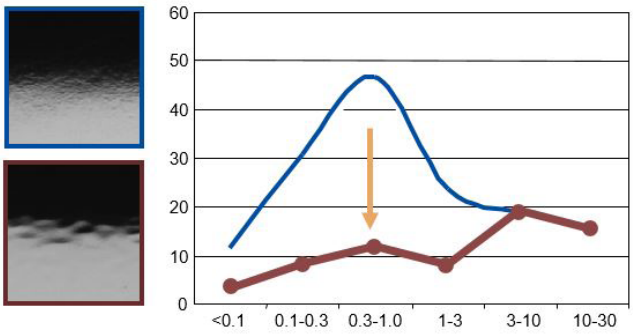
Consequently, in 2001 the next generation, wave-scan DOI was introduced measuring 5 wavelength ranges as well as the distinctness of image. These six measurement parameters are graphed and called a “structure spectrum”, which is an ideal guide for trouble shooting and optimizing surface appearance based on material or application influencers.



Picture 3: wave-scan DOI principle plus structure spectrum

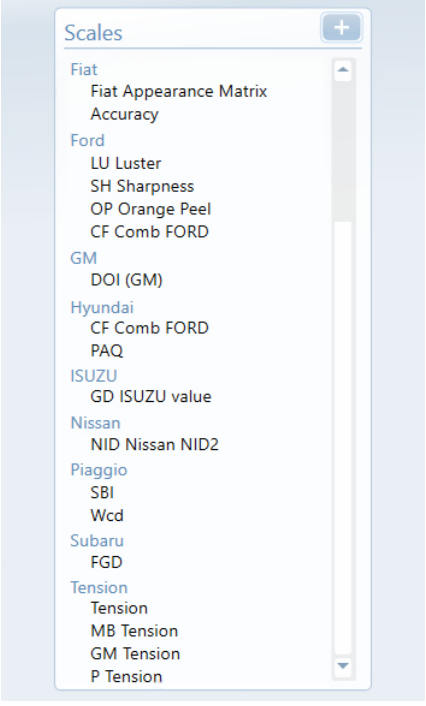


Picture 4: film build and structure spectrum



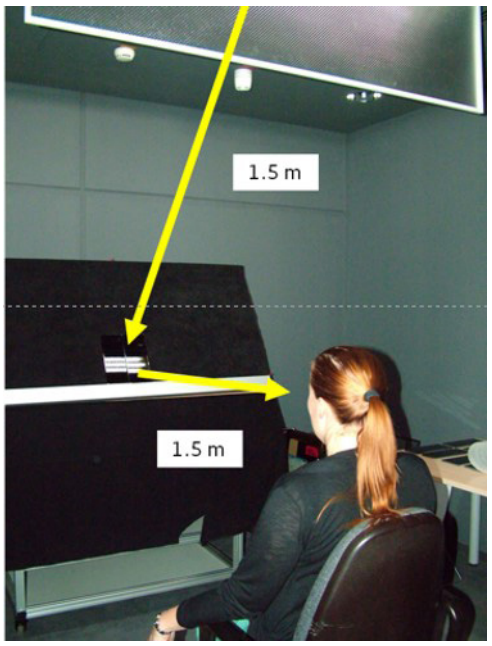
Picture 5: primer roughness - sanding

To keep it simple for QC control and management reports 1- or 2-dimensional scales are used. Additionally to LW and SW, OEM specific scales with different target values and tolerances were developed over the years.



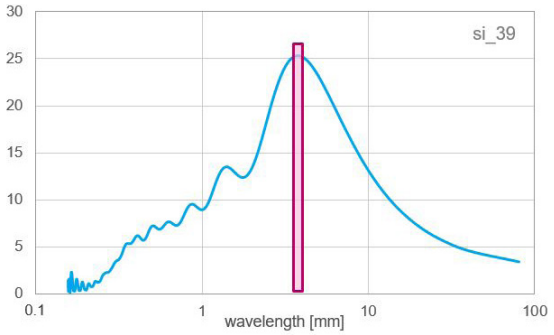
Picture 6: Overview OEM scales - copy of smart-chart

In 2012, a new approach was initiated within the VW/Audi group and was first presented at our BYK-Gardner User Meeting in 2013.



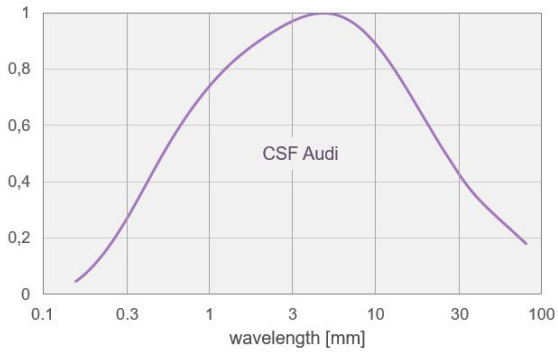
Picture 7: visual evaluation Audi

Since then several visual studies were conducted and it became obvious that observers can distinguish samples based on its dominating wavelengths. In order to determine a specific waviness size, the optical profile of the wave-scan measurement needs to be analyzed with a so-called Fast Fourier Transformation, which is in simple words, a structure spectrum with much higher resolution.

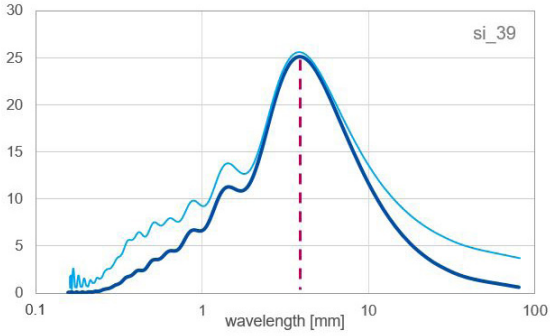


Picture 8: FFT

The results are weighted according to the VW / Audi study to simulate an observation distance of 1.5 m.



Picture 9: CSF



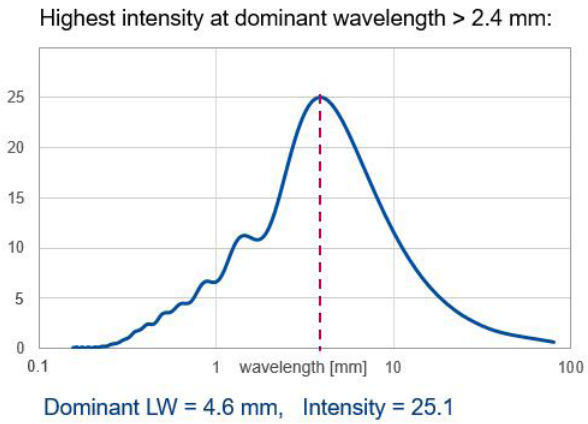
Picture 10: FFT weighted

The result is up to four new scales:

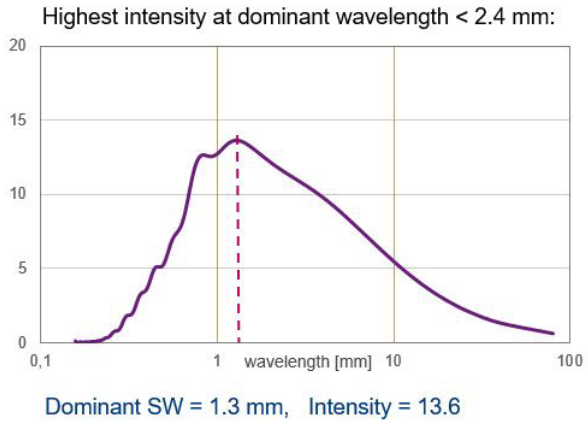
- Dominant LW wavelength
  and its maximum amplitude

- Dominant SW wavelength
  and its maximum amplitude

Dominant LW = 4.6 mm
Dominant LW intensity = 25.1



Dominant SW = 1.3 mm
Dominant SW intensity = 13.6



Two dominant wavelengths

Dominant LW = 4.4 mm
Dominant LW intensity = 8.6
Dominant SW = 1.3 mm
Dominant SW intensity = 8.2

Curious? The new firmware is free of charge and available for download in the smart-chart package under:

www.byk.com/wave-scan