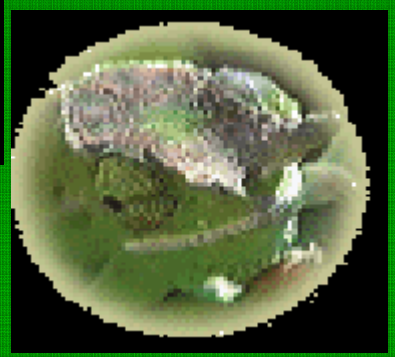
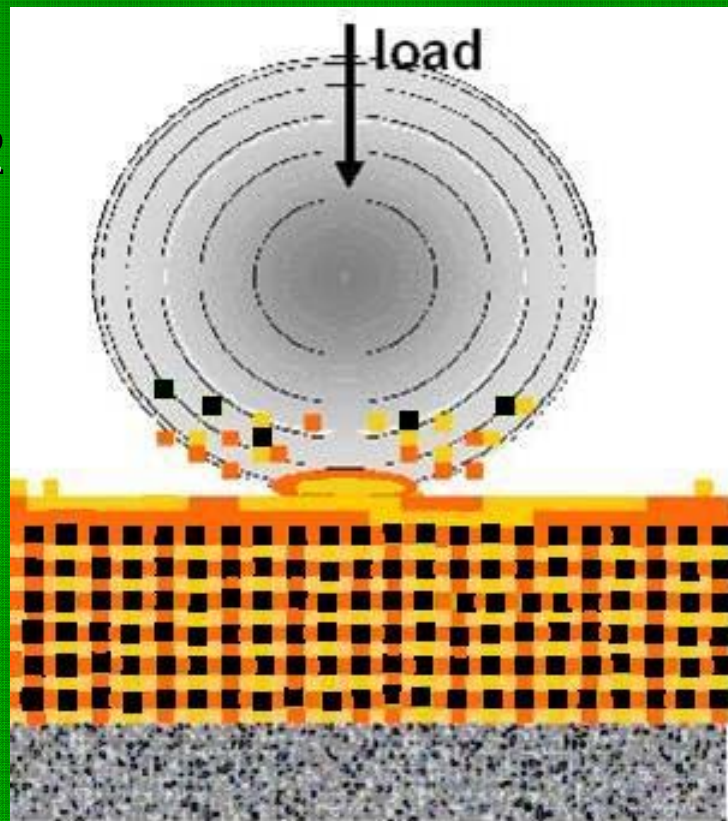
Development of a LabView Interface for CSEM POD Tribological Studies of AFRL "Chameleon" Coatings

Jason Kostelnik
DeMatha Catholic High School
AFOSR EF-MURI @ NCSU
NRL, Code 6176
Richard Chromik and Kathryn Wahl

Chameleon Coatings

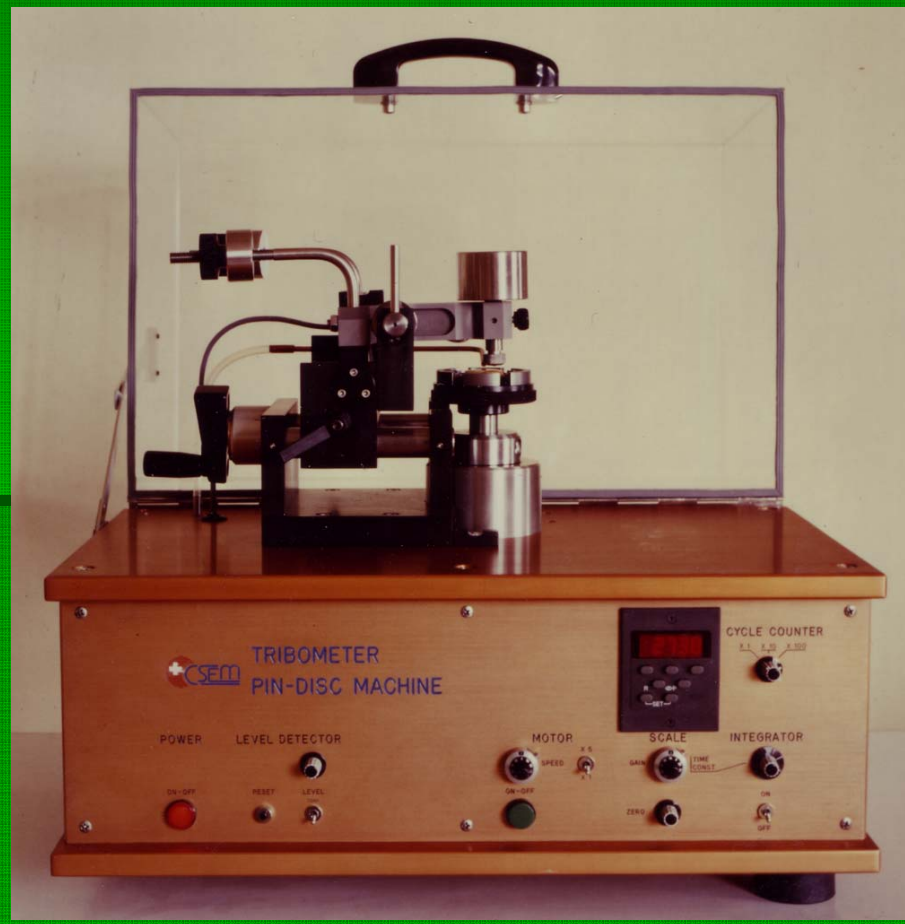
- What is tribology?
- What is a coefficient of friction?
  - Equation: $\mu = Ff/Fn$
- What are Chameleon Coatings?
  - Composition: Gold, DLC, and MoS2





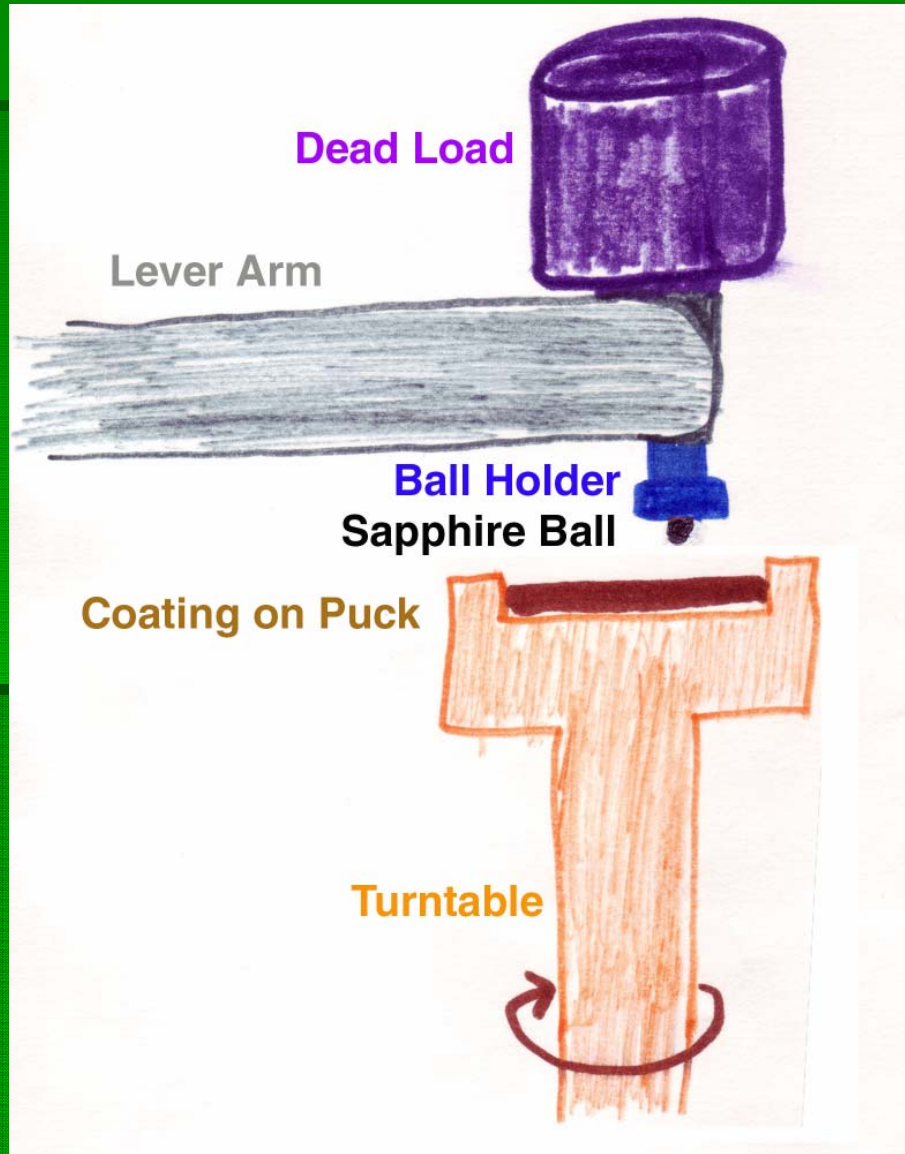
Project Tasks

- Create a flexible program to measure friction on the chameleon coatings and analyze the results
- Set up the tribometer
- How does the humidity affect the coefficient of friction?



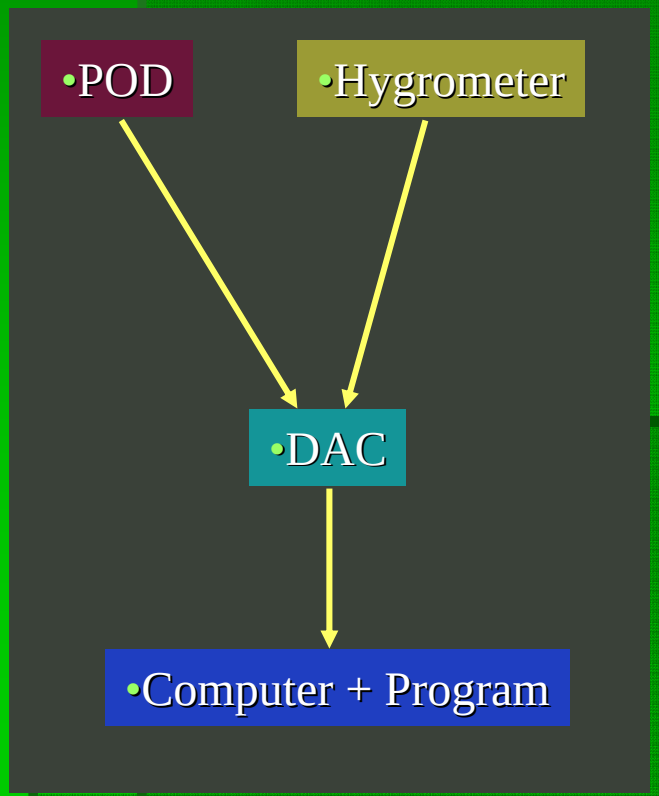
POD Tribometer

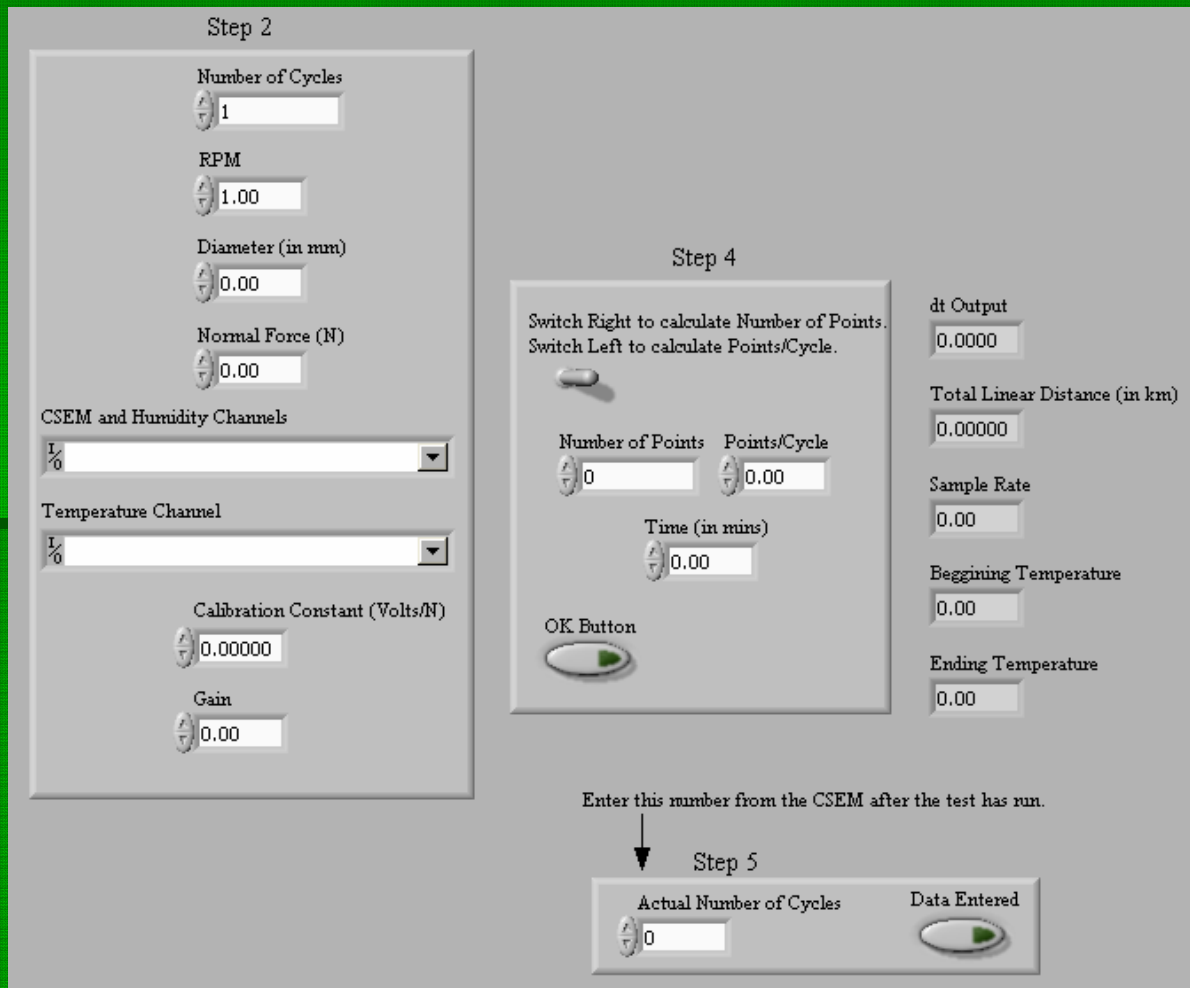
- Calibration
- Environment Setup
- Input:
  - RPM
  - Number of Cycles
- Output:
  - Voltage



Data Acquisition Program

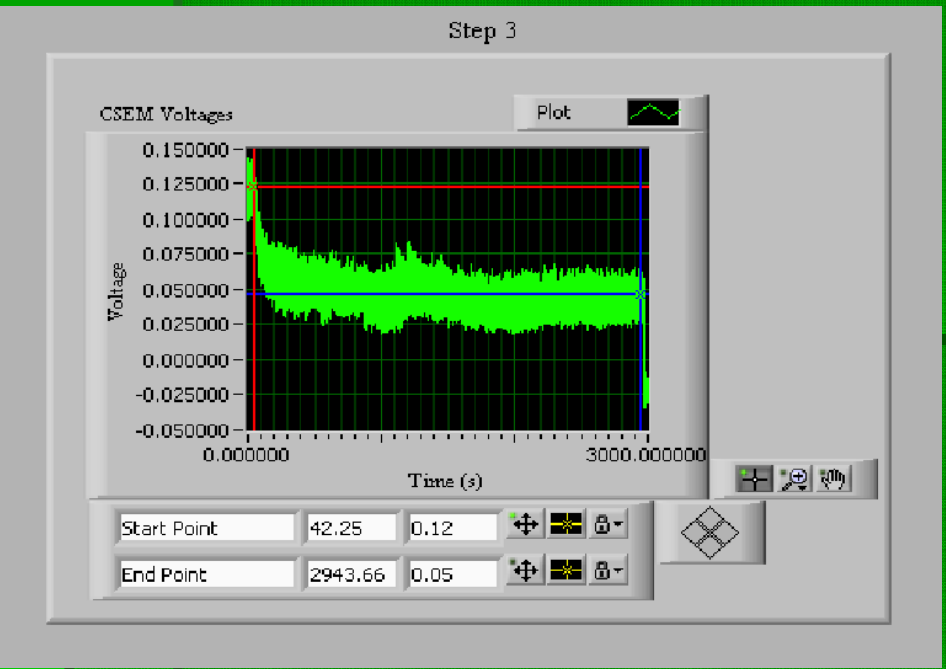
- Instrument Setup and LabView
- Test Parameters
- Acquired Data: Tribometer and Hygrometer voltages

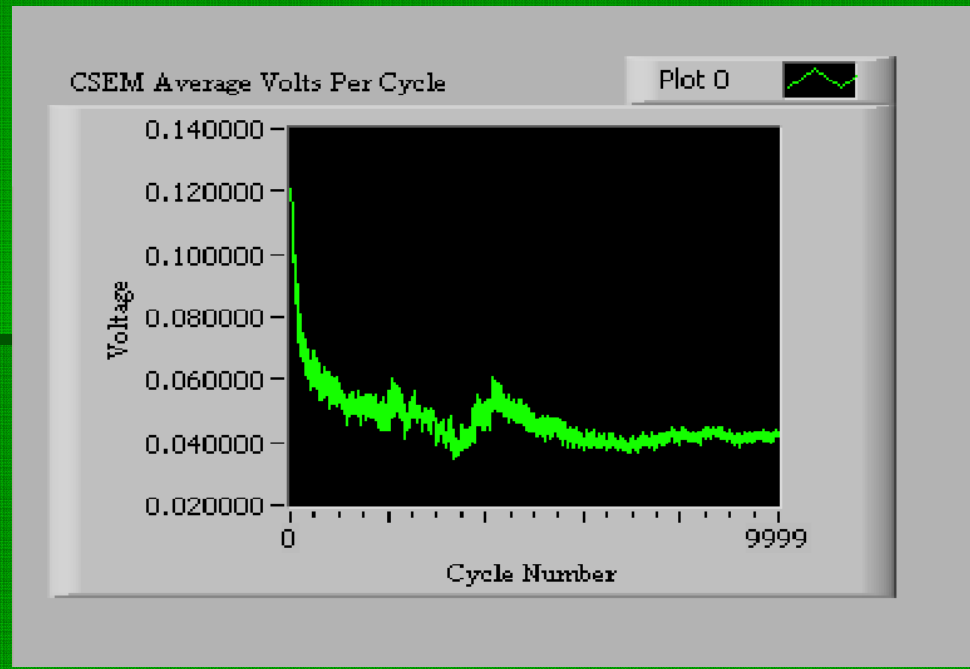




Analysis Program

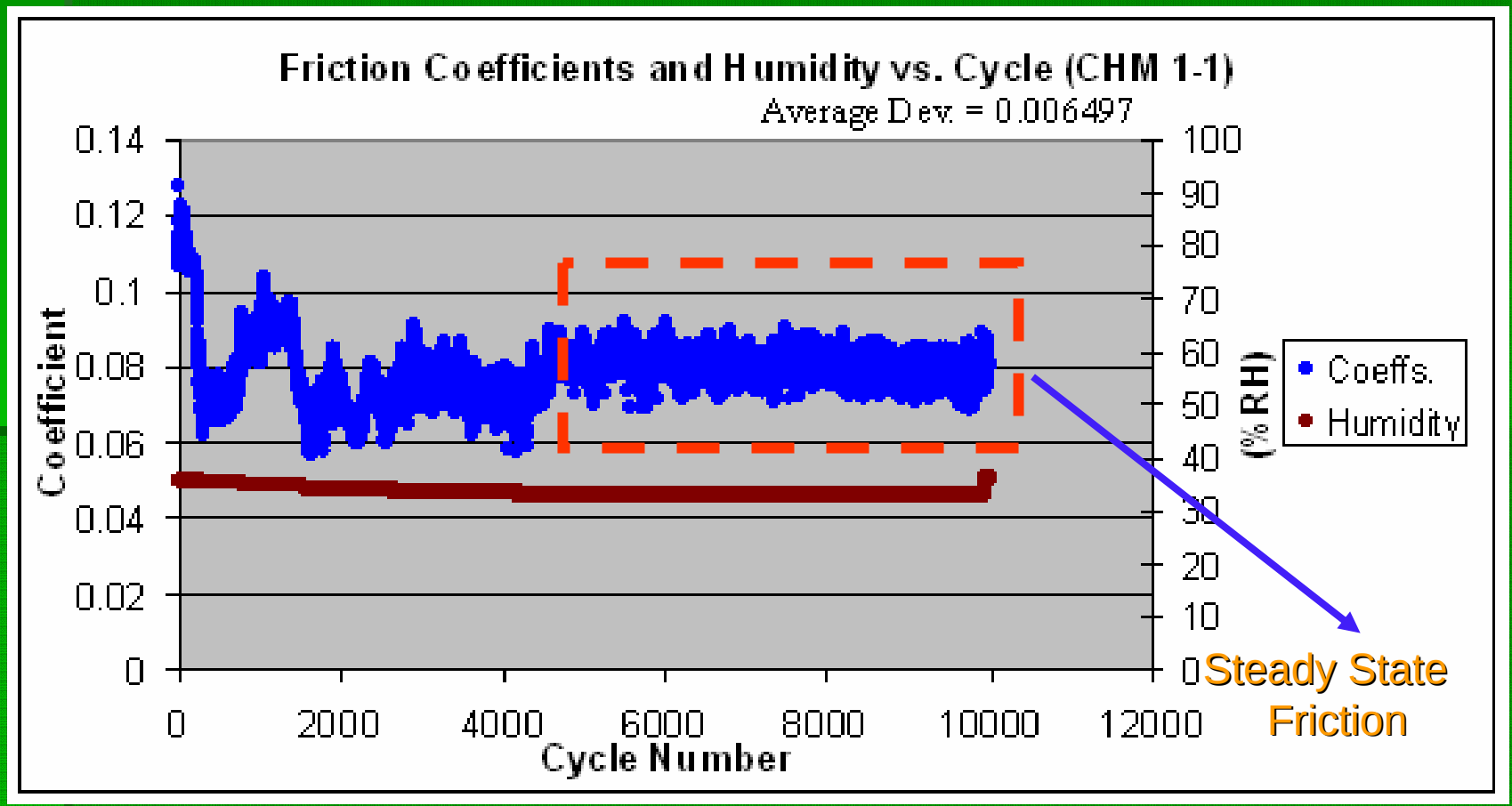
- Determining the Actual Starting and Ending Points
- The Key Feature: Cycle Averaging and Standard Deviation





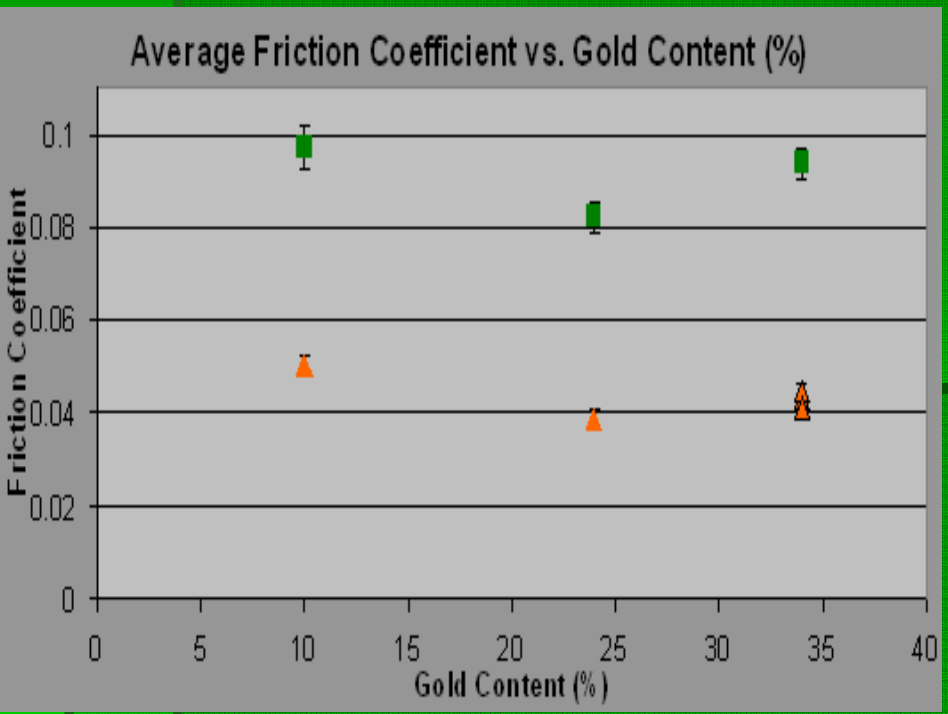
Results

- Test results of first test on coating CHM1
- Check analysis program to assure the proper numbers were calculated



Results

- Lower friction coefficient when run at low humidity
- Smaller wear track widths when run at low humidity for high gold content sample
- Wear tracks are nearly the same for other samples

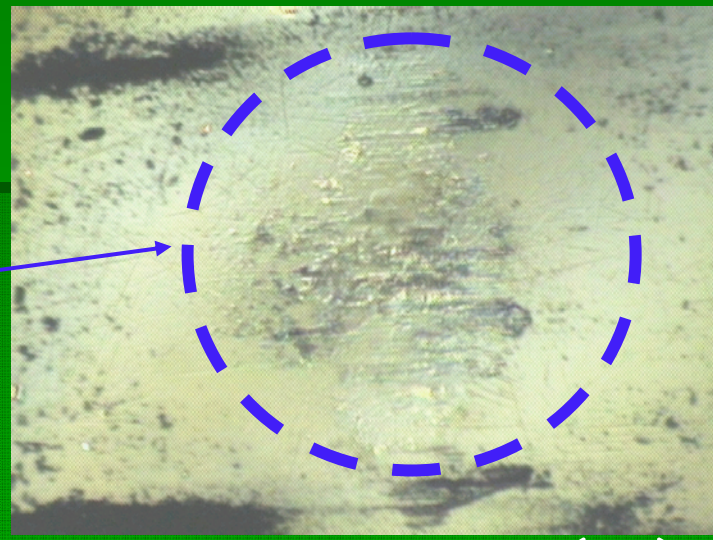


The Tests

- Eight Tests in total on three coatings
- Wear Tracks and Transfer Films

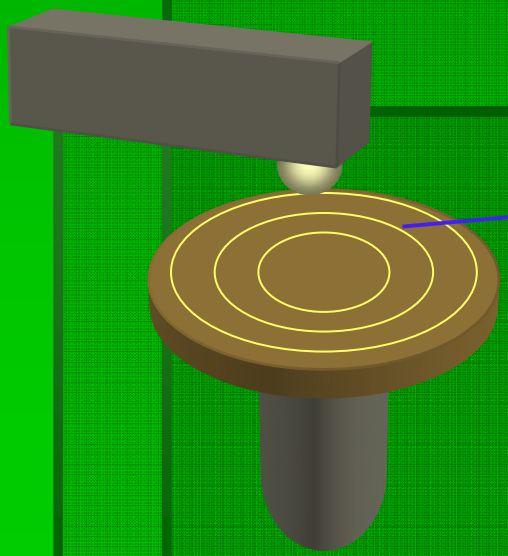
CHM 1-1 at 10x

100 um



CHM 1-1 at 10x

100 um



CHM 4: Wear Tracks
1, 4, and 2
from top to bottom

5mm

Conclusions

- Both of the programs and the tribometer function properly
- Lower Friction Coefficient on every sample when run at low humidity
- Track widths smaller at low humidity on the high gold sample, otherwise, they are nearly the same