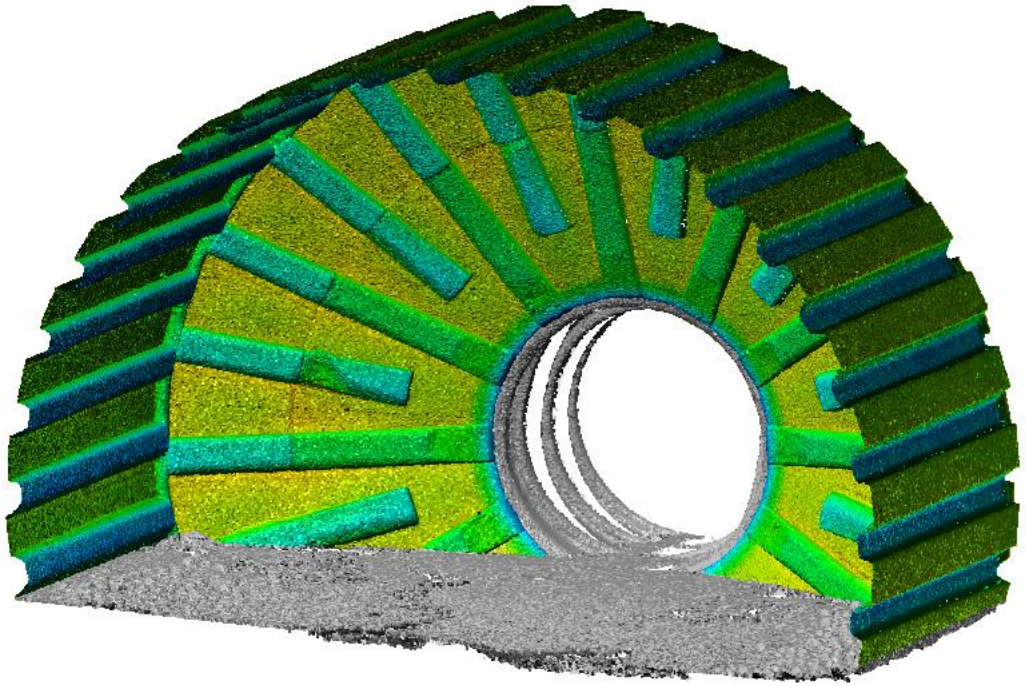
CODING METROLOGY

Measurement and Metrology Automation
*"A **TRUE MEASUREMENT** FOR **SUCCESS**"*

Laser Scan Mill Inspection

President : Tony Facciolo
Email: tony.facciolo@codingmetrology.com
Phone: +1-647-212-6710
Toronto, Ontario, Canada



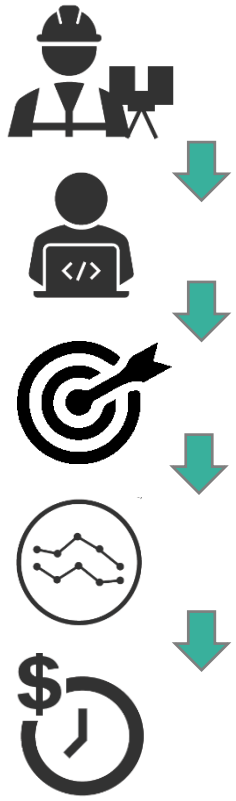
CODING METROLOGY

Intro to Coding Metrology Inc.

Coding Metrology Inc. is a Canadian owned Metrology services company offering premium laser scan and analysis services. We specialize in grinding mill and crusher wear component inspection for the mining industry. Our expertise is in wear tracking and analysis of SAG, Ball, and Rod mill liners as well as gyratory crusher liners.

We virtually and remotely train technicians to scan mills in a safe and comprehensive manner to reduce staff and shut-down time of operations; having done so all over the world. Laser scanners capture millions of measured points, data we analyze using premium metrology software and in-house developed methods and code to generate detailed reports. Each report is compiled and analyzed by our team to provide valuable feedback about operations and efficiency.

Our common deliverables are complete reports and recommendations that can be shared with team members from executives, metallurgy professionals, and technicians.



Scan mill

Automation technology

Quick, accurate & reliable scanning and analysis

Customizable reports

Mill efficiency improvements

CODING METROLOGY

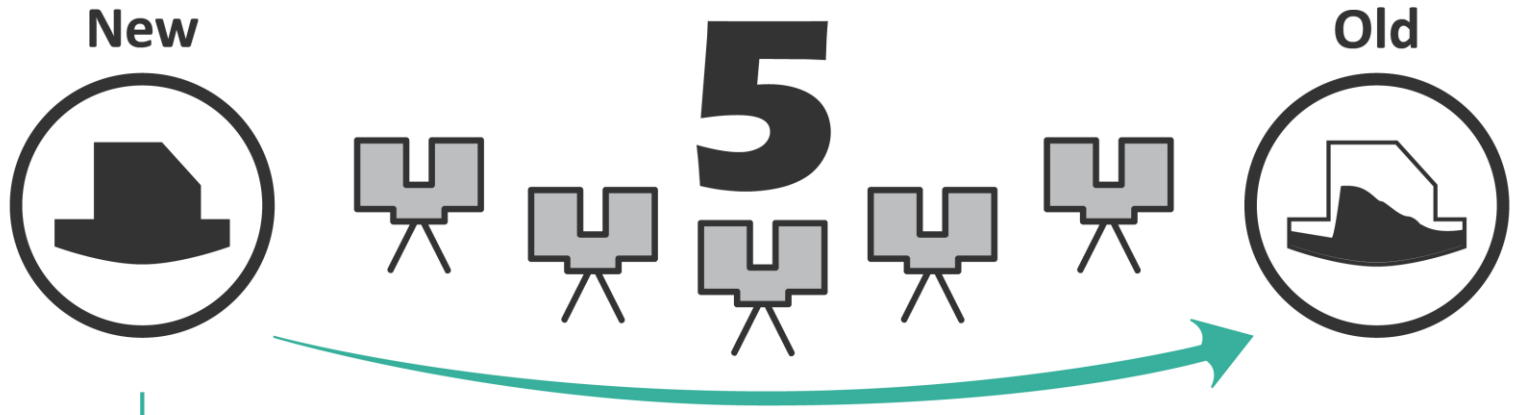
Features and Benefits of Laser Scan Mill Inspection

FEATURES	BENEFITS
ANALYSIS OF EVERY SCANNED LINER	RELIABLE REPORTING OF LINER CONDITION
ONLY ONE TECHNICIAN NEEDED	REDUCTION OF MAN HOURS AND RISKS
COMPLETE LINER PROFILES FROM MILLIMETRES POINT SPACING	ACCURATE LINER ANALYSIS
RECOGNITION OF HIGH WEAR REGIONS	REALISTIC FORECASTING OF LINER LIFE
CHARGE LEVEL CALCULATIONS FROM MILLIONS OF POINTS	HIGH TOLERANCE RESULTS

CODING METROLOGY

The Solution: 3D Laser Scan Mill Inspection

Terrestrial Scanners (Long-Range Scanning) are used to scan millions of data points which can be sent to us electronically. It is recommended that the mills each be scanned five times throughput their respective liner lives, or once per quarter, whichever is sooner.



Post-Reline

Scans conducted when liner components are newly installed

Inspection

Scans conducted throughout the liner life

Pre-Reline

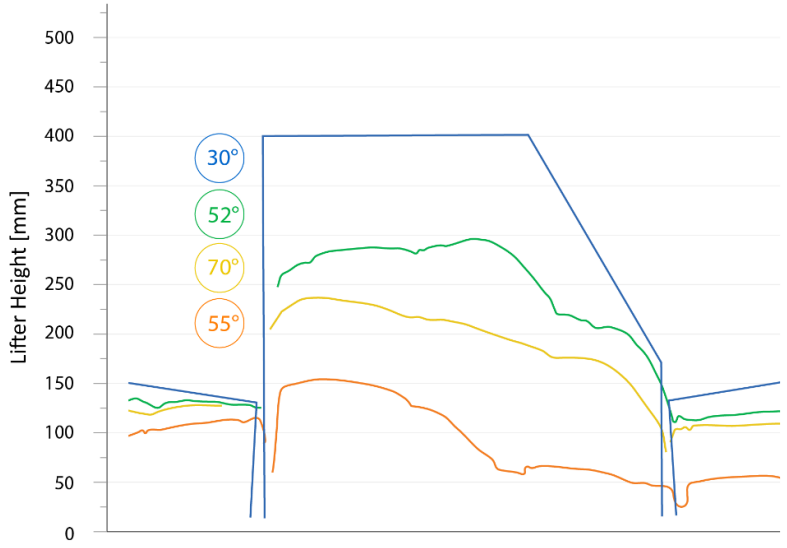
Scans conducted when liner components are to be changed-out

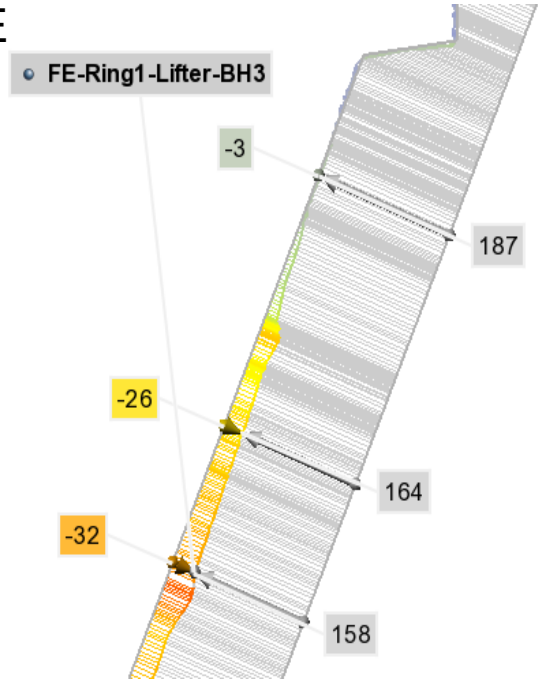
CODING METROLOGY

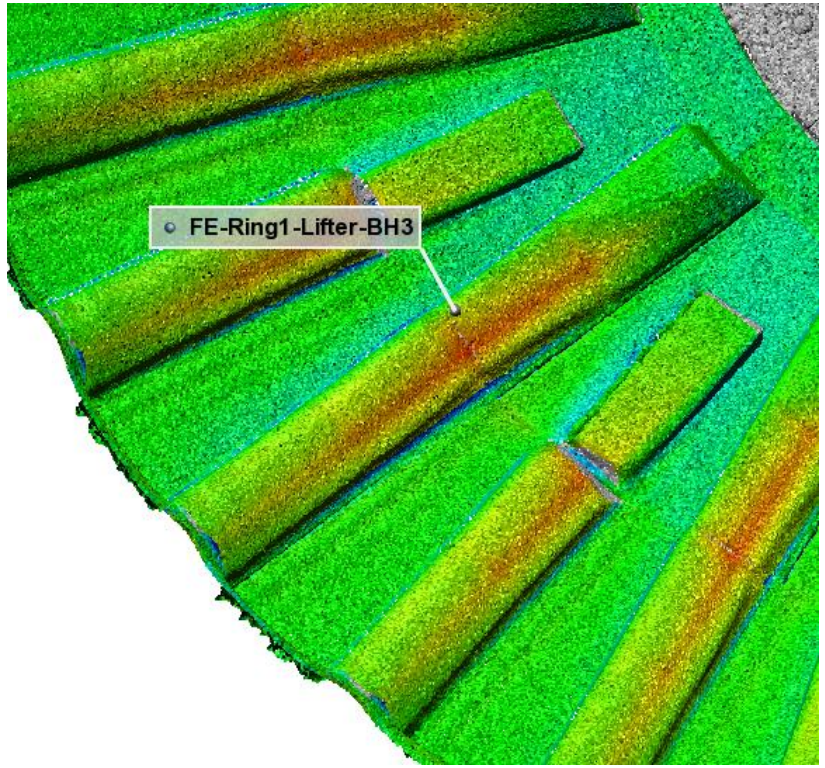
Mill Scan Data Processing

Analysis

- ACCURATE ANALYSIS OF LINERS
- EXTENSIVE LINER COVERAGE

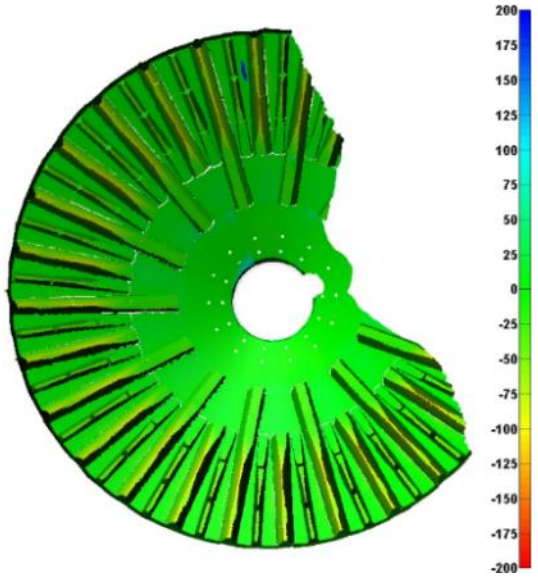






CODING METROLOGY

Example Benefit #1

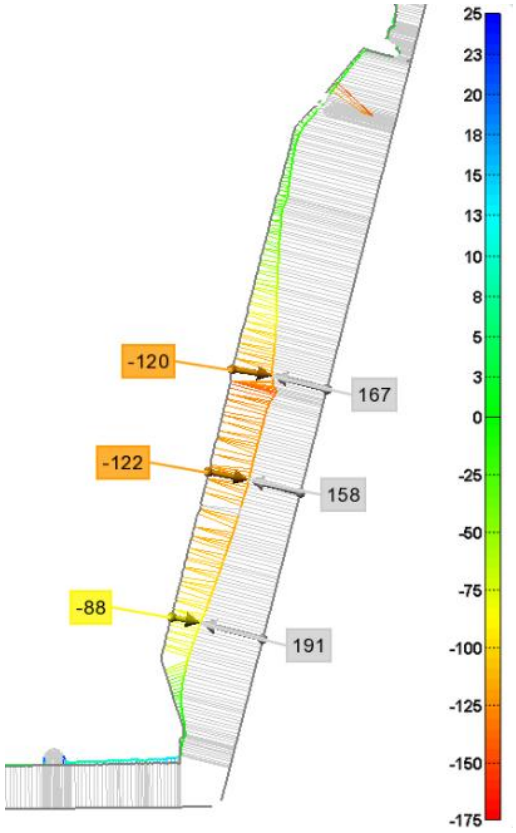


Findings

The inspection of the Feed End liners revealed that the outer 3 lifters are wearing quite uniformly, though there may be an opportunity to redistribute some inner lifter material to better suit the current wear pattern.

Recommendations

- Height reduction of lifters in innermost portion of ring 1 and outermost portion of ring 2.
- Lifter height increase to compensate for the lifter flattening by abrasion.



CODING METROLOGY

Example Benefit #2

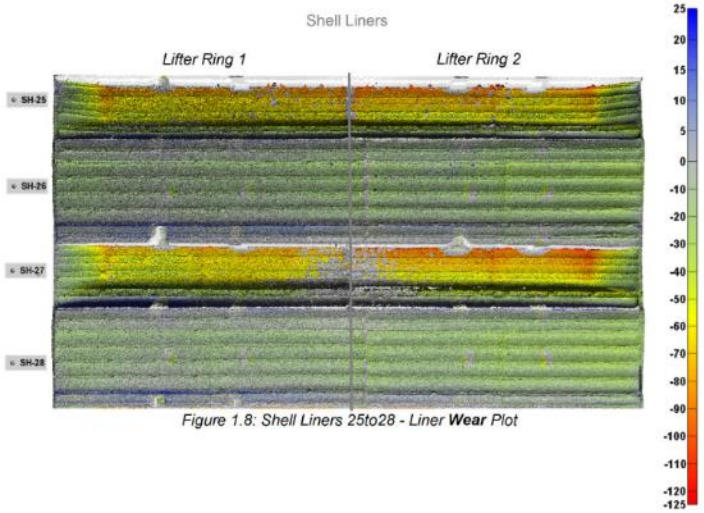
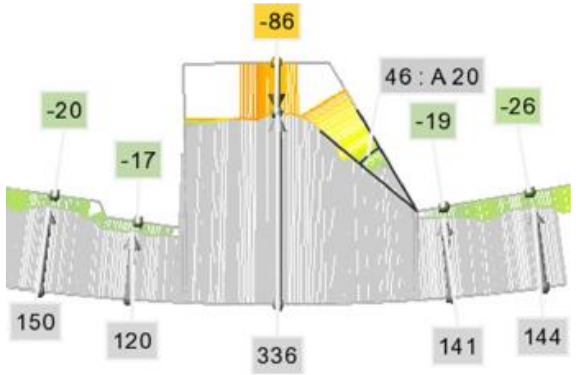


Figure 1.8: Shell Liners 25to28 - Liner **Wear** Plot

Findings

Accelerated wear on tops of the shell liners, due to aggressive operations, over-speed, or lack of water.



Recommendations

- Running mill at lower speed
- Analysis of pulp data
- Adding more water

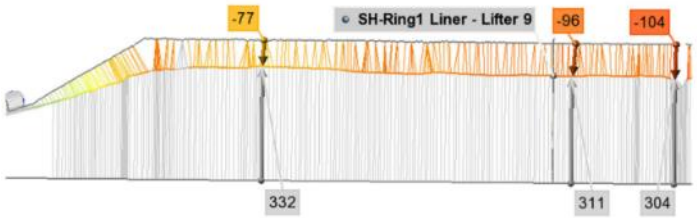
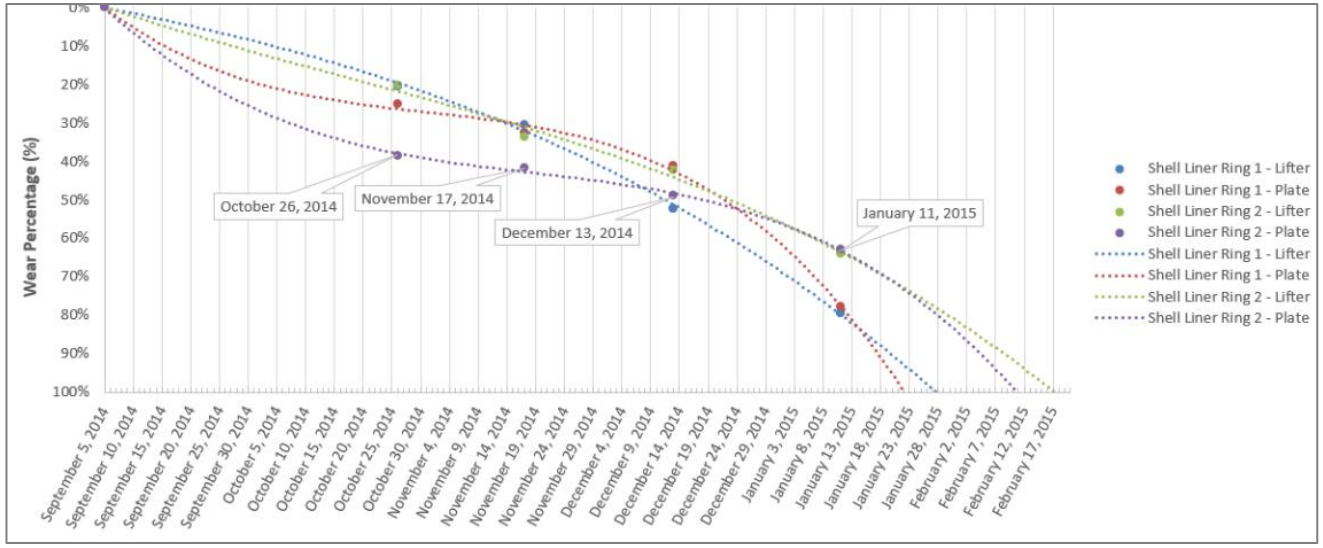


Figure 5.1: Shell Liner Row 1, Lifter 9 - Liner **Wear** Plot
Fastest Wearing Shell Ring1 Lifter

CODING METROLOGY

Algorithmic Liner Forecasting

- ACCURATE RELINE FORECASTING
- ABILITY TO USE FULL LINER LIFE
- REDUCE DOWN TIME & COST



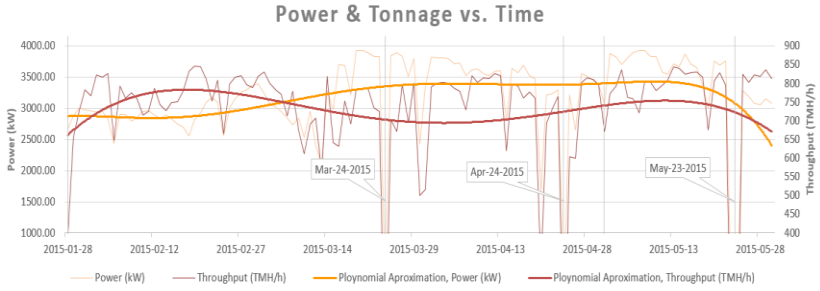
When mills are scanned several times throughout their respective liner lives, we are able to utilize algorithms derived from present and historical data. The liner wear forecast dates are predicted with high accuracy which allows the client to reline the mill exactly when needed, saving money on mill downtime, reducing overall milling costs, and using the liners to their full potential.

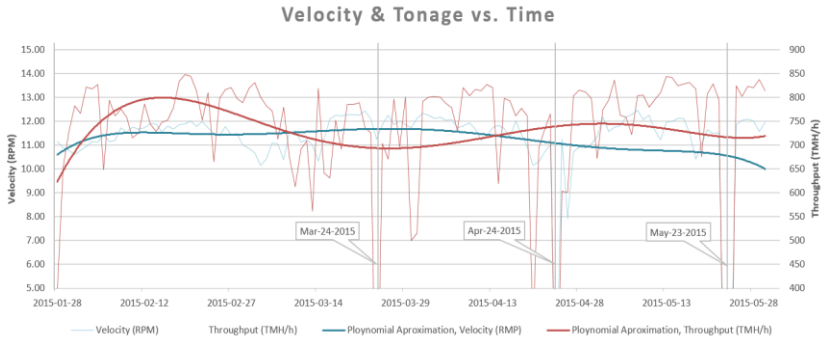
CODING METROLOGY

Optional Comprehensive Reporting

Power & Tonnage vs. Time

Production tonnage compared has not increased substantially toward the end of shell liner life. The mill efficiency seems to be quite low from March2015 onward, during times where it appears that charge levels were low.



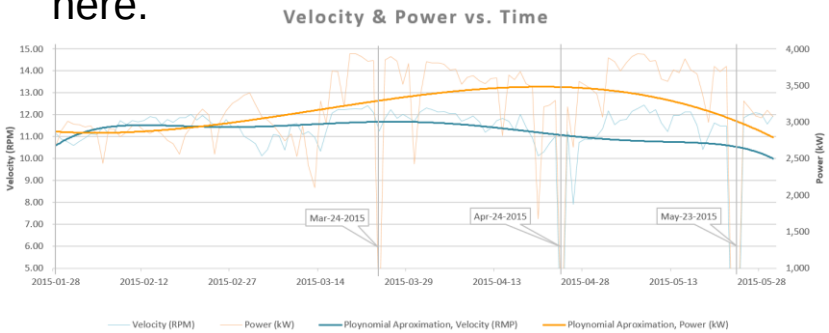


Velocity & Tonnage vs. Time

It can be seen here that the mill speed was relatively steady during the first 3 months of operation, despite large fluctuations in throughput.

Velocity & Power vs. Time

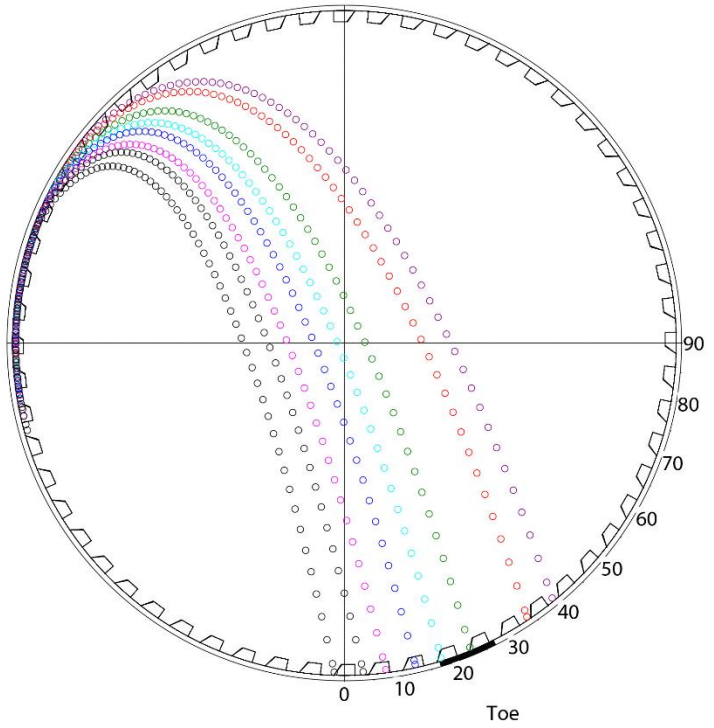
As power draw increased significantly starting end of March 2015, mill velocity decreased with only slight gains in mill throughput. This is a focal point moving forward for the client, as efficiency losses appear to be greatest here.



CODING METROLOGY

Would-Be Client

- **What we can do for you…**
  - ❖Automated mill and crusher analysis
  - ❖Optimize your mills
  - ❖Reduce comminution energy
  - ❖Reduce downtime



Date

Client Data
Customer Name
Ore Type
Mill Type

Mill Data
Mill Diameter
Mill Length
No. Of Rows
Mill Filling
Media Diameter

Lifter Specification
Units mm & % crit, Angle from base

Width	Height	Angle°	H2A	S/H	Speed	Plate
325	170	56	0	1.52	78	80
325	170	53	0	1.56	78	80
325	170	56	0	1.52	72	80
325	170	53	0	1.56	72	80
325	170	56	0	1.52	68	80
325	170	53	0	1.56	68	80
325	170	56	0	1.52	64	80
325	170	53	0	1.56	64	80

Thank You