Shaft Sample

Executive Summary

Optimet's ConoProbe Mark3 HD with a 25 mm focal length lens was used to inspect a shaft sample. The main goal of the shaft inspection was its noise level and waviness. The customer needed to verify a periodic feature on the object and evaluate its frequency and amplitude. Optimet's collinearity feature (in contrast to triangulation technologies) allowed measurements with high lateral resolution between the sample's bumps.

Using Optimet's technology we were able to verify the periodic feature on the shaft sample.

1. Optimet's Advantages over Other Technologies:

1. Collinearity – Sensors using triangulation techniques cannot measure between the shaft's bumps in both axes without rotating the sample.
2. The axis scans have similar performances due to circular sensor laser spot shape.
3. High lateral resolution
4. High sampling rate with no need for averaging

2. Application Description

Measuring a shaft sample and analyzing results in order to identify its periodic feature.

System Configuration (fig.1-2):

- Sensor MK3 HD with 25 gold lens.
- THK stage + stepper scanner mounted on an optical table
- Measured object (gear) in static position
- Reference scan on Johansson block standard Jig

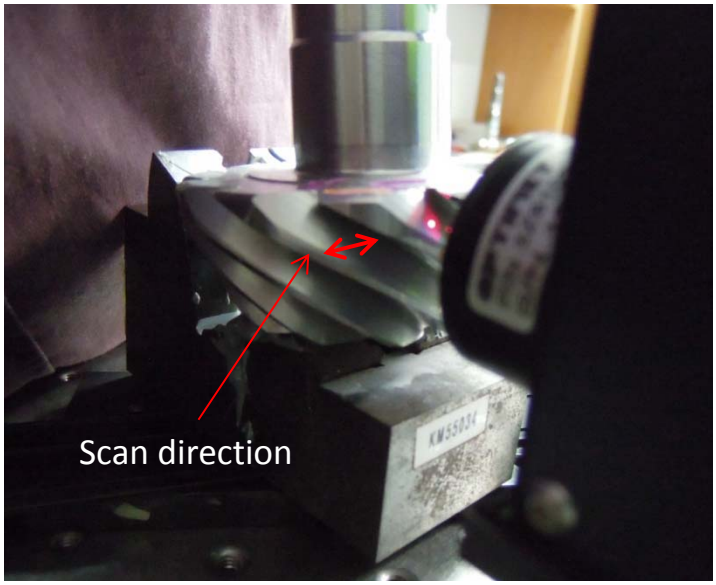

Figure 1 - System setup

2.1 Method

- As reference measurements for characterizing the sensor properties a Johansson standard block was scanned (fig.2).
- In order to get a steady measurement the scanning steps were 10 µm and ccd frequency 200 Hz
- The results were:
  - Ra ≈ 0.4 µm
  - Rz ≈ 1.2 µm
  - Spikes up to 2 µm
  - Waviness within 1 µm

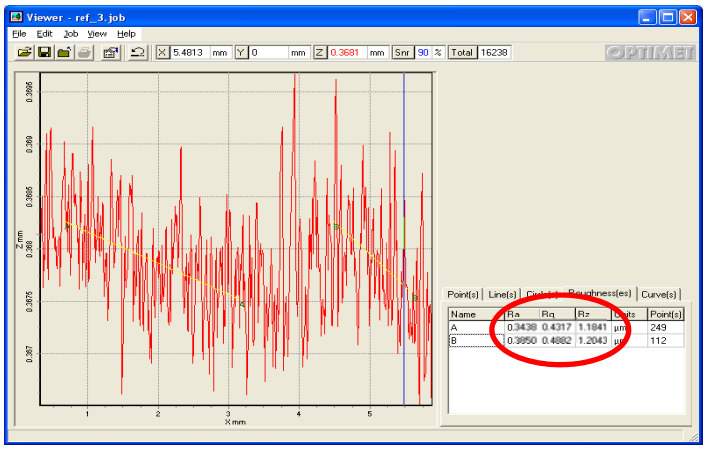

Figure 2 - Johansson block scan

3. Results and Observations

Sample 32A Scan

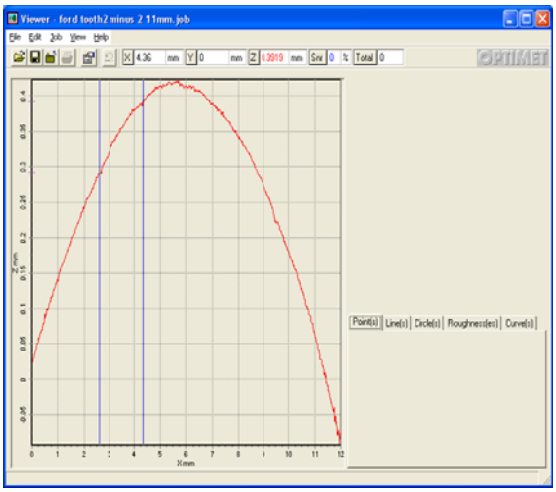

Figure 3 - Original Data – f (z) vs. x

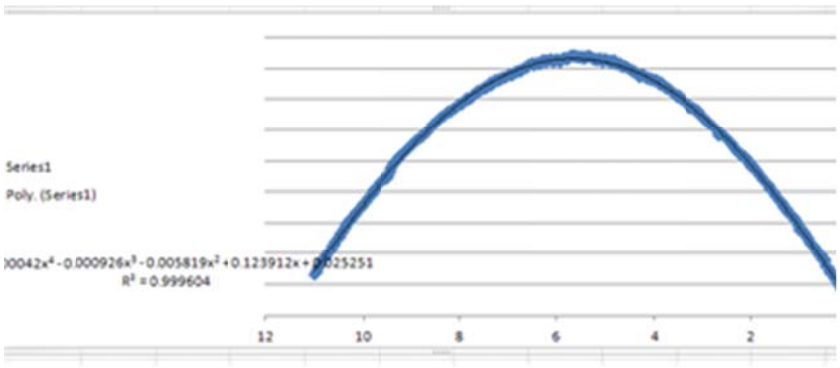

Figure 4 - Polynomial 4 degree fit

Extract Curvature - Data Processing

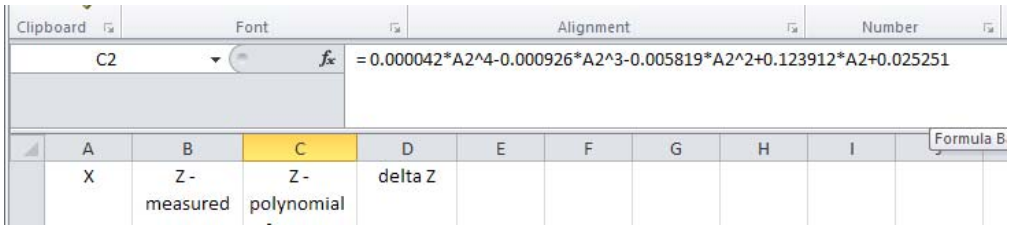

Figure 5 - Added Z column obtained from the polynomial

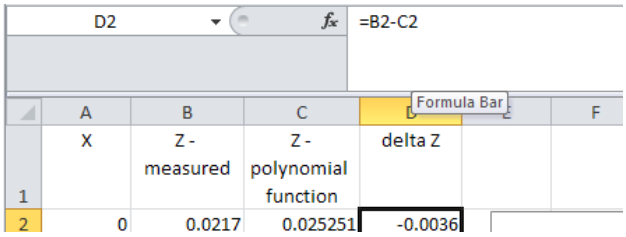

Figure 6 - Delta Z – Subtracted measured Z from Polynomial

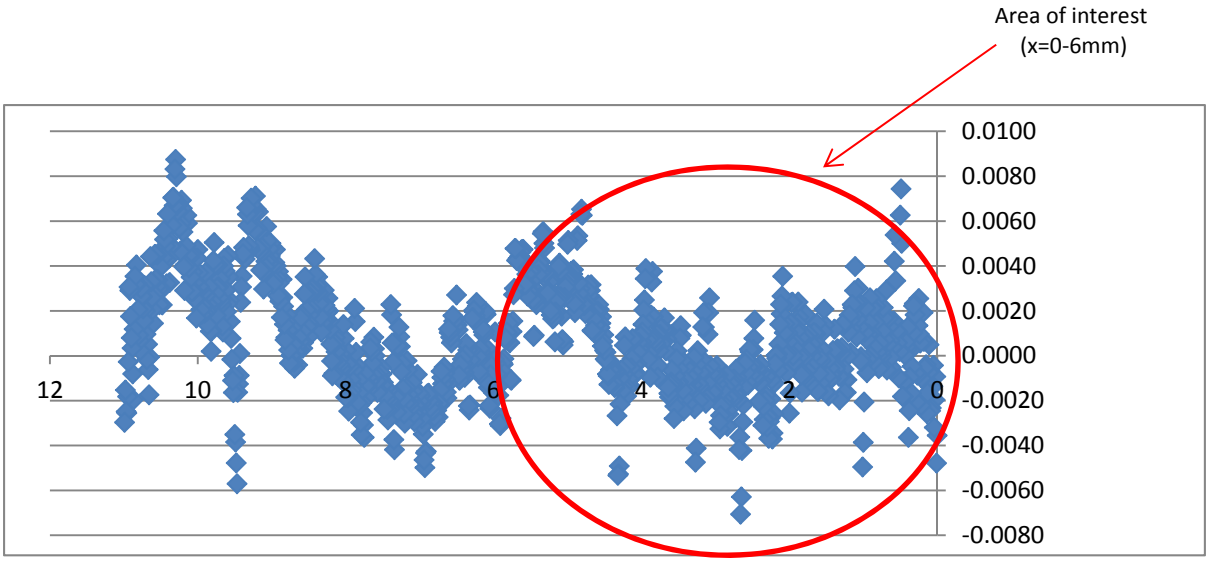

Figure 7 - Delta Z as a function of F(x) graph

Notes on figs. 6-8:

The method of data analysis was a polynomial fit for the profile (trend line in excel), each measured point is replaced with the difference between the polynomial and the measured value.

Final Data Extraction - Sample 68A After Linearization

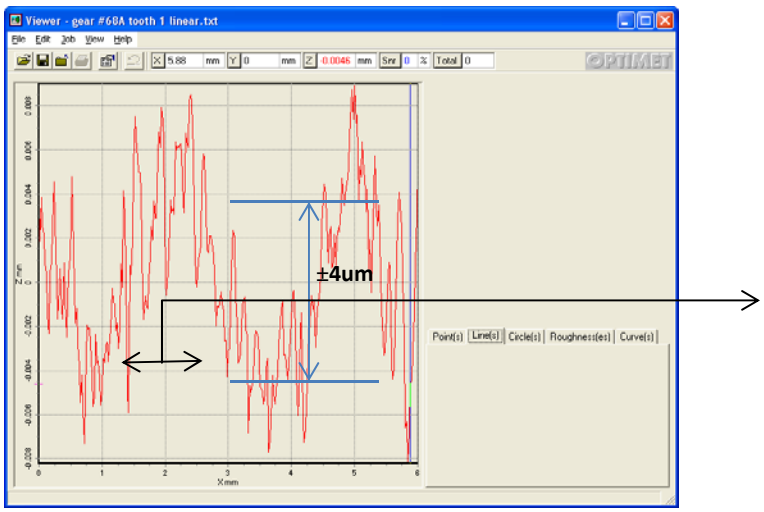

Figure 8 - Raw data after linearization, visualized using Optimet's viewer

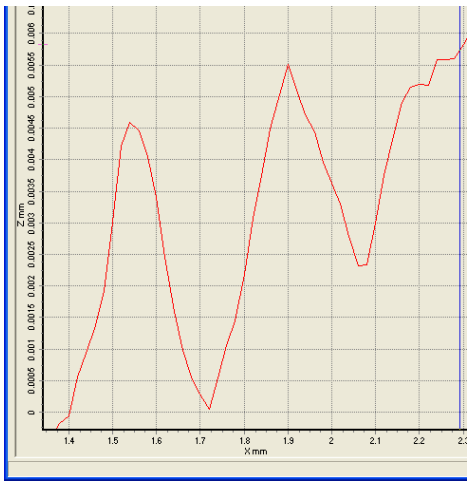

Figure 9 - Detail with Low pass filtration

As can be seen, we verified a periodic feature on the measured object with a 4 µm amplitude and 2 mm period.

4. Data:

Parameter	Value
Reflective/Diffusive/Transparent/Translucent	Diffusive
Working Range (mm)	0.6
Precision (µm)	1
Stand Off (mm)	14
Max. Data Rate (KHz)	0.2
Lateral Resolution (µm)	10
Z Resolution	-
Application Category	-