NANOVEA
A Better Measure.

Processed Leather Surface Finish Using 3D Profilometry

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INTRO:

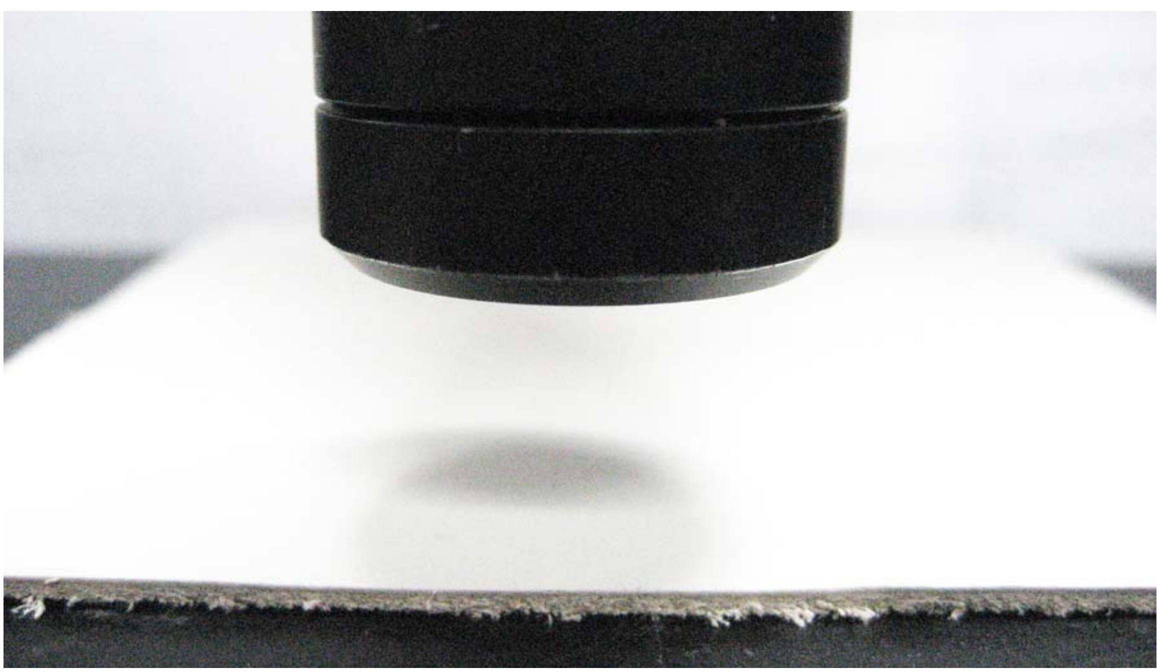
Once the tanning process of a leather hide is complete the leather surface can undergo several finishing processes for a variety of looks and touch. These mechanical processes can include stretching, buffing, sanding, embossing, coating etc. Dependent upon the end use of the leather some may require a more precise, controlled and repeatable processing.

IMPORTANCE OF PROFILOMETRY INSPECTION FOR R&D AND QUALITY CONTROL

Because of the large variation possible, and unreliability of visual inspection, the surface finish of leather should be properly inspected for quality control. Understanding surface features can lead to the best selection surface finish and control measures. To insure the quality control of such parameters, inspection will heavily rely upon quantifiable, reproducible and reliable information. The Nanovea 3D Non-Contact Profilometers utilize chromatic confocal technology with unmatched capability to measure finished leather. Where other techniques fail to provide reliable data, due to probe contact, surface variation, angle, absorption or reflectivity, Nanovea Profilometers succeed.

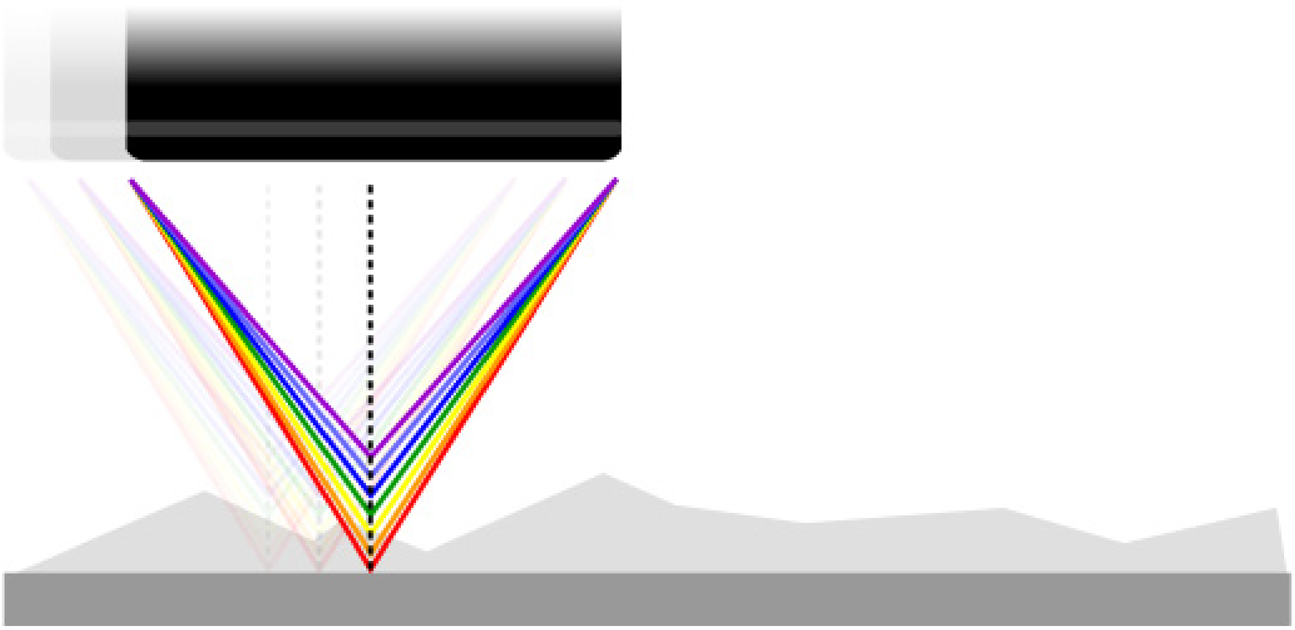
MEASUREMENT OBJECTIVE

In this application, the Nanovea ST400 is used to measure and compare the surface finish of 2 different but closely processed leather samples. Several surface parameters will be automatically calculated from the surface profile. Here we will focus on surface roughness, dimple depth, dimple pitch and dimple diameter for comparative evaluation.



MEASUREMENT PRINCIPLE:

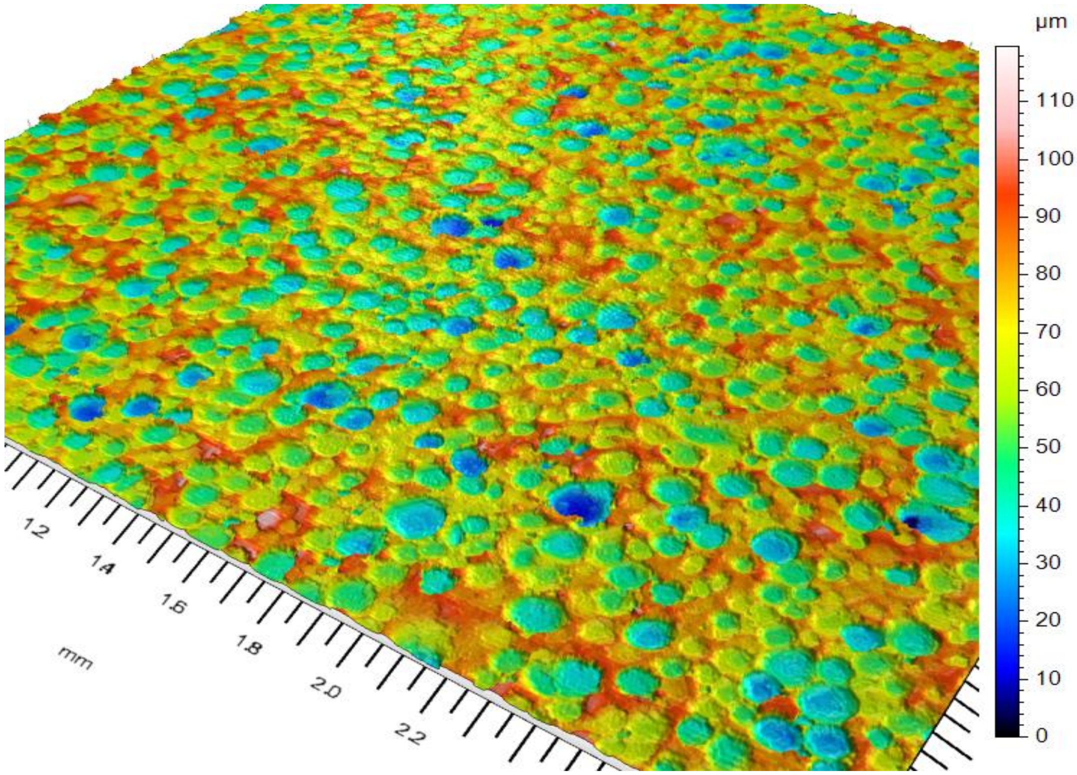
The axial chromatism technique uses a white light source, where light passes through an objective lens with a high degree of chromatic aberration. The refractive index of the objective lens will vary in relation to the wavelength of the light. In effect, each separate wavelength of the incident white light will re-focus at a different distance from the lens (different height). When the measured sample is within the range of possible heights, a single monochromatic point will be focalized to form the image. Due to the confocal configuration of the system, only the focused wavelength will pass through the spatial filter with high efficiency, thus causing all other wavelengths to be out of focus. The spectral analysis is done using a diffraction grating. This technique deviates each wavelength at a different position, intercepting a line of CCD, which in turn indicates the position of the maximum intensity and allows direct correspondence to the Z height position.



Unlike the errors caused by probe contact or the manipulative Interferometry technique, White light Axial Chromatism technology measures height directly from the detection of the wavelength that hits the surface of the sample in focus. It is a direct measurement with no mathematical software manipulation. This provides unmatched accuracy on the surface measured because a data point is either measured accurately without software interpretation or not at all. The software completes the unmeasured point but the user is fully aware of it and can have confidence that there are no hidden artifacts created by software guessing. Nanovea optical pens have zero influence from sample reflectivity or absorption. Variations require no sample preparation and have advanced ability to measure high surface angles. Capable of large Z measurement ranges. Measure any material: transparent or opaque, specular or diffusive, polished or rough.

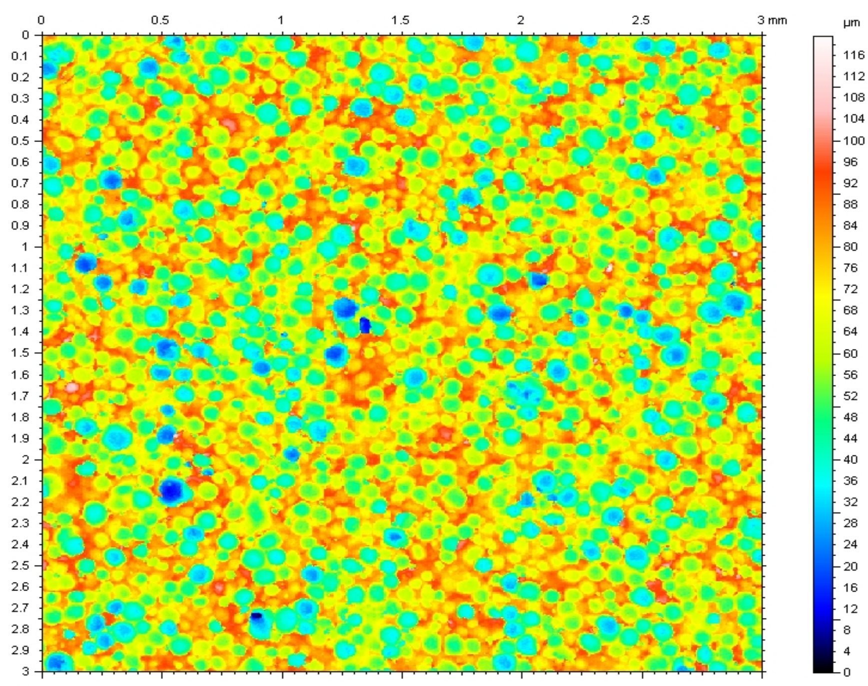
RESULTS:

Sample 1



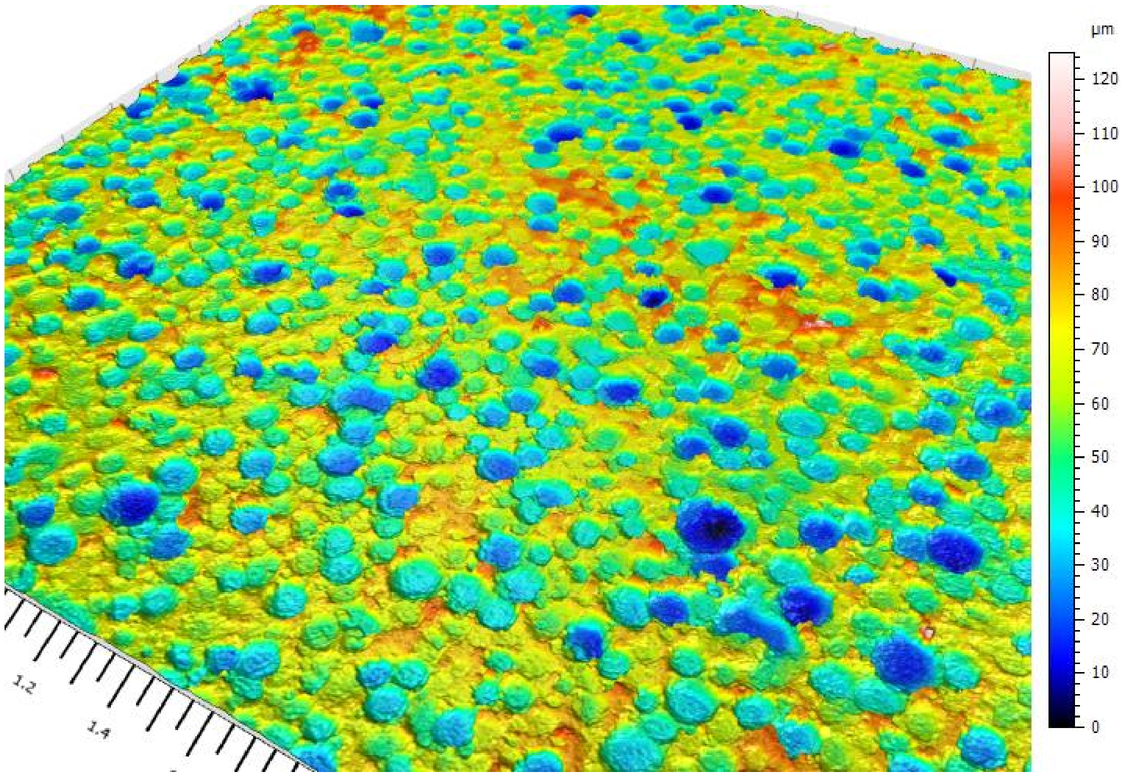
3D Profile of Sample 1

ISO 25178			
Height Parameters			
Sa	13.722	µm	Arithmetic me...
Sq	16.361	µm	Root mean sq...
Ssk	-0.230		Skewness
Sku	2.302		Kurtosis
Sp	55.453	µm	Maximum pe...
Sv	64.160	µm	Maximum pit...
Sz	119.613	µm	Maximum hei...
Other 3D Parameters			
Miscellaneous			
Sdar	18.642	mm²	Developed area
Spar	9.000	mm²	Projected area



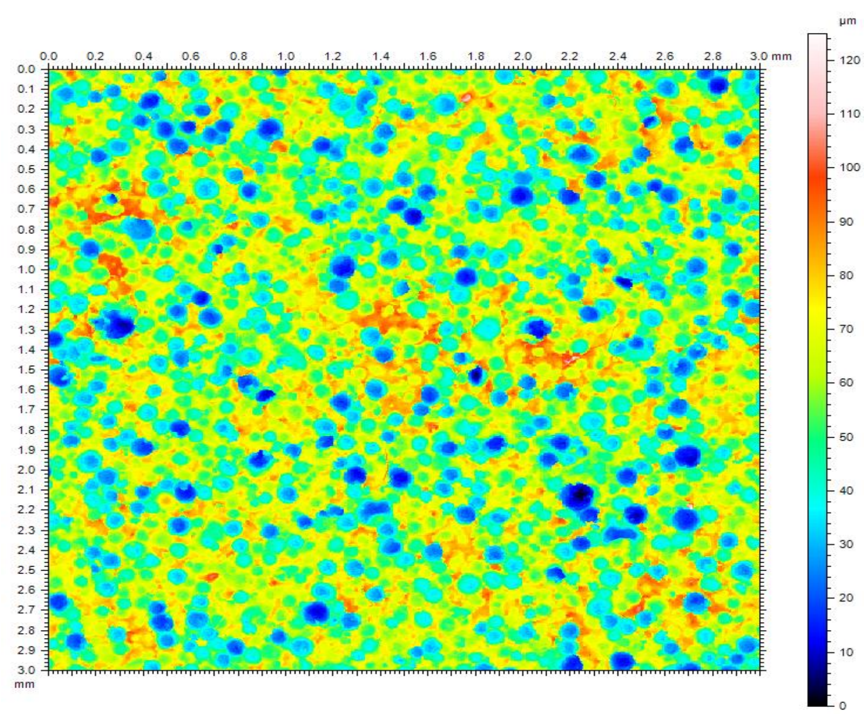
2D False Color of Sample 1

Sample 2



3D Profile of Sample 2

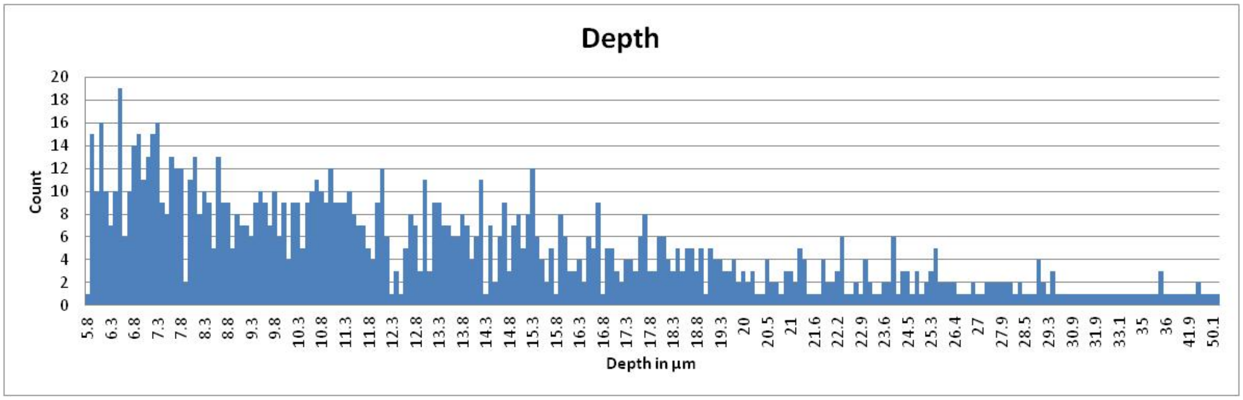
ISO 25178		
Height Parameters		
Sa	14.497	µm
Sq	17.458	µm
Ssk	-0.263	
Sku	2.418	
Sp	68.375	µm
Sv	56.570	µm
Sz	124.945	µm
Other 3D Parameters		
Miscellaneous		
Sdar	18.943	mm²
Spar	9.000	mm²



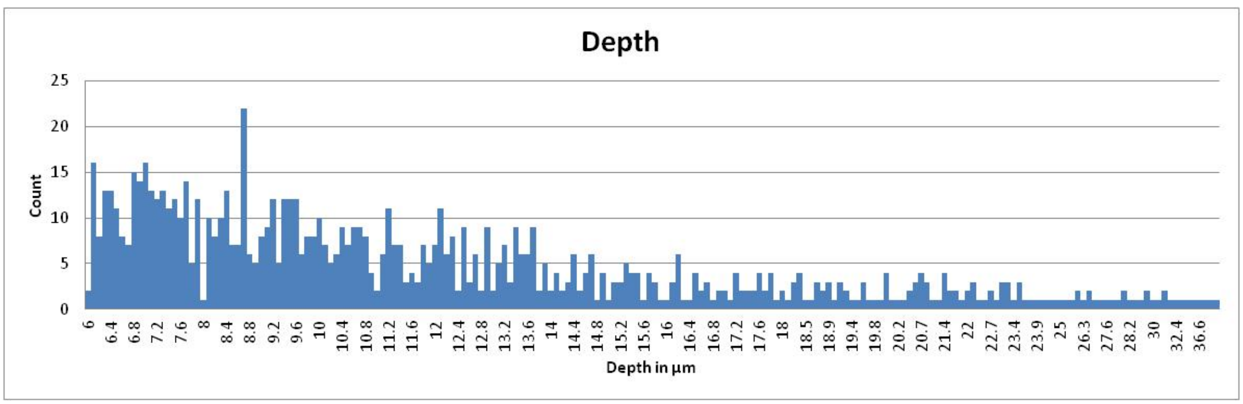
2D False Color of Sample 2

DEPTH COMPARITIVE

Sample 1



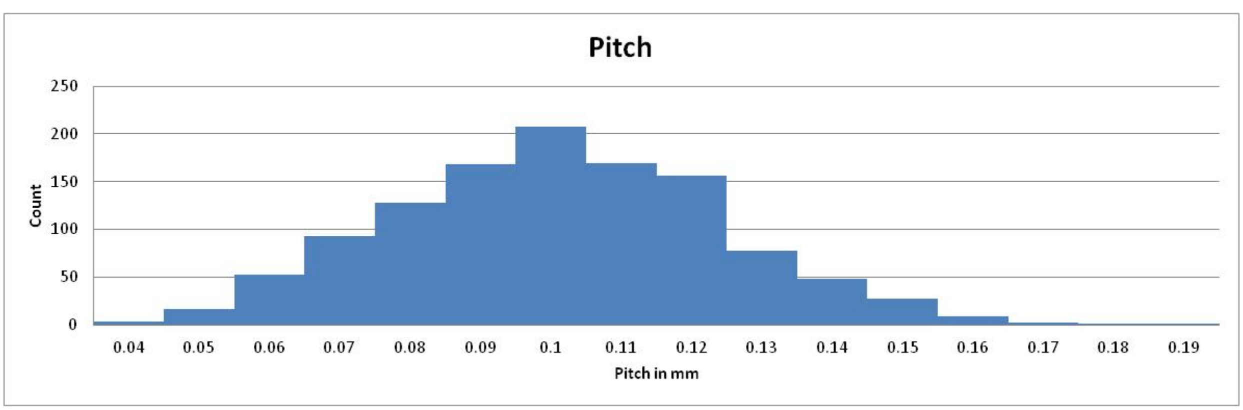
Sample 2



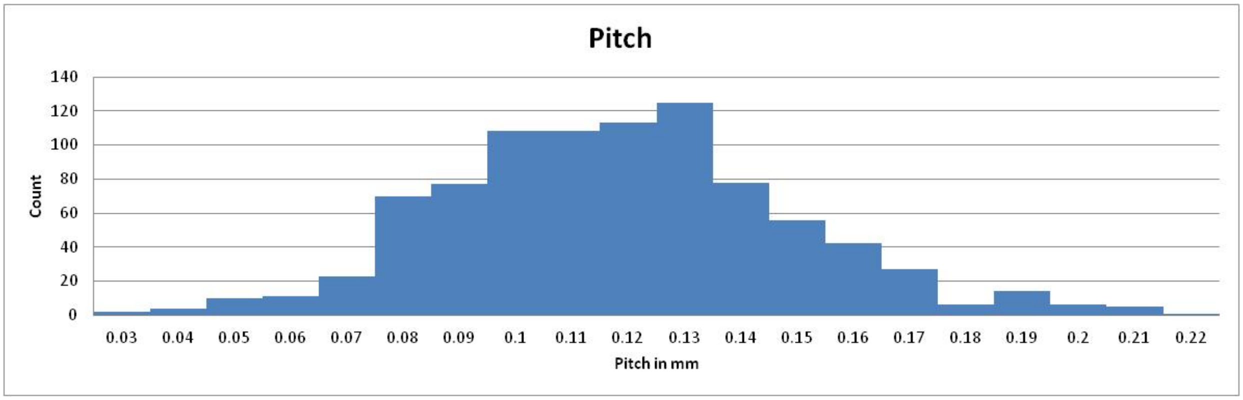
Randomly distributed depths for each sample, larger number of deep dimples seen in Sample 1.

PITCH COMPARITIVE

Sample 1



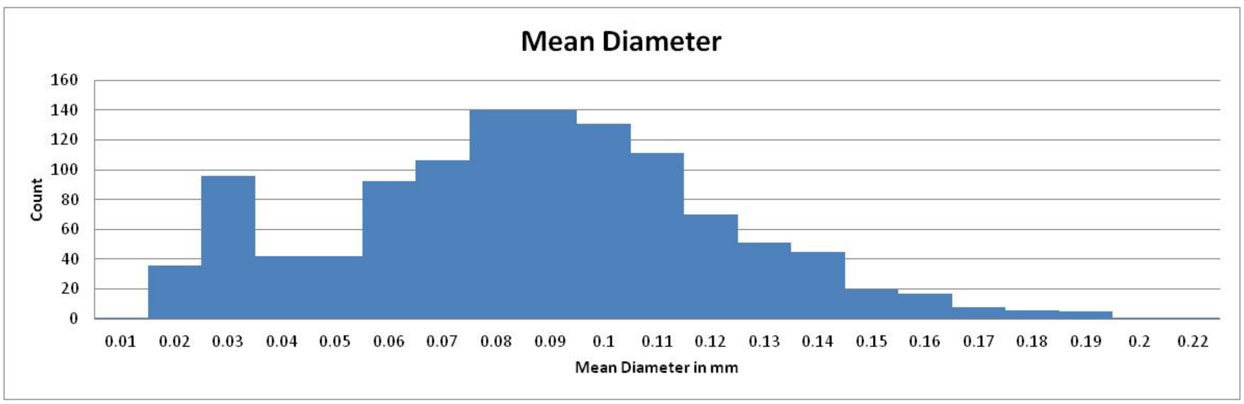
Sample 2



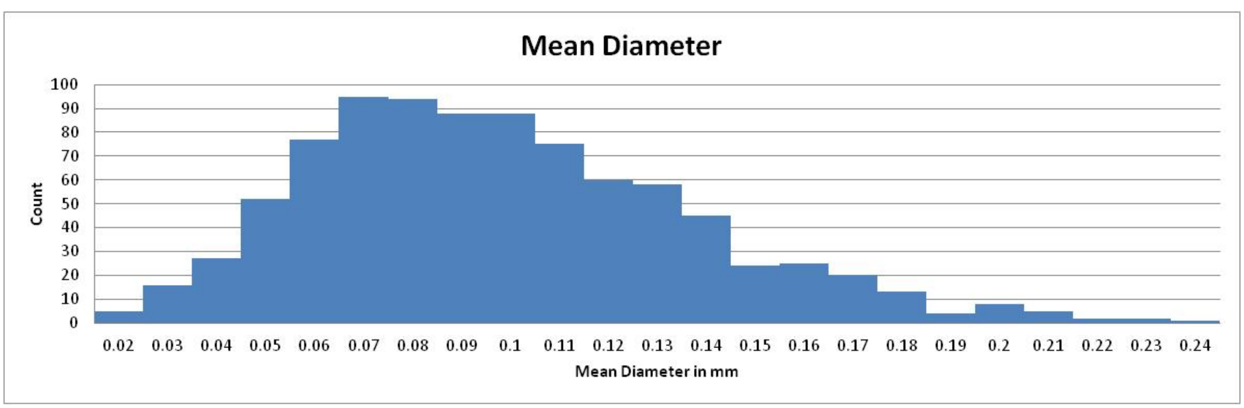
Pitch between dimples on Sample 1 is slightly smaller than Sample 2, but both have a similar distribution.

MEAN DIAMETER COMPARITIVE

Sample 1



Sample 2



Similar distributions of mean diameter of dimples, with Sample 1 showing slightly smaller mean diameters on average.

CONCLUSION:

In this application, we have shown how the Nanovea ST400 3D Profilometer can precisely characterize the surface finish of processed leather. (*Note, many other measurements could have also been made besides those shown here) By looking at the four highlighted parameters surface roughness, dimple depth, dimple pitch and dimple diameter, we can easily quantify differences between the finish and quality of the two samples that may not be obvious by visual inspection. Overall there is not a large difference in the visual appearance of the 3D scans between Sample 1 and Sample 2, however from the statistical analysis it can be shown that Sample 1 does have more deep valleys that are closer together, with smaller diameters than seen on average in Sample 2.

Special areas of interest could have been further analyzed with integrated AFM or Microscope module. Nanovea 3D Profilometers speeds range from 20mm/s to 1m/s for laboratory or research to the needs of hi-speed inspection; can be built with custom size, speeds, scanning capabilities, Class 1 Clean Room compliance, with Indexing Conveyor and for Inline or online Integration.

Learn more about the Nanovea Profilometer or Lab Services