FLS LoadIQ
Mill Scanning Technology

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Optimise mill loading with smart sensor technology

When you're working with raw materials, inconsistency is to be expected. The ore body changes. Liners wear. And before you know it, you're losing efficiency in your mill. Optimal mill loading ensures you're making the most of all that grinding energy to achieve the best possible results for the lowest possible cost.

What you need is state-of-the-art sensing technology that detects all these changing conditions in real time and enables you to adjust your operating parameters accordingly. Enter LoadIQ, the smart load optimization tool for SAG and AG that enables you to increase throughput by 3 – 6%.

Key benefits

- Load optimization
- Real-time feedback
- Increased throughput
- Reduced mill liner wear

Increase mill throughput without upgrading your grinding mill

You don't need to upgrade your mill to increase throughput — you just need to make the most of the capacity you already have. Our mill scanner technology monitors how full a mill is, where the charge is located, and where the cascading material is impacting the liner. Our LoadIQ software determines how the load should be adjusted in real-time even as ore size and hardness, and liners wear to maximize efficiency.

Take the guesswork out of setting bearing pressure and load targets

Earlier tools aimed at optimising mill load were not always successful. They were judging volumetric load — how full the mill is — by bearing pressure, a flawed measurement.

Bearing pressure doesn't account for ore size changes (interstitial spacing affecting density), and this measurement is also confused by changes in oil temperature, mill direction, liner wear, and mill density.

LoadIQ utilises cutting edge mill scanner smart sensor technologies to bridge these gaps and accurately measure volumetric filling and ore trajectory in real time. We then use large scale data analysis and real time smart sensor data to correlate maximum breakage rates to the incoming ore types as well as the current liner profile.

These correlations are used to establish automatic real-time dynamic load optimization for any control system.

Optimise efficiency, instantly

Historically, the road to steady grinding can be a long one, based on operator trial and error. And every time the ore changes, or the liners wear, or are replaced, the whole process must begin again. This not only means long delays between finding the ideal load targets — all the while losing efficiency — it also means swings between overloaded and underloaded conditions, which are damaging to both production and mill liners.

With LoadIQ, there is no long wait for feedback. LoadIQ will update bearing pressure / RPM limits and targets in real-time to adjust for changing conditions and maintain maximum grinding efficiency. These updated limits can be sent to operators for manual control, or they can be fed into any expert system for real time optimization using OPC communication.
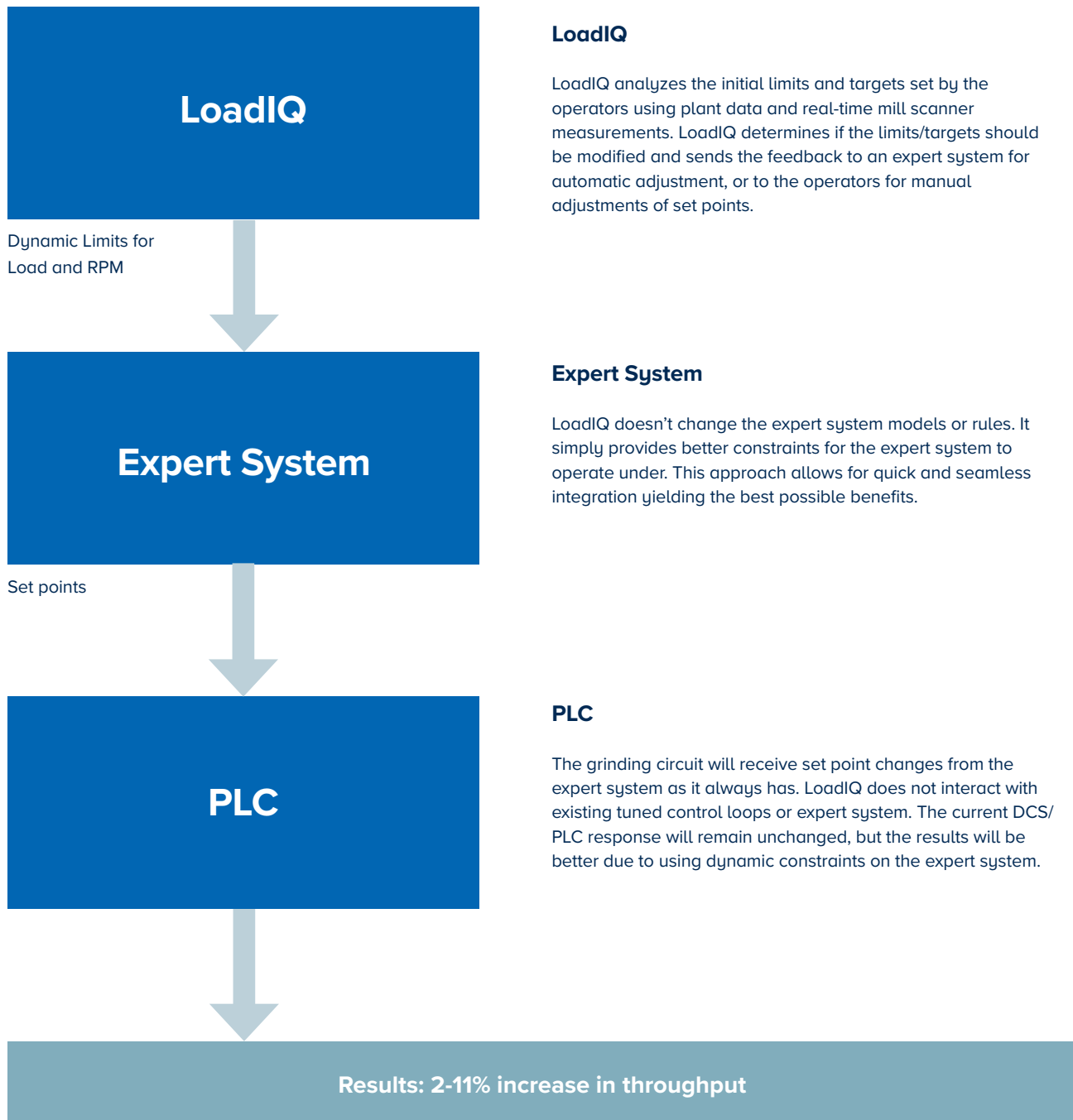
Reduce liner wear

Liner wear is directly correlated to the ore trajectory in a grinding mill for a given RPM. As the liners wear, the ability to strike the toe at higher volumetric fills may not be possible. In cases where this is true, the volumetric load will automatically be decreased until the toe is impacted, thus restoring maximum efficiency. Conversely, with a new set of liners, the trajectory at high RPM will likely cause excessive liner strikes. In these cases, LoadIQ automatically reduces the maximum allowable RPM such that the cascading ore is impacting the charge toe.

| 768 | 848 | 929 | 1,010 | 1,091 |

LoadIQ Limits

Traditional Limits
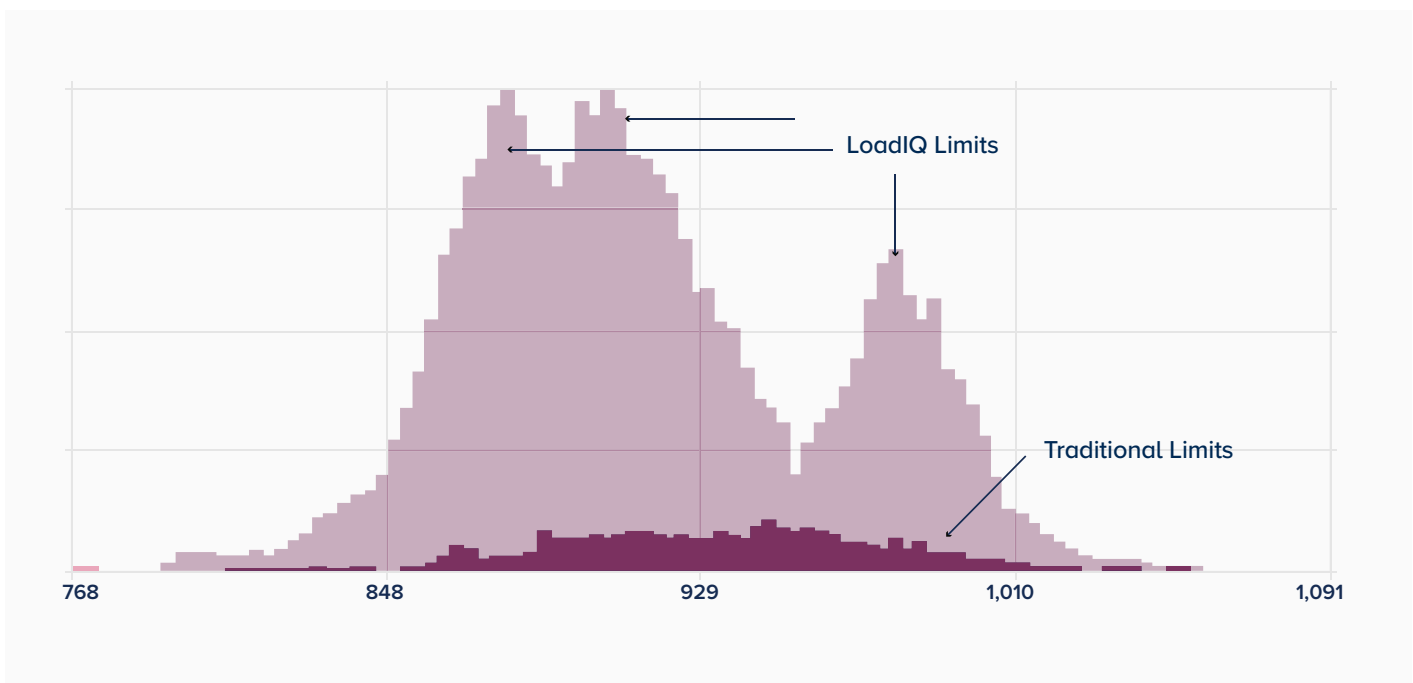
How does LoadIQ help you achieve optimal mill load?

LoadIQ is made up of smart sensors (i.e. the mill scanner technology) and AI-based software (i.e. an intelligent web-based application that integrates with your expert system and operators).

LoadIQ

LoadIQ

LoadIQ analyzes the initial limits and targets set by the operators using plant data and real-time mill scanner measurements. LoadIQ determines if the limits/targets should be modified and sends the feedback to an expert system for automatic adjustment, or to the operators for manual adjustments of set points.

Dynamic Limits for Load and RPM

Expert System

Expert System

LoadIQ doesn't change the expert system models or rules. It simply provides better constraints for the expert system to operate under. This approach allows for quick and seamless integration yielding the best possible benefits.

Set points

PLC

PLC

The grinding circuit will receive set point changes from the expert system as it always has. LoadIQ does not interact with existing tuned control loops or expert system. The current DCS/PLC response will remain unchanged, but the results will be better due to using dynamic constraints on the expert system.

Results: 2-11% increase in throughput

Smart solutions

The strength of this solution lies in the state-of-the-art hardware and software we apply.
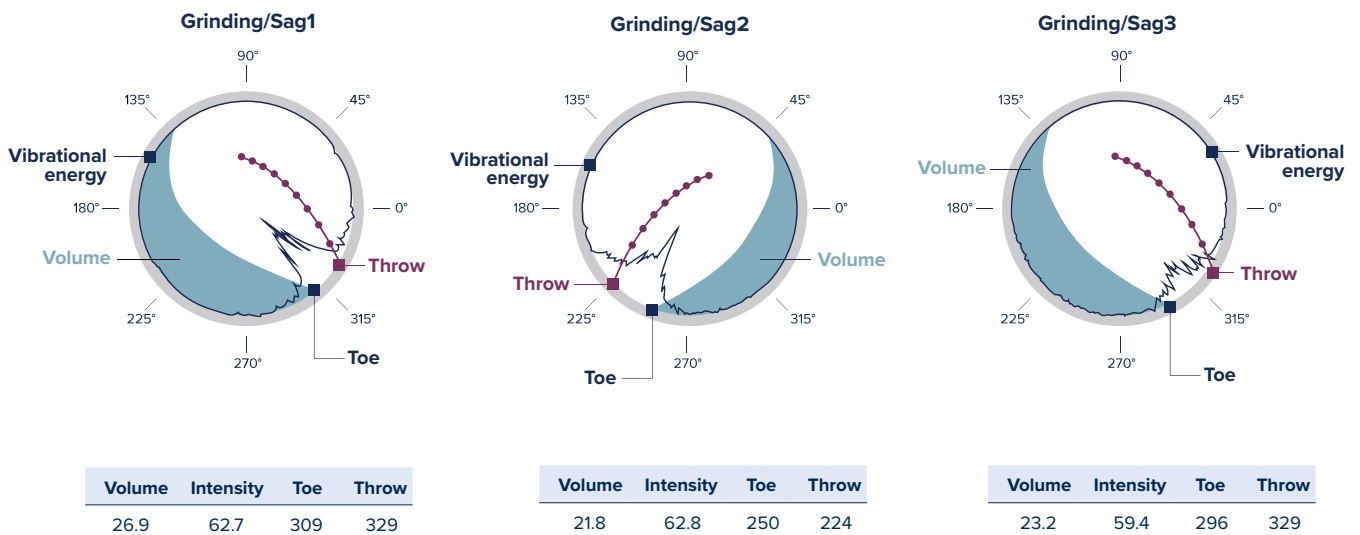
Hardware

The mill scanner technology will accurately measure volumetric fill, location of charge toe, and the location and intensity of liner impacts.

- Transmits wirelessly and installs in less than a day
- Requires no batteries or charging (self-generating power)
- Does not rely on a static position sensor or proximity sensor
- Can detect a broken liner bolt for added safety
- Has backup circuitry to ensure full functionality when primary circuits fail. Alerts can be sent to the DCS to schedule repair during next down day for seamless operation.

Software

- Accessed using a web browser eliminating the need for multiple client licenses
- Measures ball charge, volumetric fill, impact intensity & location, and charge toe position
- Can automatically determine and adjust optimal load targets and limits using OPC communication.

Grinding/Sag1

Volume	Intensity	Toe	Throw
26.9	62.7	309	329

Grinding/Sag2

Volume	Intensity	Toe	Throw
21.8	62.8	250	224

Grinding/Sag3

Volume	Intensity	Toe	Throw
23.2	59.4	296	329

Quick Results

The installation of LoadIQ will have an immediate and significant impact on your process. Typical results are extended liner life, increased throughput, and reduced power usage. The charts below demonstrate a recent example from a client in Peru. This particular client had an existing expert system, but was having difficulty achieving the target throughput and had significant variability in mill loading and feed rates. With the addition of LoadIQ power usage dropped dramatically, while throughput increased by 10%.

LoadIQ continuously reads two key data points in the mill – the toe, which indicates fill level, and the throw, which indicates liner life. It also monitors the particle size of the material entering the mill, enabling the intelligent software to calculate the optimum mill load target based on current liner and ore parameters. The aim is to maximize volume while ensuring that input energy is used efficiently to reduce particle size, giving you optimum mill performance.
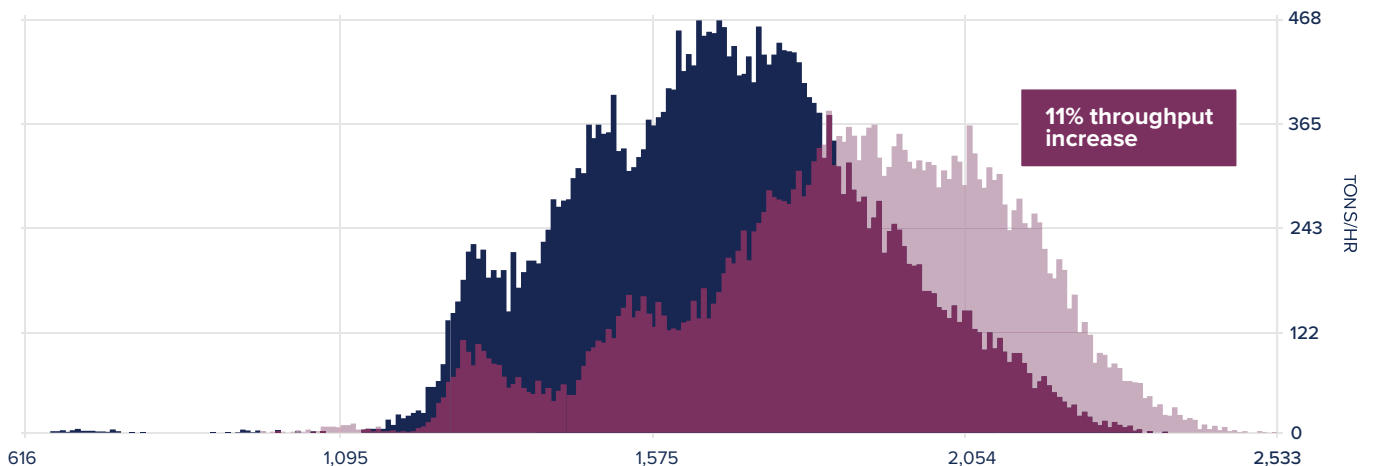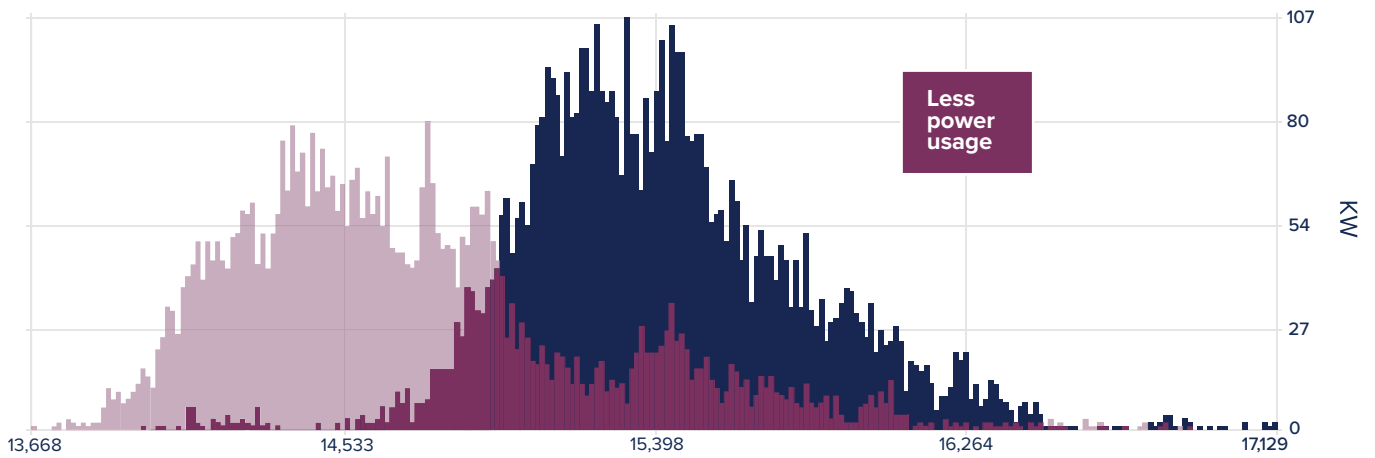
Are you sure your mill has the optimal load? Find out how our LoadIQ can increase your throughput. Contact us today.

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Mission Zero Towards zero emissions by 2030