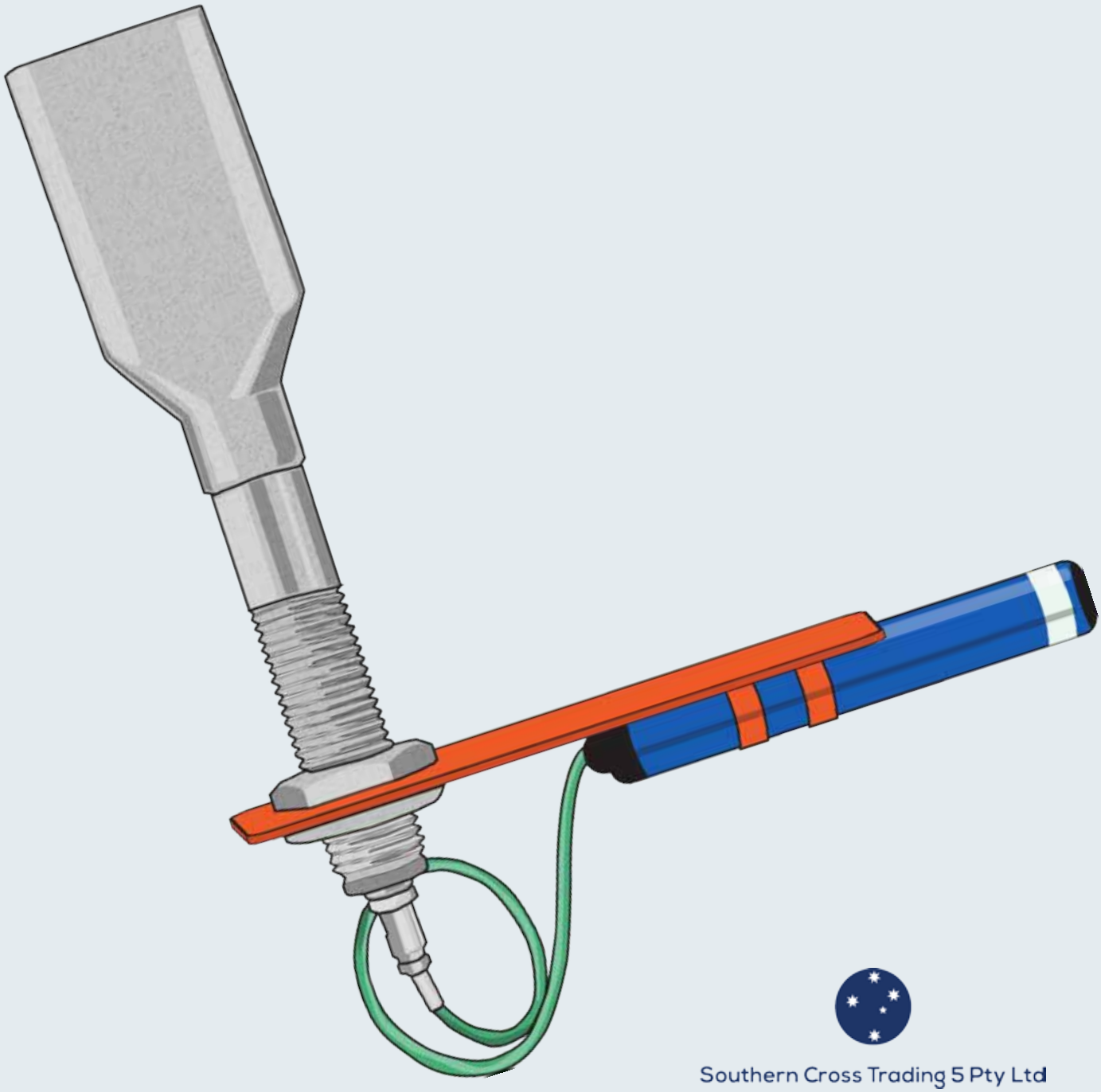
LINER INTELLIGENT SYSTEM



Southern Cross Trading 5 Pty Ltd

Liner Intelligent System (LIS)

This product is currently under development and is the intellectual property of Southern Cross Trading 5 (Pty) Ltd (SCT), patent pending. The aim of the product is to supply the client with live readings of mill liner wear during production. The only requirement from the client is a 110 – 240 volt power source. The system can operate totally independent from the mine or connected to the mines LAN (local area network) system. LIS is the only known system worldwide which has the ability to measure liner wear during production in mills.

LIS parts

The system is made up of the following parts:

1	Host	A main central processing unit which processes and stores information before sending the data. The unit can be updated at any time from SCT's central office.
2	Antenna	A transceiver with its own central processing unit sends information to the host.
3	Probe	Incorporated into the steel bolts for steel liners or fitted into the rubber liner.

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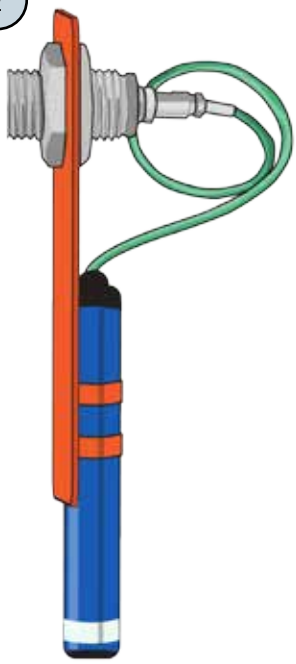

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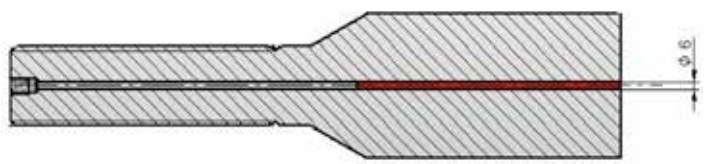


*Bolt showing probe inserted

The host is a once off installation, the antenna and probe are consumables.

Measurement and specifications

The standard completed probe is currently 1.5mm x 4.5mm x length to suit bolt and liner.

- Accuracy – Measures in 0.5mm increments.
- Length – The length of the probe will vary to suit bolt and liner
- Width – The probe is 4.5mm wide but after encapsulation may go up to 6mm in diameter.

Currently liner wear readings are performed manually in rubber lined mills by inserting a nail between the liners then the measurements being obtained using a steel ruler. Steel lined mills are being measured by ultrasonic equipment or laser scanning devices.

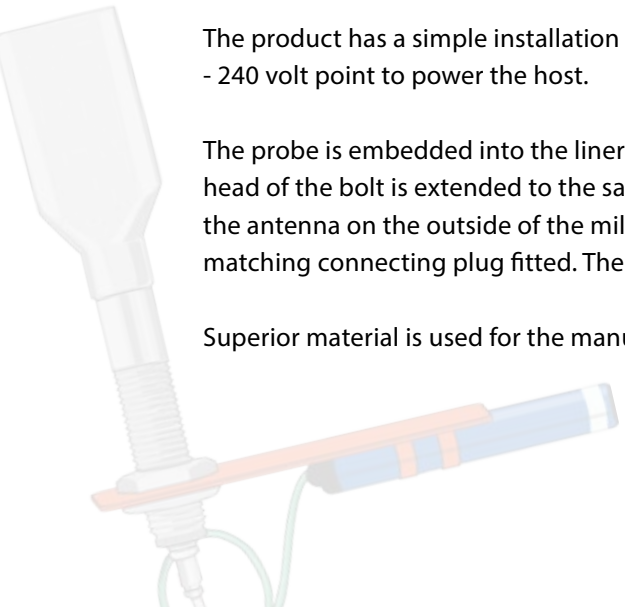
Predictions at times have inaccuracies resulting in liners being removed prematurely or resulting in washing of the mill. Steel liners experience a sudden rapid wear as the liner wears nearer to the inner core where the hardness is considerably lower than that of the outer crust. This rapid wear period can be seen quite clearly with the LIS. Currently no system can predict when this rapid rate of wear occurs resulting in inaccurate predictions. The information generated by LIS can be viewed in real time.

Product installation and commissioning

The product has a simple installation process where the only requirements from the mine is a 110 - 240 volt point to power the host.

The probe is embedded into the liner holding bolt for steel liners and within the rubber liner. The head of the bolt is extended to the same level as the height of the lifter. The cable connection from the antenna on the outside of the mill connects to the threaded portion of the bolt which has a matching connecting plug fitted. These fittings are on the outside of the mill.

Superior material is used for the manufacture of these bolts so as not to compromise integrity.

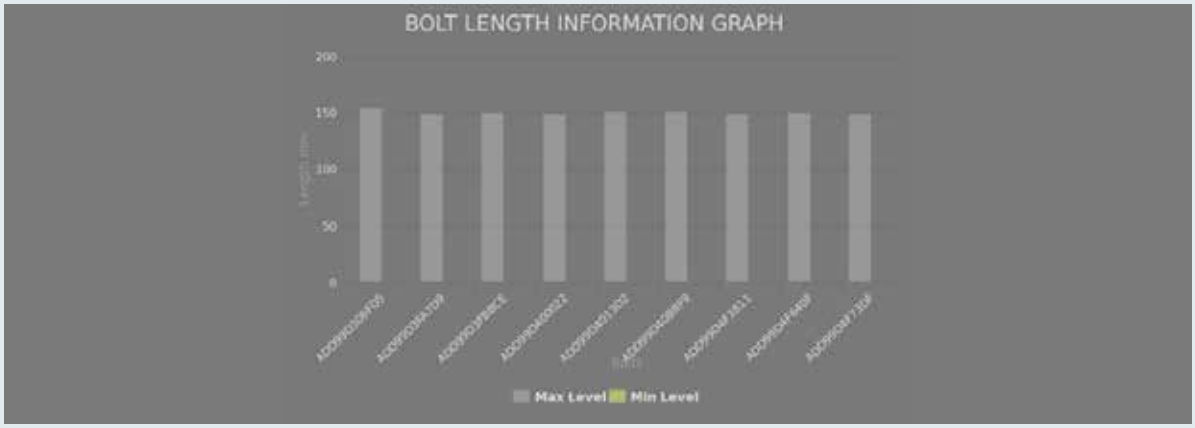


The mill is then put into operation to bed liners in position for a 12 to 24 hour period.
The bolt torque-up is then initiated.

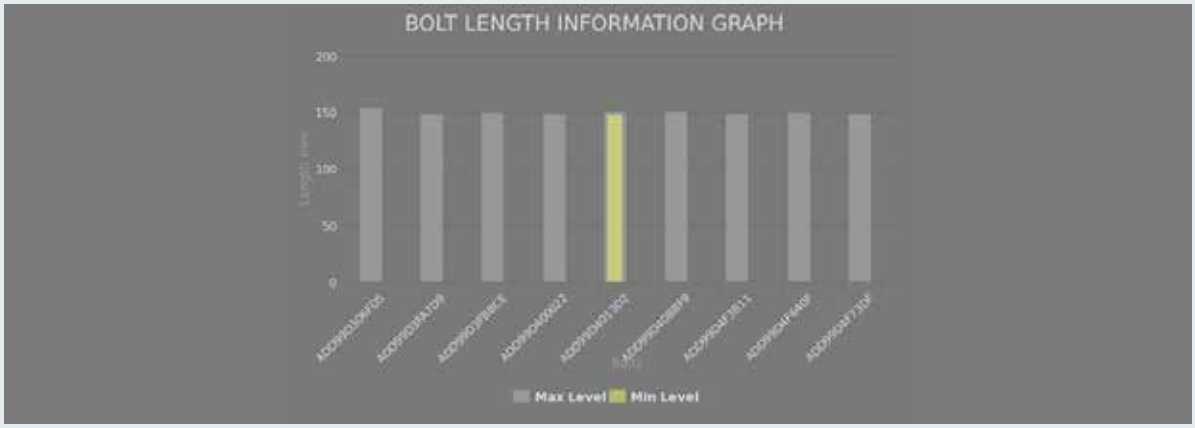
Technicians mount the antenna holding plate to the torqued bolt by means of a locknut. Once in place, the antenna is secured to the plate by means of a saddle clamp.

The device is then activated by simply inserting the harness plug into the matching plug on the bolt.

The technician will confirm activation of each probe. The bolt information table on the computer records the most recent signal sent by each unit. The history of each unit can be obtained from the Select Filters portion on the computer system.



Sample pre-activation View

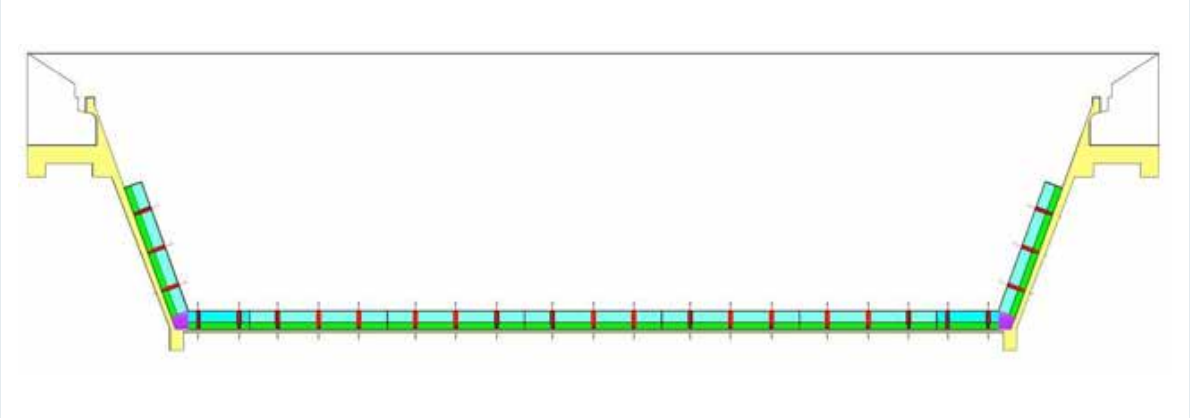


Sample post activation view of unit ADD99D4013D2

Bolt Information Chart showing unit ADD99D4013D2 has been activated on the network.
The location of each unit is identified on the mill general assembly drawing as a communication reference.

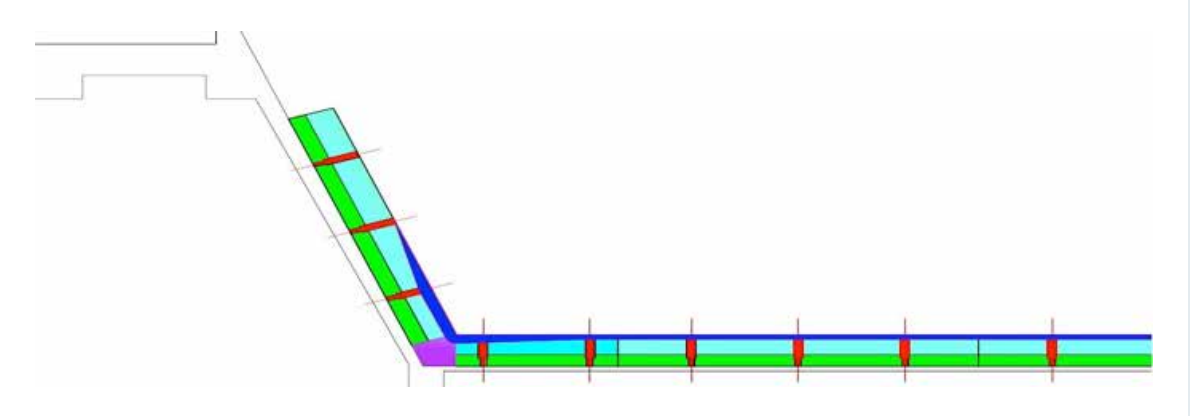
The mill is ready to run as soon as the re-torque is complete, meaning there is no additional downtime required for the installation of the product as its installation is synchronized with the reline.

The technician would then activate and commission the system for all probes. The activation creates the datum point which would be the high point of the lifter. The monitoring can then be done in real time.



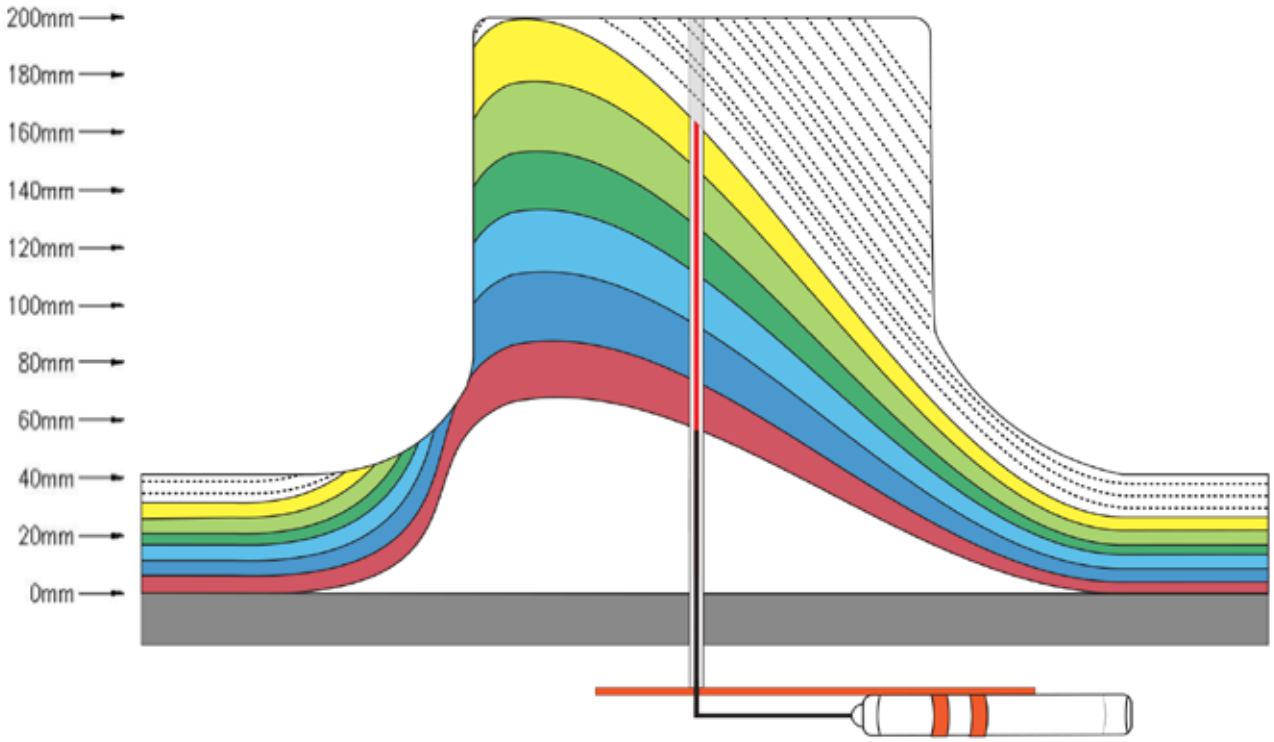
Positioning of the LIS in mills

A bolt is positioned in each liner bolt hole as determined by the client from feed end to discharge end of the mill.



Wear chart

With actual wear data, charts can be created to suit each client.



Example of probe wear detail

Individual liner wear

Individual and detailed wear data is stored. This gives a detailed history of wear over periods selected by client accompanied by a wear pattern graph.

Mills using rubber liners

Rubber lined mills work similarly, the main difference being probes are bonded into the lifters or shell plates as shown in figures 1 and 2.

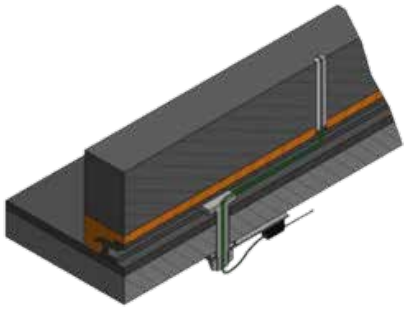


Figure 1

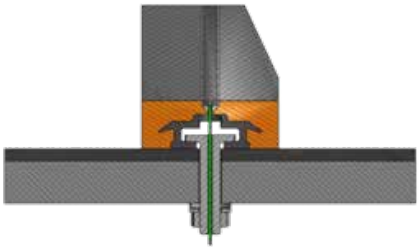


Figure 2

Benefits to the client

Mill optimization, availability and savings
The amount of downtime required for the monthly inspection of an average mill is approximately 6 – 12 hours. Although general maintenance and checks are required these stops could be extended to every six weeks and then targeted for every eight weeks which would allow approximately 50 additional hours annually for production.

Safety
The mill does not need to stop as often for inspections, thereby reducing safety risks by eliminating confined space entry and reducing the possibility of incidents.

Optimization of liner life and design
Full analysis of the liner can be carried out and optimization of the liner designs can be discussed with the client and supplier in real time without any stoppages by monitoring and verifying the level of each ring of the mill in three different positions.

Maintenance planning
Planning of maintenance shuts are important to any mine where focus is on minimum downtime. Should the mill be critical path, planning the scope of work and estimation of downtime can be streamlined. Constant monitoring of liner wear will give mill managers confidence in scheduling liner change outs and purchasing of liners with sufficient lead times.

Data collection
Wear ratio's per 100 000 tonnes milled can be shown throughout the liners lifespan.

LIS can be used for a variety of products

- Wearing parts of cyclones
- Pump inner casings
- Steel pump casings
- Rubber or polyurethane wear pads
- Rubber or polyurethane membranes
- HDPE piping
- Steel piping
- Lobster back piping
- Feed Chutes
- Ceramic tiles
- Ceramic wear pads
- Hosing (static)
- Wear plates (steel & rubber)

Mill Washing Alert

The system also accommodates for a mill washing alert. This application would alert the operator of slurry washing behind the liners during operation. The alert would be sent to the operator via sms or email. This application would only be installed at the client's request.

Conclusion

The aim of the product is to supply the client with real time readings of liner wear during production, minimizing downtime and streamlining forward planning.

Clients will benefit from the product through its safety maximisation, optimisation of liner life and design, superior maintenance planning, mill optimisation and availability allowing considerable cost saving and increasing production due to downtime and maintenance efficiency.

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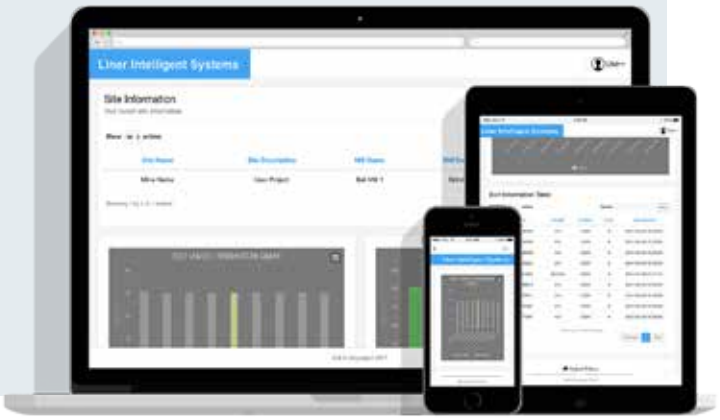

Liner intelligent system flow diagram