

# Experiment Number 04

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*What effect does specimen hardness have on the quality of the friction signal?*

## Background

Comparison is provided between the data generated in Experiment 03, in which an annealed fixed plate was used, and the same experiment, but performed with a through-hardened steel plate.

## Test Conditions

Moving Specimen:	6 mm diameter x 12 mm wide line contact nitride steel pin
Fixed Specimen:	NSOH BO1 steel gauge plate
Fixed Specimen Hardness:	Hardened
Load:	150 N
Lubricant:	Metal working oil (at 50°C)
Stroke:	2 mm
Frequency:	30 Hz

## Comparison of Wear Scars



**Figure 1: Soft Plate (Experiment 3)**



**Figure 2: Hard Plate**

## Comparison of r.m.s. Friction Force

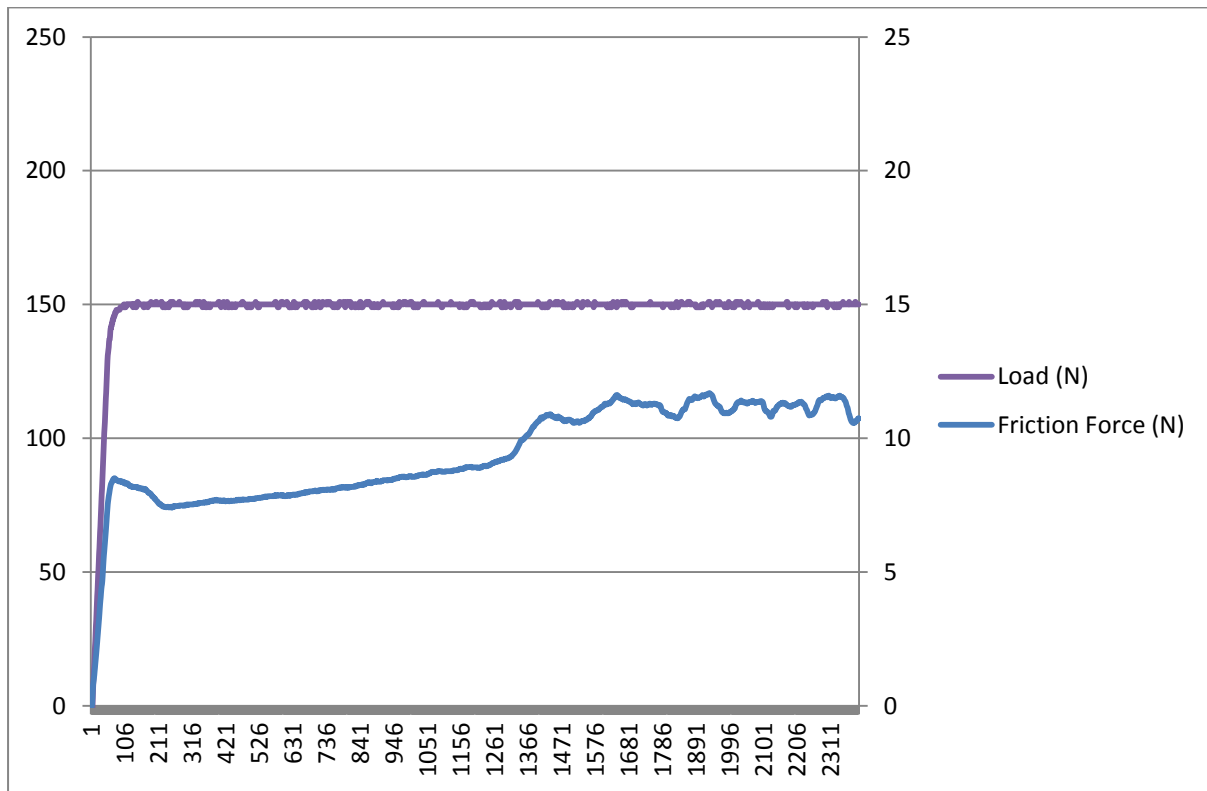


Figure 3: Soft Plate (Experiment 3)

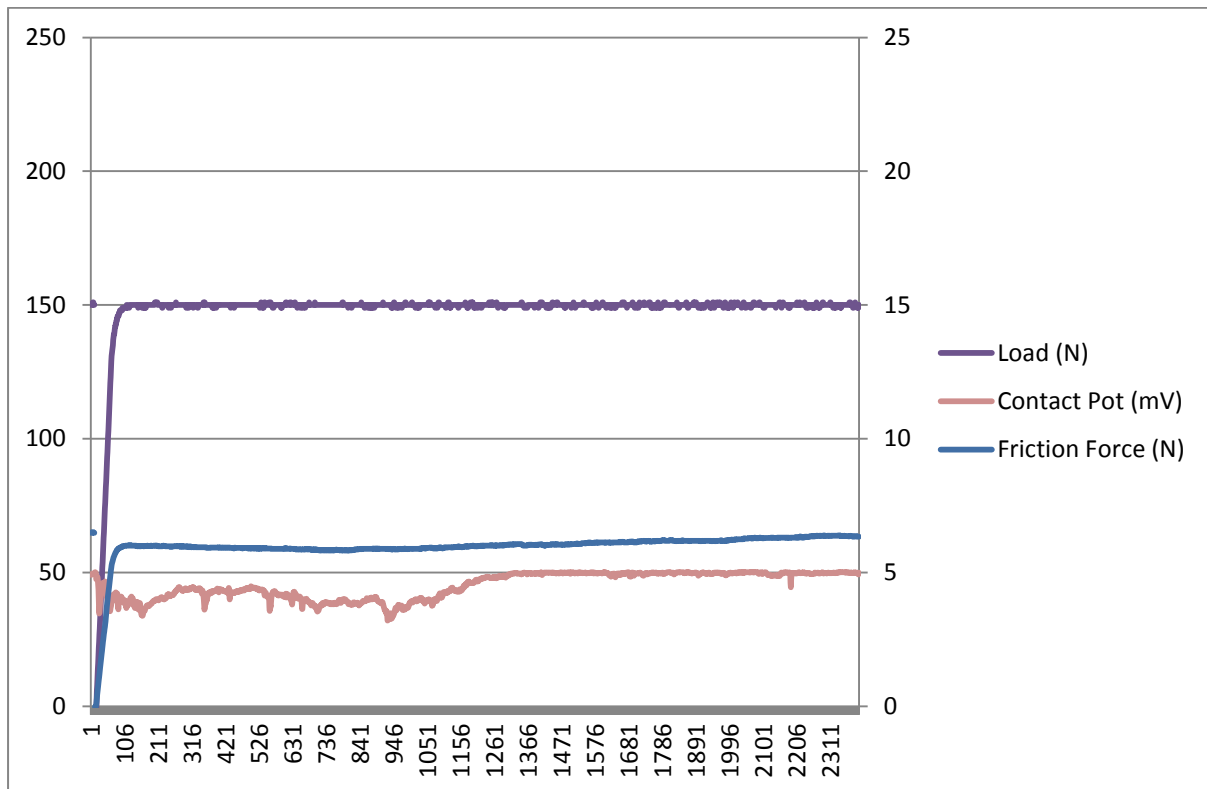


Figure 4: Hard Plate (Note high contact resistance signal)

## Comparison of Instantaneous Friction Signal

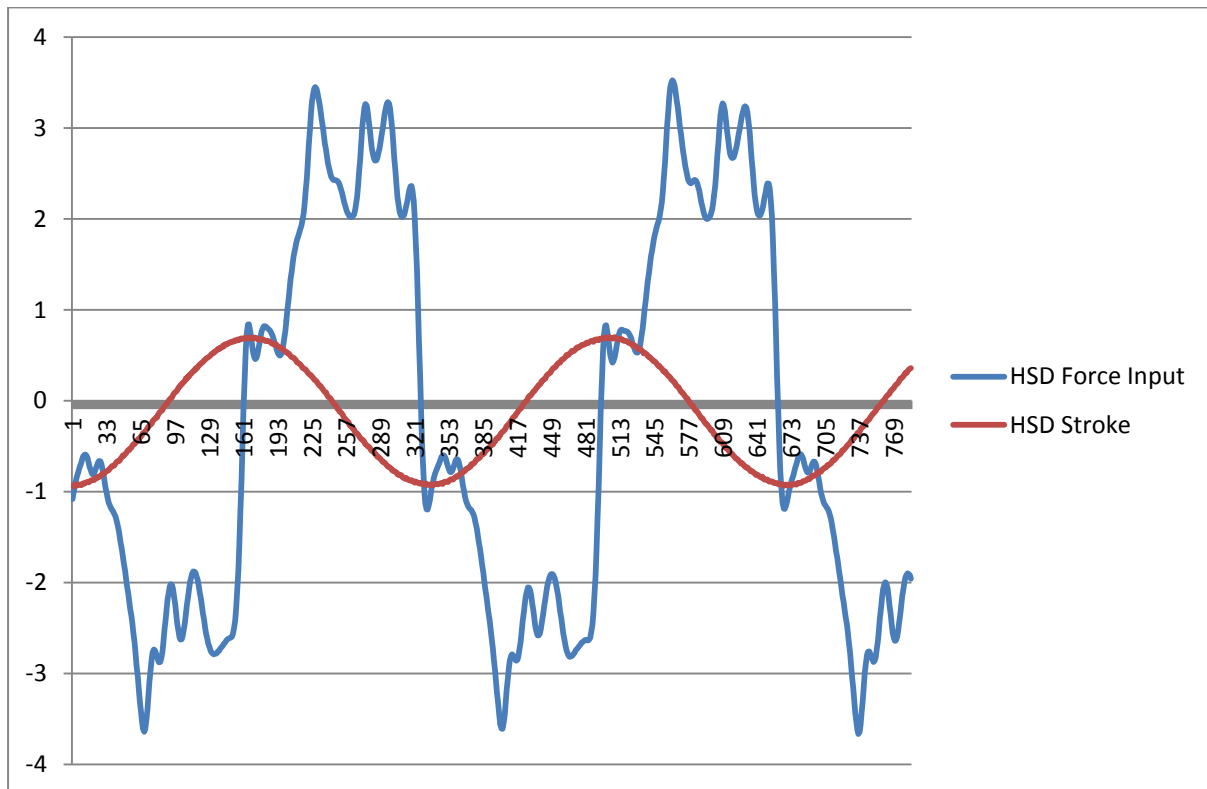


Figure 5: Instantaneous Friction – Soft Plate - Test End (Experiment 3)

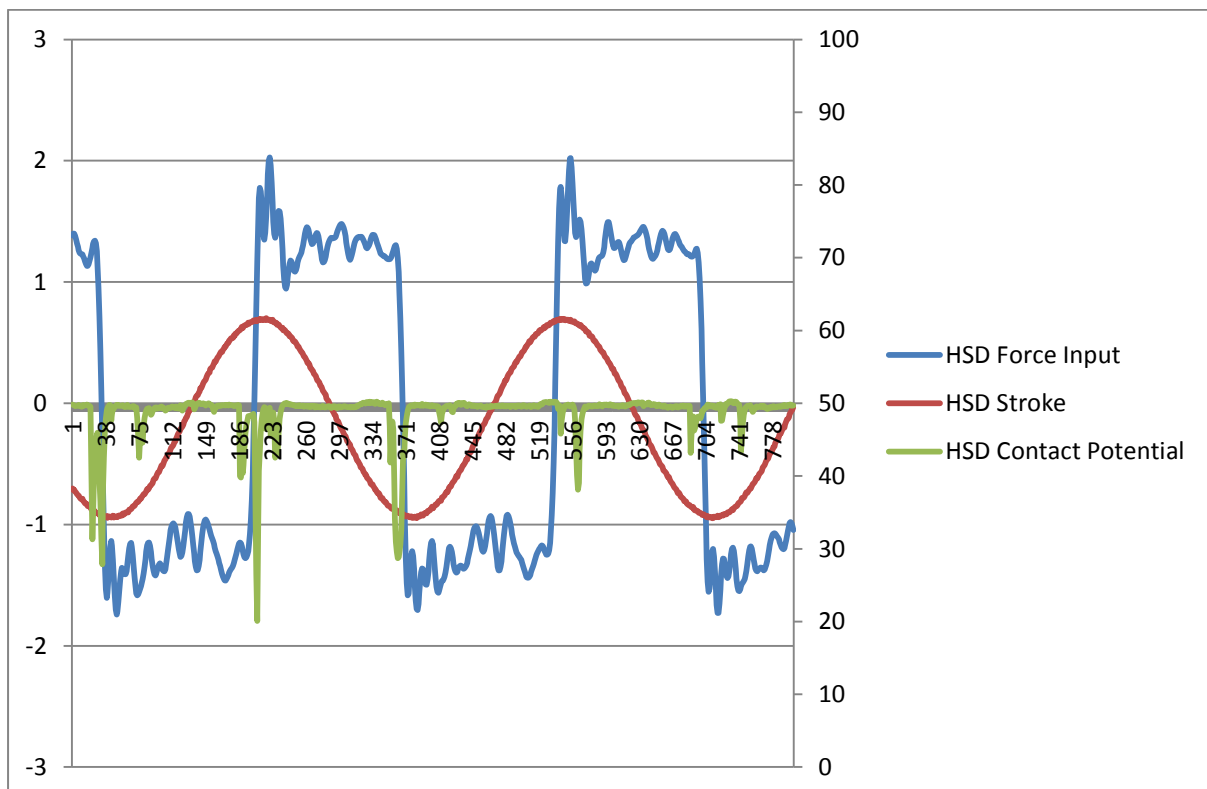


Figure 6: Instantaneous Friction – Hard Plate - Test End

## Comparison of Friction Noise

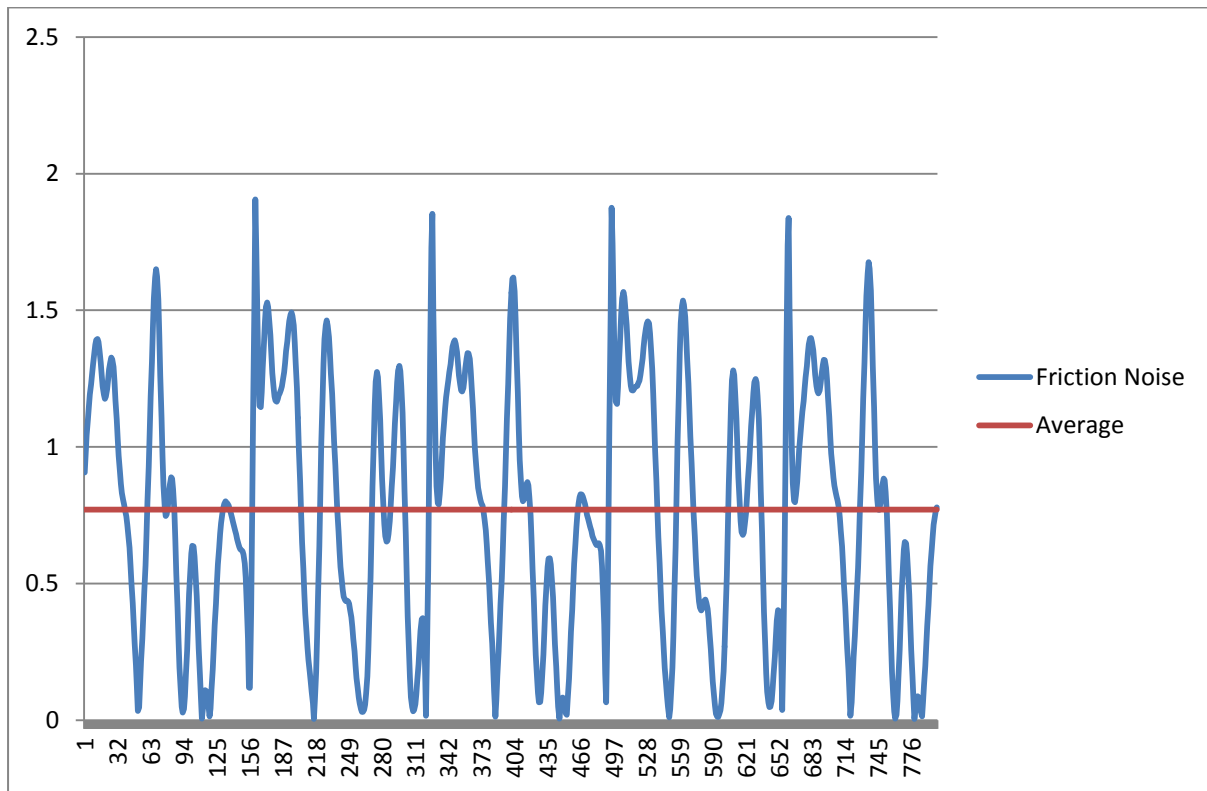


Figure 7: Friction Noise – Test End (Experiment 3)

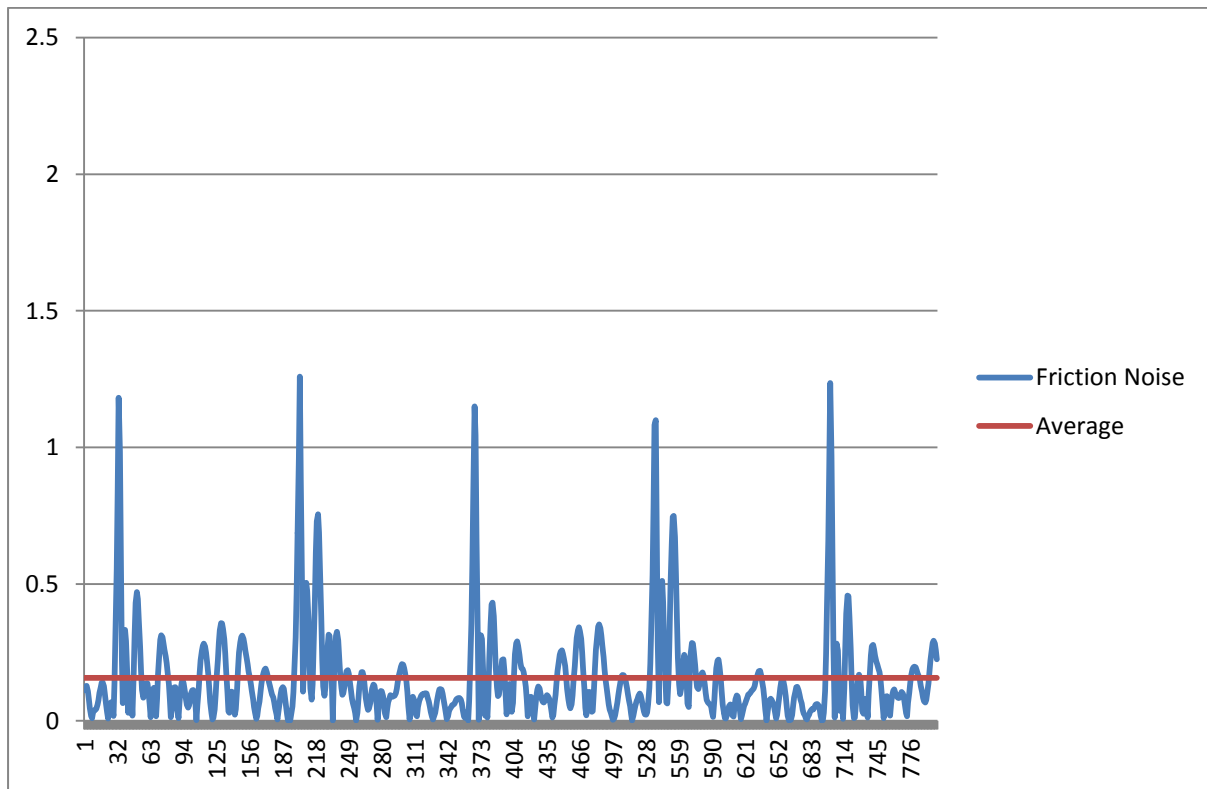


Figure 8: Friction Noise – Hard Plate - Test End

## Comparison of Results

Frequency	Stroke	Plate	Mean Friction	Mean Friction Noise	Ratio
Hz	mm		(un-scaled)	(un-scaled)	
30	2	Soft	1.503	0.319	21.20%
30	2	Soft	1.987	0.771	38.80%
30	2	Hard	1.272	0.157	12.36%

## Conclusions

1. Running a hard cylinder on a soft plate at short strokes results in high levels of wear, resulting in disorderly friction force measurements.
2. Running a hard cylinder against a hard plate at short strokes results in reduced wear of the plate, resulting in more stable running and more orderly friction force measurement.
3. In this experiment, running a hard cylinder against a hard plate at short strokes resulted in a high contact potential signal, indicating progressive smoothing of the specimen surfaces.