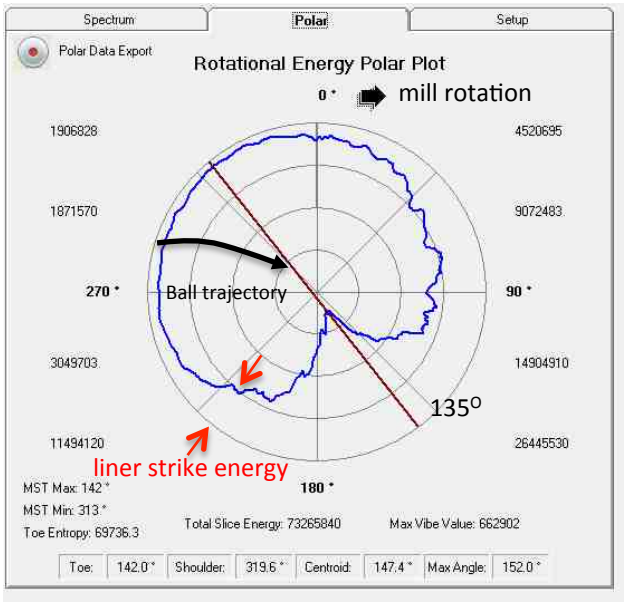
MillSlicer Polar Plot Examples & Explanations

Introduction

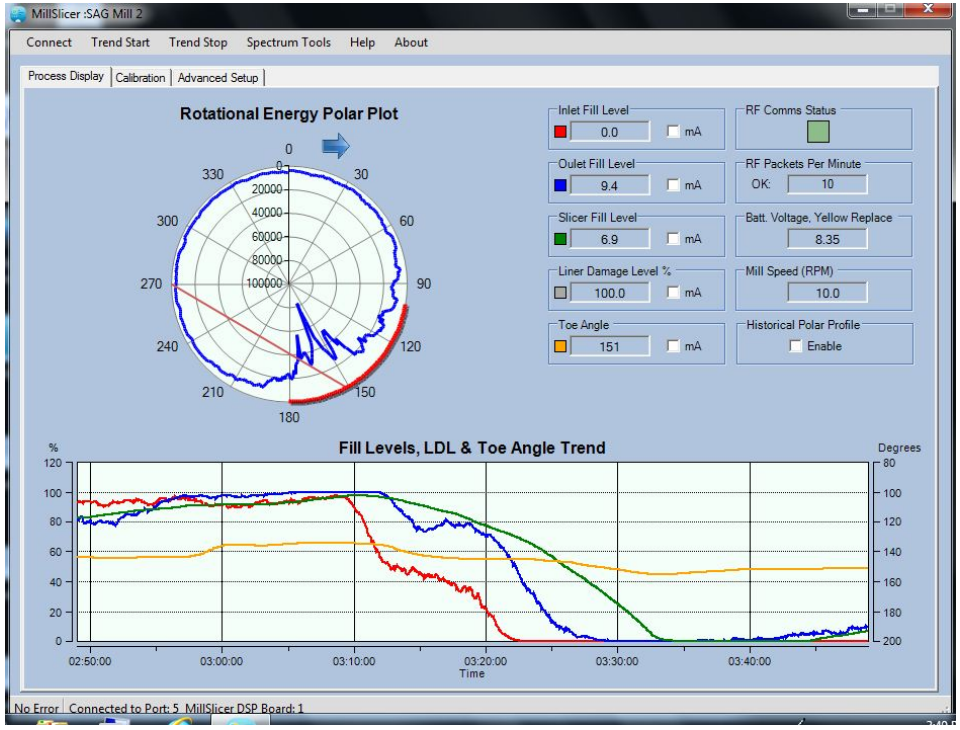
The shell vibration sensor is used to generate a polar plot by sampling vibration 360 degrees through the rotation of the mill. The mill rotation is clockwise in the real-time plot and is updated every revolution of the mill. Energy is plotted as increasing towards the center of the plot.

The purpose of the plot is to aid the operator in determining optimal mill speed for reduced liner wear and to also have an approximate idea of the mill fill level (volume of material) in the mill.

What are examples of an under filled mill?



Very High Energy Reading from 135 – 180 degrees.
This is the cascade grinding region of the mill.



Sharp Spikes in the cascade grinding region (Toe).
Polar Plot taken when fill levels (red, blue and green) were near zero. Toe signal is shown in yellow.

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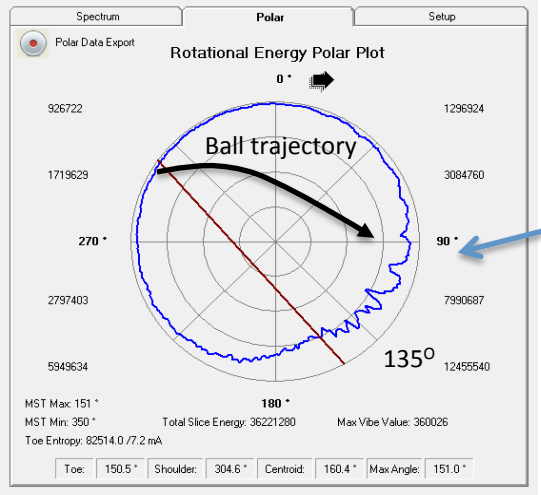
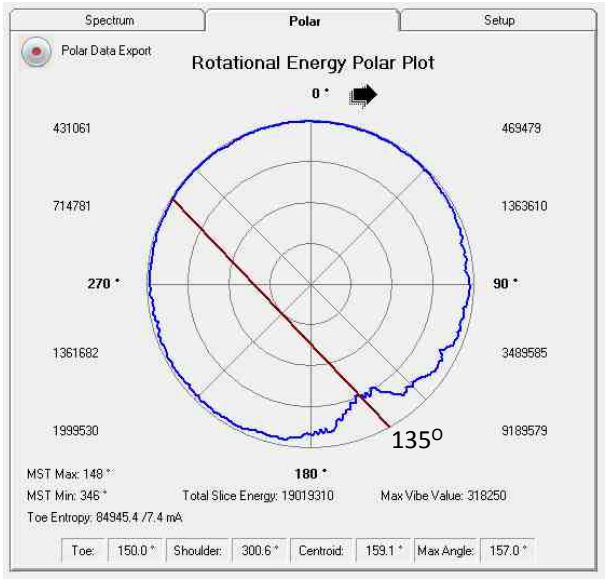
What if the mill is run too fast?



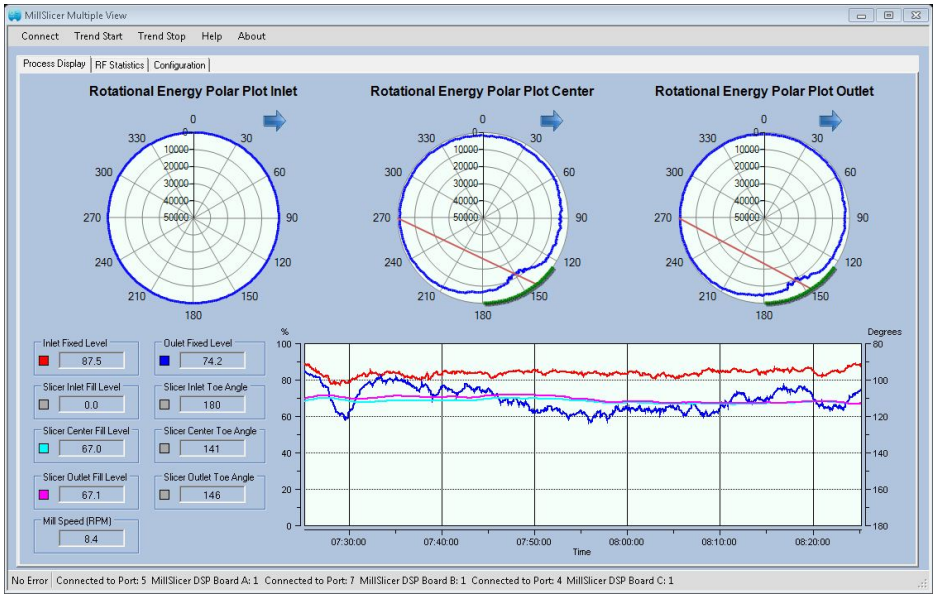
The region of typical cascade grinding is from 135 – 180 degrees. When the mill is run at excessive speeds, we observe spikes above the cascade grinding region where balls are being thrown into the liner above the material load.

This results in extreme damage to the mill liners and is a 'metal on metal' severe wear condition. Required action: Slow down the mill!

What does a sufficiently loaded mill look like?

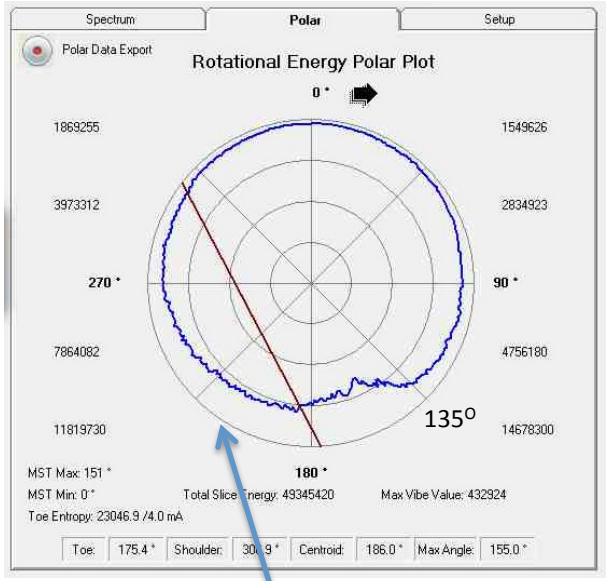


Small bump of energy in the cascade grinding region and minimal energy outside this region.

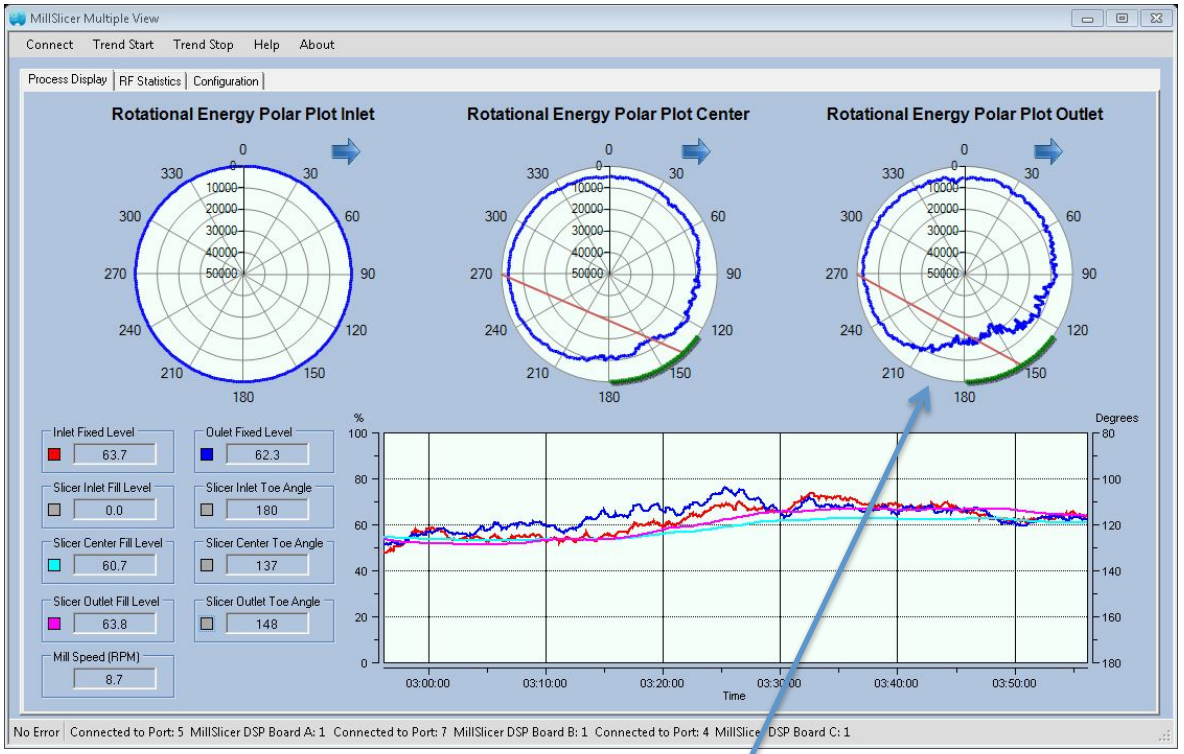


Rightmost Polar Plot is the best example. Three MillSlicers were placed on a RNMC SAG. The third MillSlicer (leftmost polar plot) is not in operation due to RF communication problems which will be fixed at next shut down.

More examples of under filled mills…



Too much energy in the shoulder region
(180 – 270 degrees).



Rightmost Polar Plot is the best example.
Energy levels are too high.

Two operating MillSlicers placed on RNMC SAG Mill Shell.

Note: Fill level signals are too high in this example and were calibrated to lower levels shortly after this plot was taken. This snapshot was taken during the first day of commissioning three MillSlicers placed on the shell of a 2500+ TPH RNMC SAG mill.

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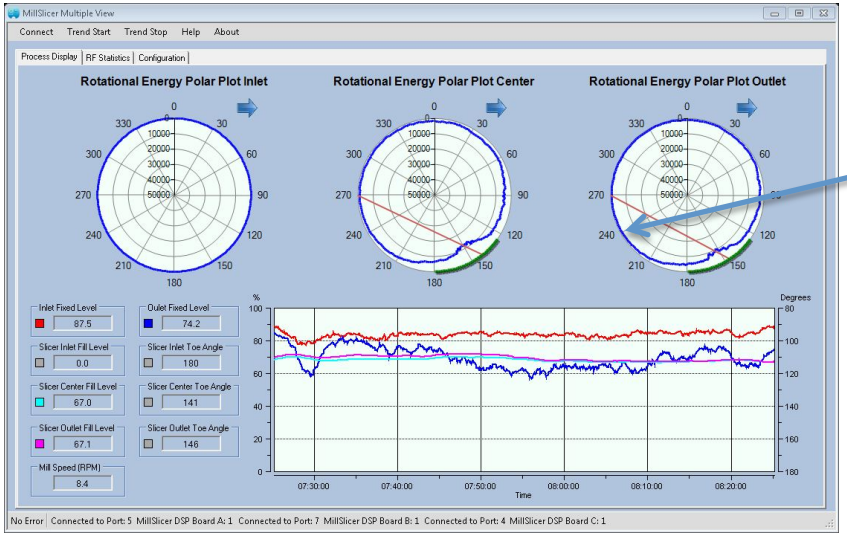
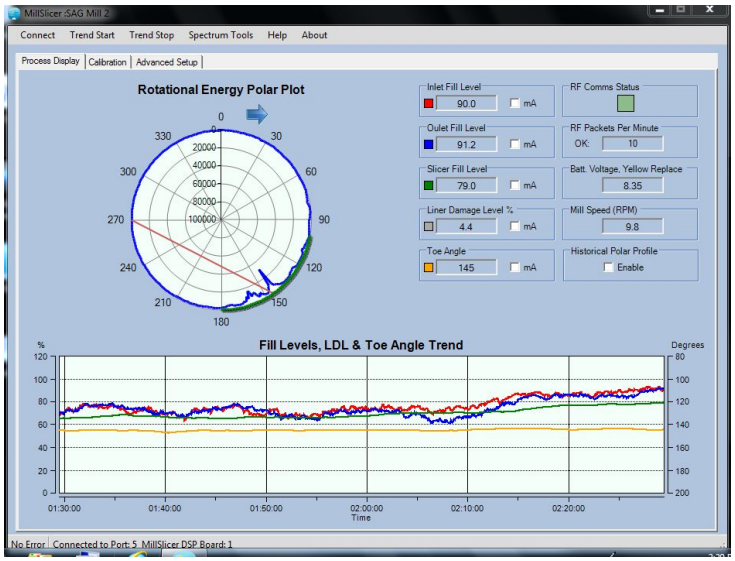
More examples of filled mills.



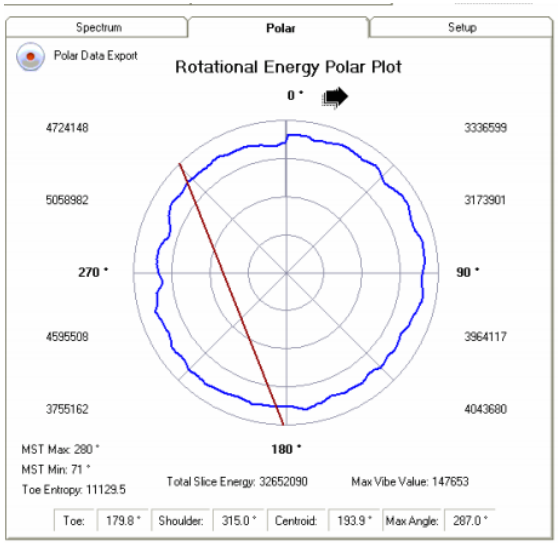
Minimal energy in the shoulder region.
Balls are being pushed up against the mill liner due to the large amount of material in the mill.

Snapshot taken from RNMC
Two Slicer SAG Installation.



Energy only observed in the expected grinding region.
Snapshot taken from BG SAG mill.
Sharp peak in the grinding region is due to brand new liners (swapped out the previous week).

And one example of a mill passing clay (below) …



We observe no real toe area at all when clay is passing through the mill. (RNMC)
Just even vibration throughout the liner.

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