

Live Telemetry CM2763 ▼ Online Night Shift



DASHBOARD



CONFIGURE



REPORTS



FAULTS

Metres so far

8

Metres per hour
of cut 2

cut rate
2 m/h

time of first coal
06:00

time of last coal
10:00

operating hours
4



PUMP
23 A



FAN
10 A



LH GATH
34 A



 pempek
made for mining

ROYCE Mining Telemetry

“All the Data, All the time”

Pempek Telemetry Systems installed for more than 10 years on multiple sites globally!

The ROYCE system is installed and functioning on notable sites such as Kriel Colliery, Kestrel Coal Mine, Matla Coal and many others.

ROYCE is the current development of the proven Elliot reporting system, which has been a functioning and stable system for over ten years. The ROYCE system integrates the consistency and functions of the legacy Elliot system, while bringing forward the addition of new exciting technologies and developments to the fingertips of the user.



ROYCE Feature Summary

- Live Dashboard
- Historical Database
- Multitude of reports
- User Configured report generator & data trending
- Mine specific KPI's and feedback
- Fault reporting and troubleshooting functionality
- Data Export functionality
- Automated email service
- User permission control
- Device and Machine connectivity diagnostics
- Site Status feedback
- Data Buffering and Recovery from machine
- Section Overview display.

Time Base

Date/Time
 Shift

Time Window (Australia/Sydney)

Start: 19 Jan 2021 16:05

Finish: 20 Jan 2021 16:05

Event Types

Events
Faults

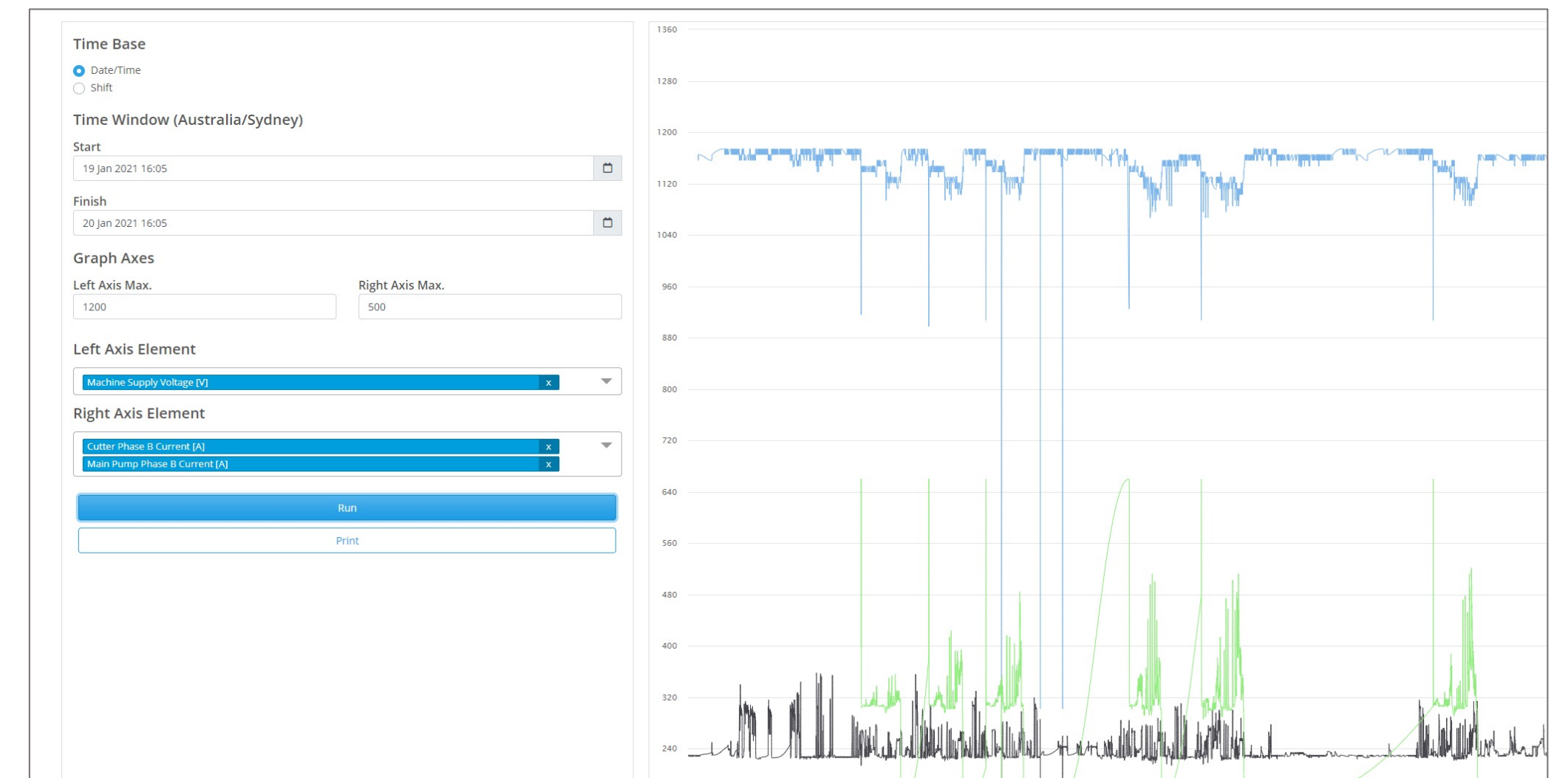
Event Data Source

HMI Left Inner

Run

CSV Export Print

#	Event ID	Event Name
1	51597	HMI Two Handed Control Lever Switch 2
2	51632	FeedDown Solenoid ON/Off Status
3	51619	HMI Button 22 - Feed Down
4	51597	HMI Two Handed Control Lever Switch 2
5	51632	FeedDown Solenoid ON/Off Status
6	51619	HMI Button 22 - Feed Down
7	51596	HMI Two Handed Control Lever Switch 1
8	51621	HMI Button 24 - Tilt Backward
9	51621	HMI Button 24 - Tilt Backward
10	51596	HMI Two Handed Control Lever Switch 1
11	51596	HMI Two Handed Control Lever Switch 1
12	51596	HMI Two Handed Control Lever Switch 1
13	51596	HMI Two Handed Control Lever Switch 1
14	51631	FeedUp Solenoid ON/Off Status
15	51612	HMI Button 15 - Feed Up
16	51612	HMI Button 15 - Feed Up



Live, reliable, future proofed, user driven reporting, available anywhere.

Mining Telemetry

- **Collects live data** from a range of machines (CM, BM, SC, Bolters, Conveyors)
- **Presents the data live across a range of devices in a range of formats**
- Protects from network dropouts, no loss of data!
- A VAST RANGE of standard and user driven report generators
- Visually clear and intuitive, with simple navigation and control mechanics
- Web browser interface to support PC, Laptop, Tablet, Smartphone
- Permission levels to present appropriate range of data with query tools
- Future proofed to support future changes in hardware & operating systems.
- **IS optimised for existing Pempek Ecosystem & Nautitech modems.**

Live Telemetry

8

Live Telemetry CM2763 ▼ Online Night Shift
IgorK (Administrator)
17/03/2020 03:21:04

DASHBOARD
 CONFIGURE
 REPORTS
 FAULTS

 SHIFT REPORT

Metres so far

Metres per hour of cut **2**

cut rate **2 m/h**

time of first coal **06:00**

time of last coal **10:00**

operating hours **4**



FAULT TABLE

51315	1:50:00 pm	Water Module Valve4 Fault
51317	1:45:00 pm	HPWater When Drilling LOWP Fault
53201	1:40:00 pm	Feed Line SOL Output Open Fault
53212	1:35:00 pm	STOP BUTTON FAULT
53199	1:30:00 pm	Not Calibrated Gripper Sol
53209	1:25:00 pm	Tow Arm Overtension REV Force Trip
53215	1:20:00 pm	PumpOff-Oil Pump Turned On
53219	1:15:00 pm	Conv State Machine Fault
53220	1:10:00 pm	Oil Pump State Machine Fault
53274	1:05:00 pm	Supply Module LOLU Fault
53287	1:00:00 pm	Tram Fast Sol OutputFault
53297	12:55:00 pm	1032-17 Sump TD Fault
53210	12:50:00 pm	LH e7 FAULT Magnetic Contamination - Spool #1
53211	12:45:00 pm	1030-3 Cutter Ext. Sol OutputFault
53212	12:40:00 pm	HMI REQUESTED PUMP OFF
53213	12:35:00 pm	ModeLight Current Below Threshold
53205	12:30:00 pm	1016-13 No Conveyor Water Flow

METHANE 1
0.0 %

METHANE 2
0.0 %

WATER PRESSURE
15 BAR

WATER FLOW
23 LPM

DUST
2 mg/m

SC LOADED
14

PRODUCTION
87 t

MACHINE VOLTAGE
987 V

PUMP
23 A

FAN
10 A

LH GATH
34 A

RH GATH
35 A

CONVEYOR
27 A

LH TRACT
0 A

RH TRACT
0 A

LH CUTTER
113 A

RH CUTTER
114 A

Live Telemetry

8

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IgorK (Administrator)
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DASHBOARD
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FAULT TABLE

52673	Active	1016-2 No Conv Fwd Feedback
51284	Active	1016-5 R Conveyor Overload
51293	Active	1016-5 L Conveyor Overload
51315	1:50:00 pm	Water Module Valve4 Fault
51317	1:45:00 pm	HPWater When Drilling LOWP Fault
53201	1:40:00 pm	Feed Line SOL Output Open Fault
53212	1:35:00 pm	STOP BUTTON FAULT
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53297	12:55:00 pm	1032-17 Sump TD Fault
53210	12:50:00 pm	LH e7 FAULT Magnetic Contamination - Spool #1
53211	12:45:00 pm	1030-3 Cutter Ext. Sol OutputFault
53212	12:40:00 pm	HMI REQUESTED PUMP OFF
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0.0 %

METHANE 2
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WATER PRESSURE
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CONVEYOR
27 A

LH TRACT
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RH TRACT
0 A

LH CUTTER
113 A

RH CUTTER
114 A

Live Telemetry

Live Telemetry SC3113 ▼ Online Night Shift

IgorK (Administrator)
17/03/2020 03:21:04

Dashboard
Configure
Reports
Faults
Shift Report

Metres so far
8

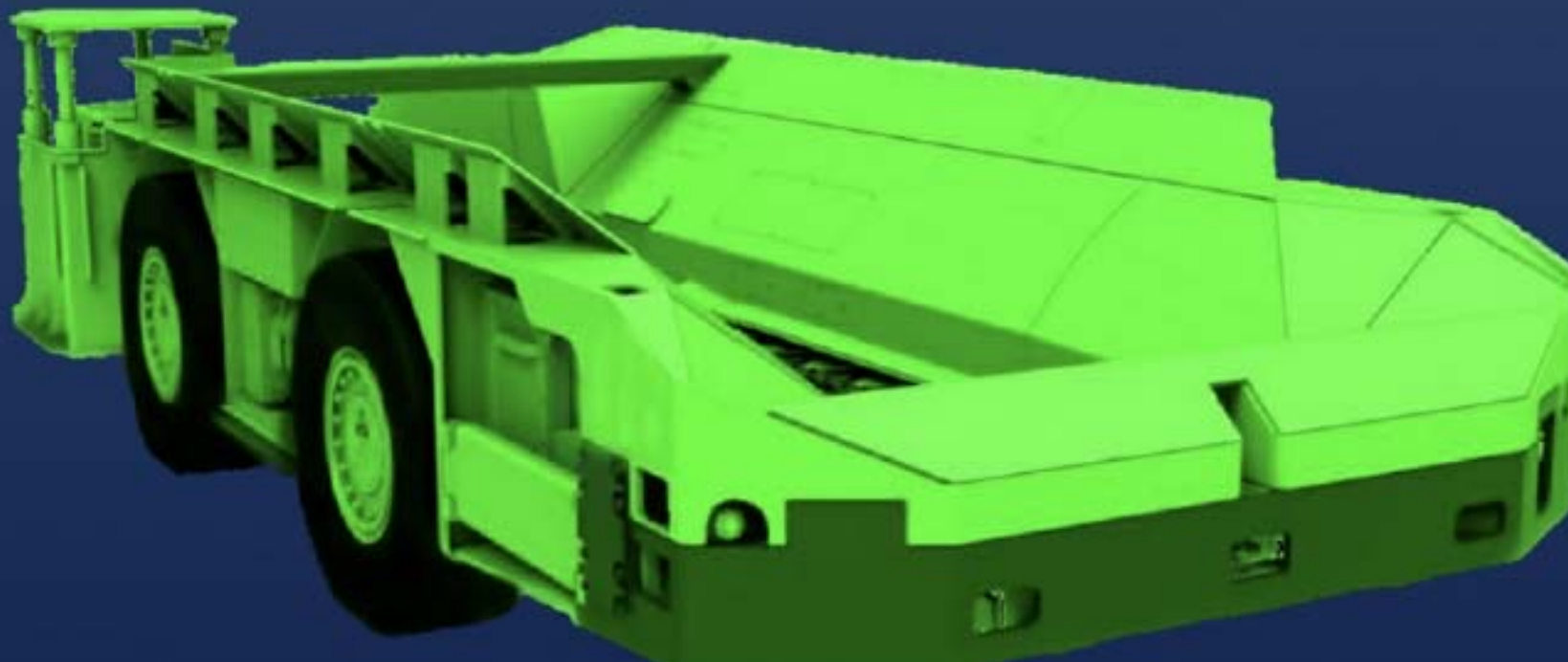
Metres per hour of cut
2

cut rate
2 m/h

time of first coal
06:00

time of last coal
10:00

operating hours
4



FAULT TABLE

51073	1011-12 - CONV INHIBITED - CONV CONTACTOR POWER-UP FAULT
51078	1011-17 - CONV INHIBITED - RH CONV MOTOR OVER TEMPERATURE
51105	1012-3 - TRACTION INHIBITED - RH DRIVE FATAL SHUTDOWN
51085	1:50:00 pm 1011-26 - CONV INHIBITED - LH CONV MOTOR PHASE IMBALANCE
51076	2:00:00 pm 1011-14 - CONV INHIBITED - CONV CONTACTOR CAN TIMEOUT
51056	2:05:00 pm 1010-21 - PUMP INHIBITED - OIL LEVEL TRIP
51050	2:15:00 pm 1010-12 - PUMP INHIBITED - PUMP CONTACTOR POWER-UP FAULT
51144	2:20:00 pm LH MR3 0x058
51283	2:25:00 pm 1012-6 - TRACTION INHIBITED - FOOTSWITCH ERROR 4
51300	2:30:00 pm SYSTEM - L0LU RELAY 4 - FEEDBACK FAULT
51314	2:35:00 pm COLLISION WARNING - SPEED LIMITED
51319	2:40:00 pm DRIVER DOOR OPEN - PUMP INHIBITED
51296	2:45:00 pm SYSTEM ERROR - L0LU RELAY FEEDBACK FAULT
51284	2:50:00 pm 1012-6 - TRACTION INHIBITED - FOOTSWITCH ERROR 5
51290	2:55:00 pm TRACTION ERROR - CHECK A39 CONNECTIONS ON LEFT DRIVE
51294	3:00:00 pm PUMP INHIBITED - VOLTAGE TOO HIGH
51225	3:05:00 pm RH MR3 0x054
51102	3:10:00 pm TRACTION INHIBITED - LEFT TRACTION OVER TEMPERATURE
51041	3:15:00 pm 1010-3 - PUMP INHIBITED - PUMP CONTACTOR SUPPLY LOW
51033	3:20:00 pm MEMORY ERROR - DOUBLE SETUP VALUES SET TO DEFAULT

METHANE 1
0.0 %

METHANE 2
0.0 %

WATER PRESSURE
15 BAR

WATER FLOW
23 LPM

DUST
2 mg/m

SC LOADED
14

PRODUCTION
87 t

<p>PUMP 18 A</p>	<p>LH DRIVE 0 A</p>	<p>RH DRIVE 0 A</p>	<p>LH CONVEYOR 16 A</p>	<p>RH CONVEYOR 16 A</p>	<p>NO LOADS 14</p> <p>EST. TONNES 135</p>	<p>MACHINE VOLTAGE 1036 V</p>
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Live Telemetry

Live Telemetry CM2763 Online Night Shift IgorK (Administrator)
17/03/2020 03:21:04

[DASHBOARD](#) [CONFIGURE](#) [REPORTS](#) [FAULTS](#) [SHIFT REPORT](#)

Configuration

Time and Date	
Day Shift Start	07:00:00
Day Shift End	14:45:00
Afternoon Shift Start	15:00:00
Afternoon Shift End	22:45:00
Night Shift Start	23:00:00
Night Shift End	06:45:00

Configure KPI targets and shift times in the configuration tab

Live Telemetry

Live Telemetry SC3113 Online Night Shift IgorK (Administrator)
17/03/2020 03:21:04

DASHBOARD CONFIGURE REPORTS FAULTS SHIFT REPORT

Provides a vast range of in-depth configurable reports

ROYCE Provide a vast range of configurable reports.

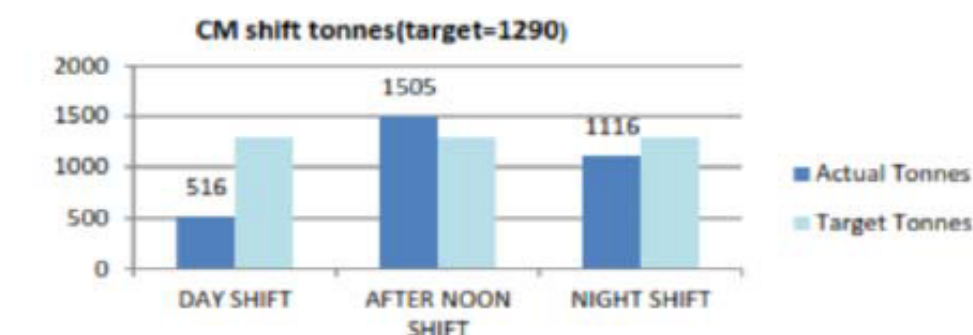
The generation of high-quality production reports make it easy to estimate a shift outputs, makeshift comparisons and improve business process. Set your commission goals and validate their completion using these reports.

- Provides intuitive platform which users can configure including:
- Troubleshoot issues with a machine fault report
- Generate custom graphs based on selected data
- Generate historic production graphs based on the period of your choosing,
- Query all events that occurred in a machine over a specific period,
- And a number of other useful applications.

Mine: Section: 18 Machine ID: 25 Machine no: CM004

	Ave Estimate meters per shift	Ave Estimate tonnes per shift	Ave Cutting time per shift	Ave Cutting tempo per shift	Ave Production tempo per shift	Ave late 1 st Coal	Ave early last Coal	Ave late machine powered	Ave early machine shutdown
ACTUAL	25.92	1116	136	8.2tpm	4.26tpm	00:04:50	0:00:36	00:06:29	0:00:00
TARGET	30	1290	144	9.00	6.00	00:00:00	0:00:00	00:00:00	0:00:00

	Ave SC Loads per shift	Ave SC away time per shift	Ave SC load time per shift	Ave system Availability per shift	Ave system Utilisation per shift	Total daily tonnes
ACTUAL	72	88sec	129sec	?	?	3137
TARGET	83	90sec	80sec	?	?	3870



Fault	Duration	Count
1 Traction Cont supply below limit	100milliseconds	2
2 Machine powered up	15seconds	1
3 Left Drive: Mains supply under voltage	12seconds, 100milliseconds	6
4 Left Drive: Lost phase lock on mains supply	2seconds, 200milliseconds	5
5 Right Drive: Mains supply under voltage	100milliseconds	2
6 Right Drive: Lost phase lock on mains supply	250milliseconds	5
Total	29seconds, 750milliseconds	21

Live Telemetry

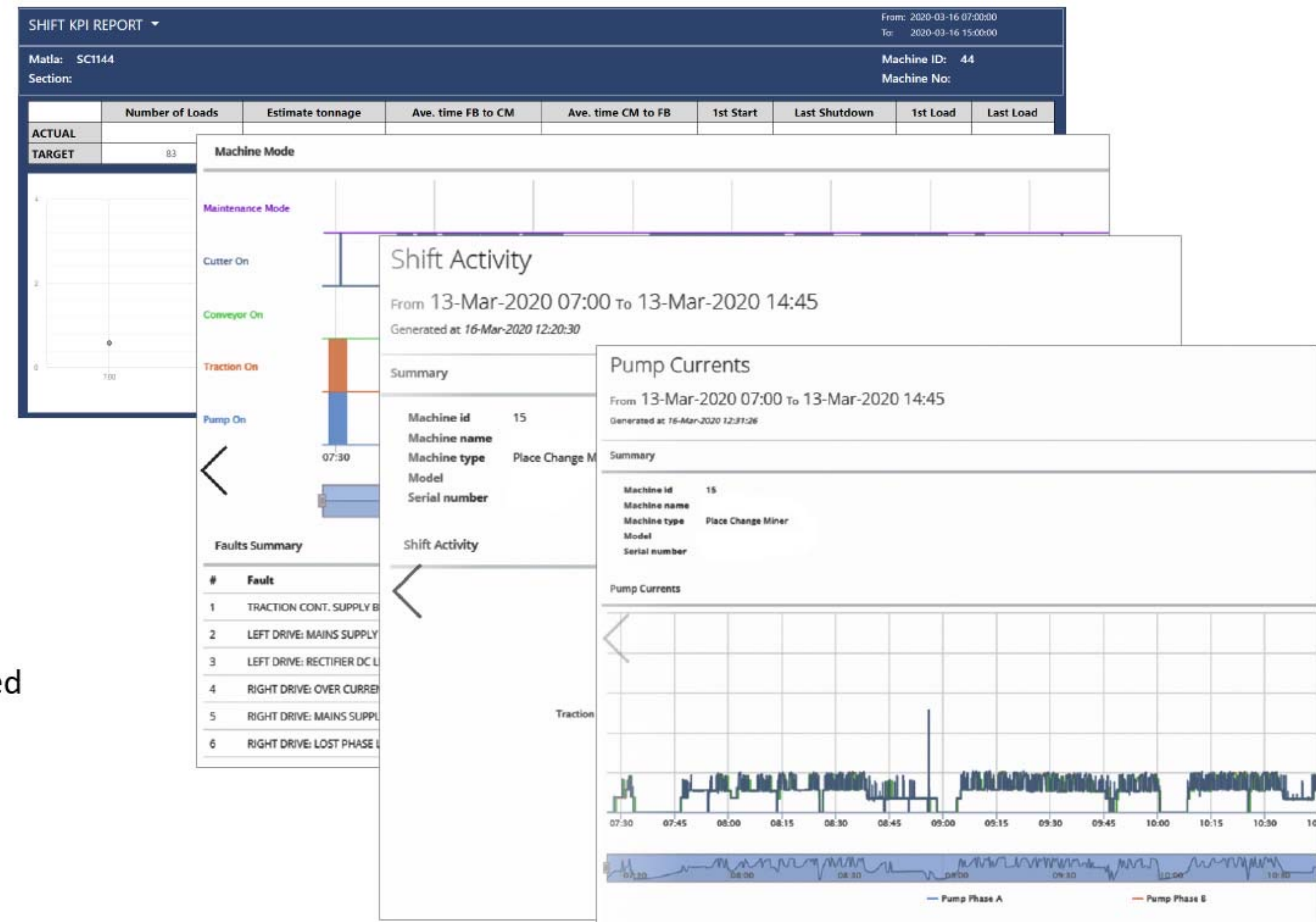
Live Telemetry SC3113 Online Night Shift

IgorK (Administrator)
17/03/2020 03:21:04

DASHBOARD CONFIGURE REPORTS FAULTS SHIFT REPORT

A VAST range of preconfigured reports

- Activity - Shows machine activity
- Production - Shows estimated coal output and info
- Event - Highlights notable machine events
- Fault - Details on last 20 active faults
- Cycle Time - Graphical break down of cutting cycle
- User Configured - User selects elements to be graphed
- Custom - Custom report request to be added to app



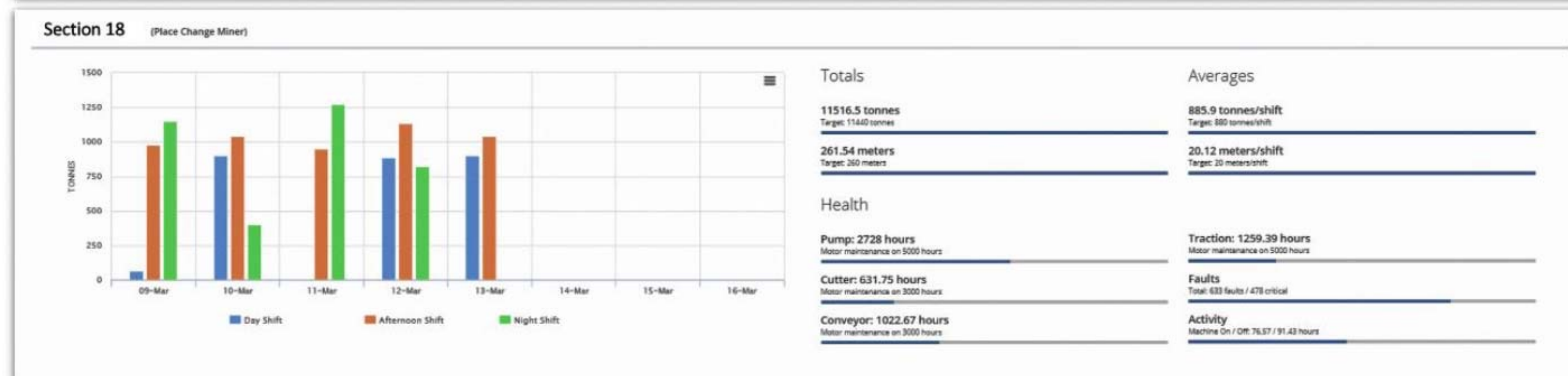
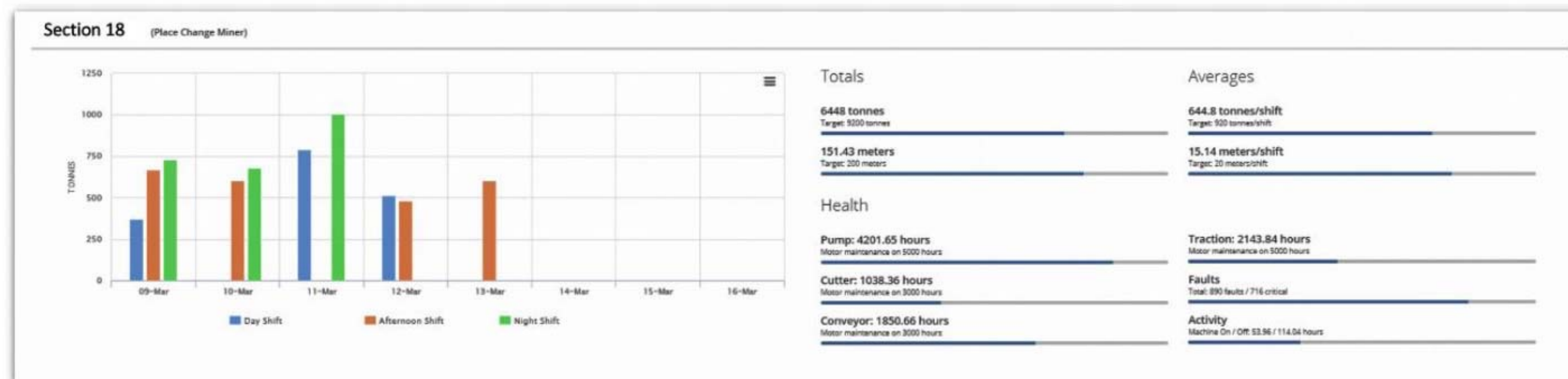
Highly detailed graphical outputs

Compare prior periods

Live Telemetry SC3113 ▼ Online Night Shift

IgorK (Administrator)
17/03/2020 03:21:04

DASHBOARD CONFIGURE REPORTS FAULTS SHIFT REPORT



User analytics process example

Live Telemetry SC3113 ▼ Online Night Shift IgorK (Administrator) 17/03/2020 03:21:04

DASHBOARD CONFIGURE REPORTS FAULTS SHIFT REPORT

Cycle Time Report **Event Report** Data Browser User Configu

Shift Time

Date: 31 Jan 2020

Shift: Shift 24

Run

CSV Export Save As Template

Print

Use Cycle Time report to query desired period of operation



A typical shift summary that can be reconfigured by the user with different reports for different user types

Live Telemetry CM2763 Online Night Shift

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17/03/2020 03:21:04

DASHBOARD
 CONFIGURE
 REPORTS
 FAULTS

SHIFT REPORT

Mine: Machine ID: 25
Section: 18 Machine no: CM004

	Estimate meters	Estimate tonnes	Cutting time	Cutting tempo	Production tempo	1 st Coal	Last Coal	Machine powered	Machine shutdown
ACTUAL	25.92	1116	136	8.2tpm	4.26tpm	00:04:50	6:14:24	23:36:29	6:21:04
TARGET	30	1290	144	9.00	6.00	00:00:00	6:15:00	23:30:00	6:20:00

	SC Loads	Ave SC away time	Ave SC load time
ACTUAL	72	88sec	129sec
TARGET	83	90sec	80sec

Hour	Loads
0:00	0
1:00	11
2:00	12
3:00	11
4:00	13
5:00	10
6:00	10
7:00	5

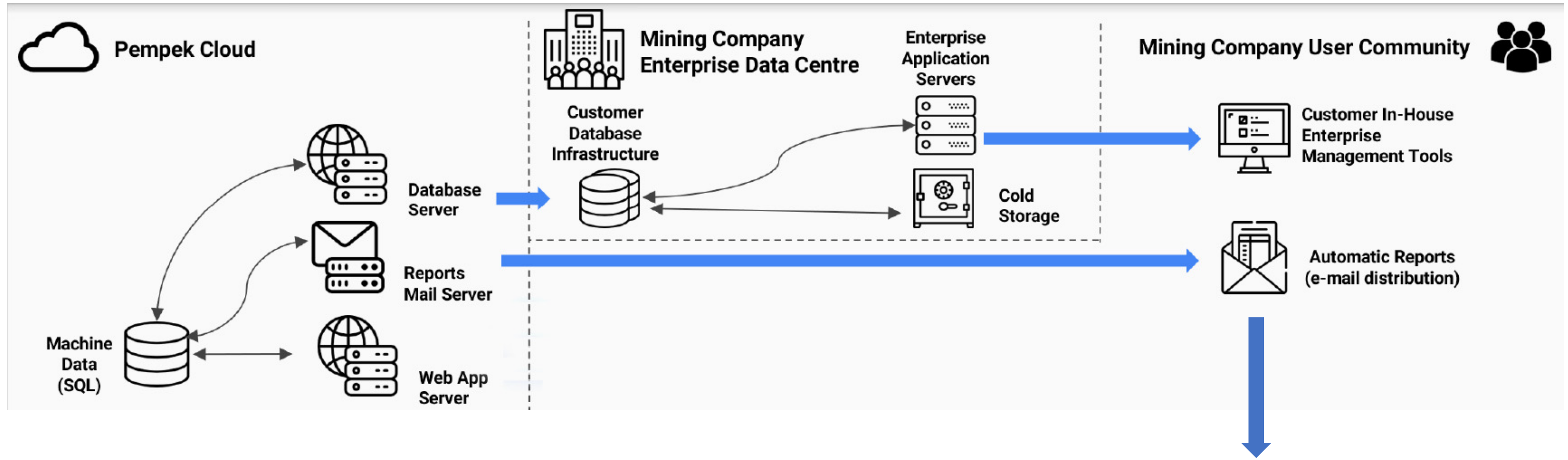
Waiting General	1minute, 30seconds
Waiting in Production	1hour, 58seconds
Cutting only	40minutes, 40seconds
Cutting and Loading	1hour, 31minutes, 16seconds
Relocation	59minutes, 28seconds
Sweeping	0minutes, 40seconds
Machine on	0hours, 40minutes, 20seconds
No Link	58minutes, 34seconds
Availability	
Utilisation	

Fault	Duration	Count	
1	Traction Cont supply below limit	100milliseconds	2
2	Machine powered up	15seconds	1
3	Left Drive: Mains supply under voltage	12seconds, 100milliseconds	0
4	Left Drive: Lost phase lock on mains supply	2seconds, 200milliseconds	5
5	Right Drive: Mains supply under voltage	100milliseconds	2
6	Right Drive: Lost phase lock on mains supply	250milliseconds	5
Total		29seconds, 750milliseconds	21

Shift activity graph

Live data displayed on any device!

Mining Telemetry



SEE YOUR LIVE DATE AND REPORTS ON ANY OF THESE DEVICES



An abundance of additional features

Mining Telemetry

- CSV and JASON data export: for movement into excel tables or other desired use case
- User Account Control: designate who gets access to Application, and what level of control they have
- SMTP report email service: have reports automatically emailed out to a desired recipient list
- Can be accessed on phone or tablet!
- Azure development platform: providing a robust backbone for the system
- Draws data from installed Telemetry Database, which is capable of syncing with both OPC and ODBC

Data browser

Mining Telemetry

Select desired period

Select what data you wish to query

Customize your output

View raw data values

The screenshot shows the 'Data Browser' application interface. At the top, there are tabs for 'Cycle Time Report', 'Event Report', 'Data Browser', and 'User Configured Report'. The 'Data Browser' tab is active. On the left side, there are several filter sections: 'Time Base' with radio buttons for 'Date/Time' and 'Shift' (selected); 'Shift Time' with a 'Date' field set to '31 Jan 2020' and a 'Shift' dropdown set to 'Shift 24'; and 'Data Element' with a list of items including 'Main Pump Max Current [A]', 'Cutter Max Current [A]', and 'HEARTBEAT'. Below these filters are buttons for 'CSV Export', 'Template', and 'Print'. On the right side, there is a table with two columns: 'Timestamp' and 'Main Pump Max Current [A]'. The table contains 20 rows of data. An arrow points from the 'View raw data values' text to the first row of the table.

Timestamp	Main Pump Max Current [A]
31 Jan 2020 15:00:00.337	55
31 Jan 2020 15:00:00.540	53
31 Jan 2020 15:00:00.737	47
31 Jan 2020 15:00:00.937	46
31 Jan 2020 15:00:01.950	58
31 Jan 2020 15:00:04.573	55
31 Jan 2020 15:00:04.780	51
31 Jan 2020 15:00:04.983	50
31 Jan 2020 15:00:05.387	46
31 Jan 2020 15:00:07.413	47
31 Jan 2020 15:00:07.620	46
31 Jan 2020 15:00:09.027	50
31 Jan 2020 15:00:09.230	55
31 Jan 2020 15:00:10.043	56
31 Jan 2020 15:00:10.277	55
31 Jan 2020 15:00:10.653	56
31 Jan 2020 15:00:14.320	55
31 Jan 2020 15:00:14.527	56
31 Jan 2020 15:00:17.550	55
31 Jan 2020 15:00:18.160	54
31 Jan 2020 15:00:19.373	47
31 Jan 2020 15:00:19.580	82

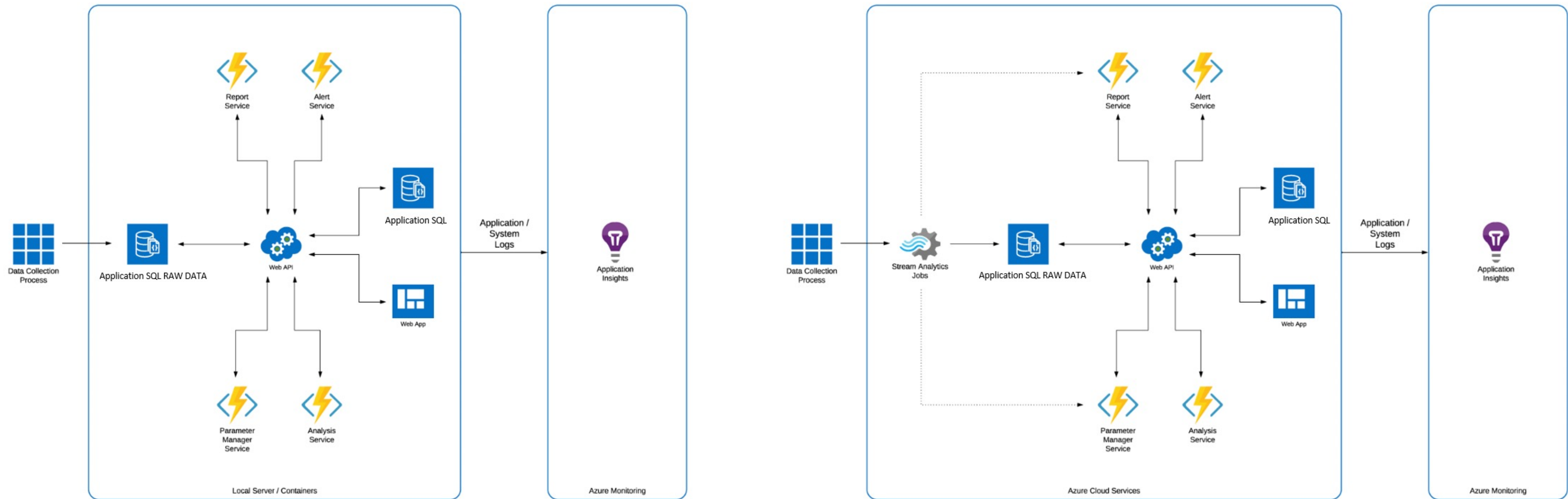
- Data Browser application, allows the user to query any machine data, at any period of time.

- 16
- Exceptionally useful tool when fault finding, troubleshooting and analysing operation process.

Machine to surface, functional overview

Mining Telemetry

Data Analysis / Visualization

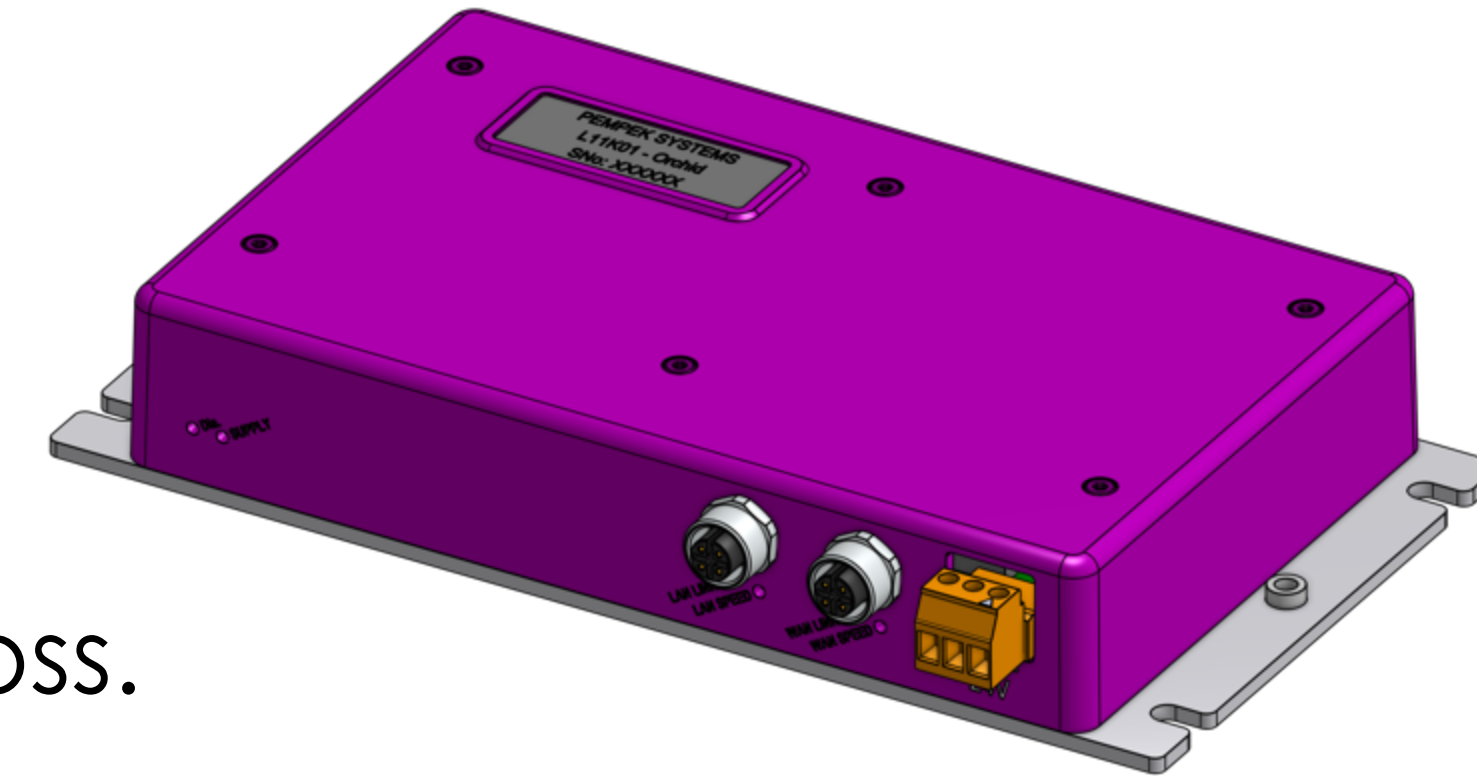


Pempek's Intelligent collector protects against data loss!

Mining Telemetry

NO CONNECTION? – NO PROBLEM WITH PEMPEK ORCHID UNIT

- Provides a point of collection from a number of sources.
- Has on board, data buffer. Data disconnection? No data lost!
- Data connection can be down for up to five days without data loss.
- Once reconnected, collector will feed stored and live data simultaneously.
- Has EIP functionality setup.
- Has Diagnostic tool, which is useful to validate system setup and health.



Nautitech, how we choose to get information from A to B

Mining Telemetry

Data Movement:

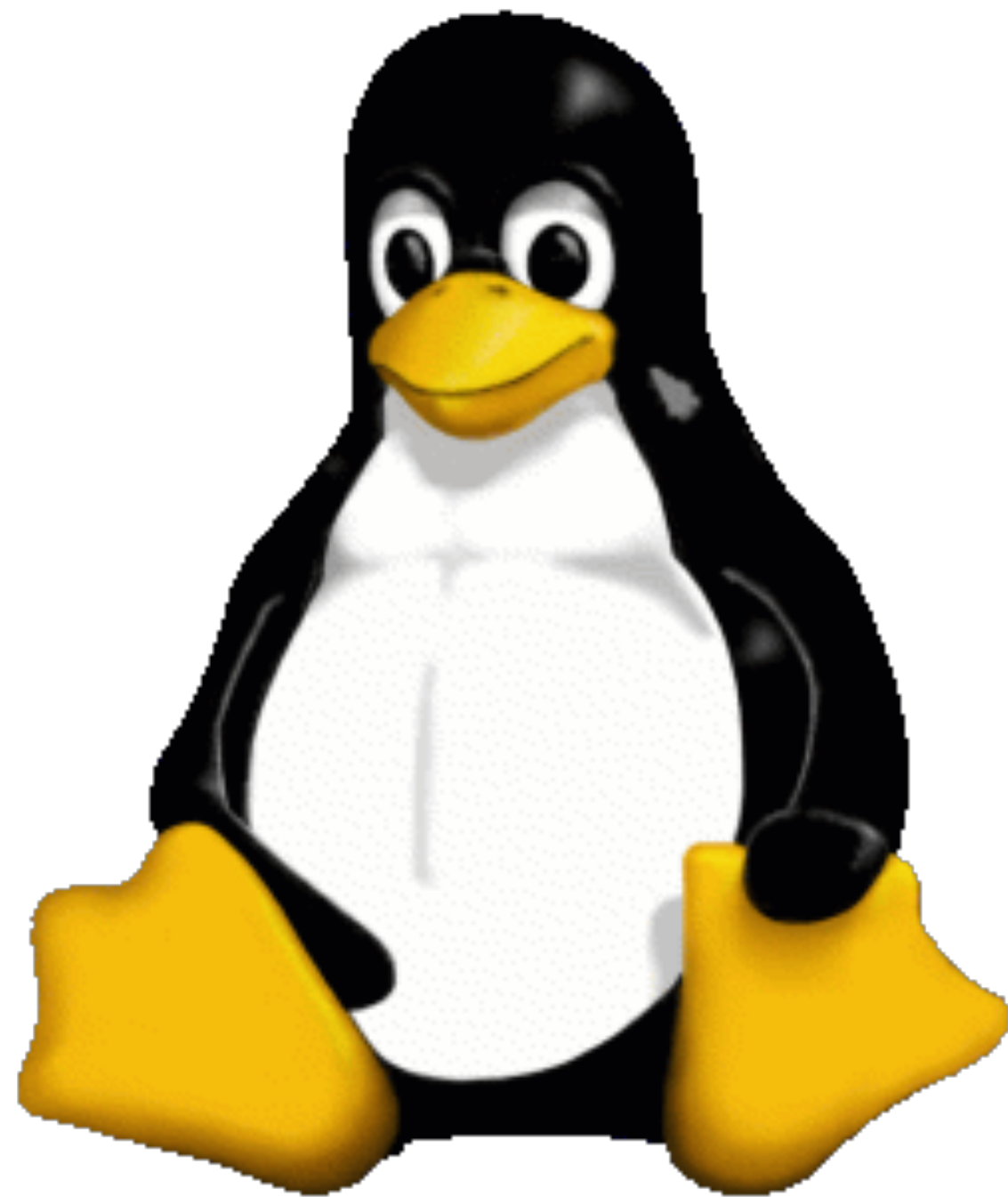
- For establishing a link between machine and server, we have opted to utilize Nautitech, with whom we are having great success with in ongoing projects
- Nautitech Power line solution, the Spitfire, is our top option. It is hardy, needed for a mining environment, and requires little additional infrastructure to implement.
- They also offer wireless solutions, which require more setup, but is certainly an exciting option, looking into the future.
- Finally they too have a Fibre solution, which provides the fastest link, but only works as a solution if it can maintain structural integrity in the target use case environment.

NAUTITECH[®]
DEVOTED TO SOLUTIONS IN HAZARDOUS AREAS



Future proofed with .Net

Mining Telemetry



ROYCE works on any Operating System Platform

ALL the data All the time

- Live collection
- Live capture
- Live storage
- Live display
- Live reporting

- Standard or user generated reporting
- User query function
- Any Operation System
- Local or Cloud data base
- Future proofed

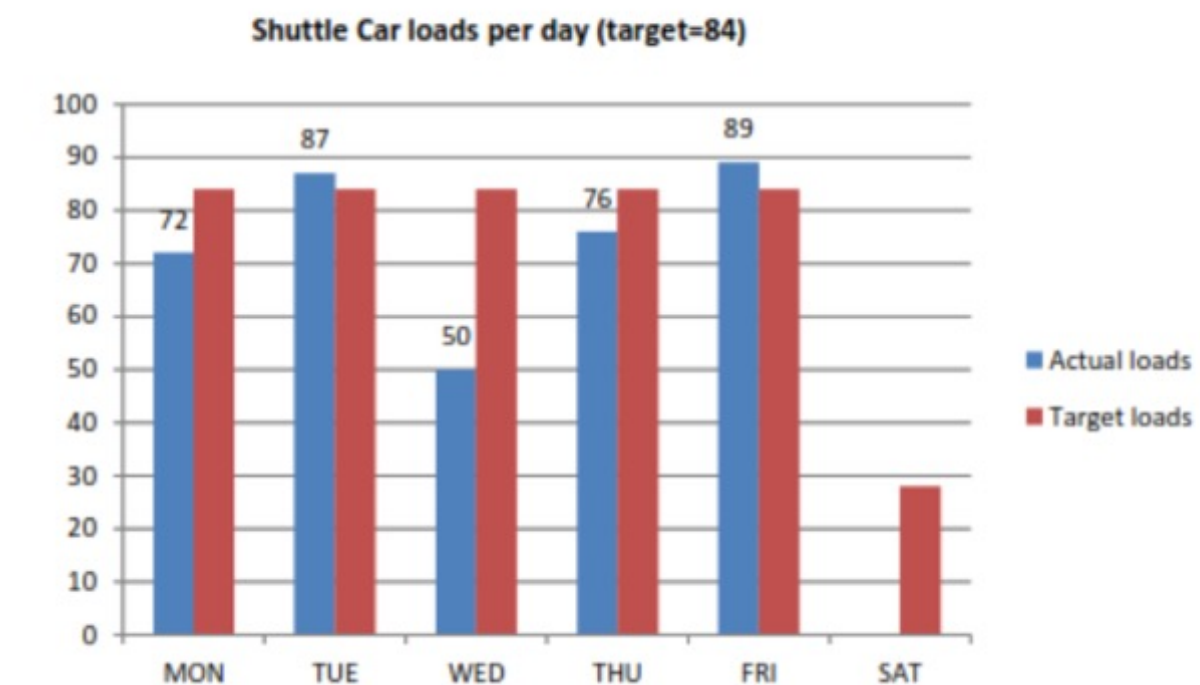
An annual subscription service to keep the platform in the forefront of telemetry practise in mining!

SC WEEK TO DATE KPI REPORT

14/04/2019 23:00 to 19/04/2019 21:45

Mine: Machine ID: 40
 Section: 18 Machine no: SC3272

	Ave. No of loads per shift	Ave. est. tonnes per shift	Ave. travel FB to CM per shift	Ave. travel CM to FB	Ave. late 1 st start up	Ave. early last shutdown	Ave. late 1 st load	Ave. early last load	Total weekly tonnes
ACTUAL									
TARGET									



Fault	Duration	Count
1 Traction Cont supply below limit	100milliseconds	2
2 Machine powered up	15seconds	1
3 Left Drive: Mains supply under voltage	12seconds, 100milliseconds	6
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6 Right Drive: Lost phase lock on mains supply	250milliseconds	5
Total	29seconds, 750milliseconds	21

OTHER FEATURES

- FUNCTIONAL LAYOUT
- INFRASTRUCTURE
- FUTURE PROOFING

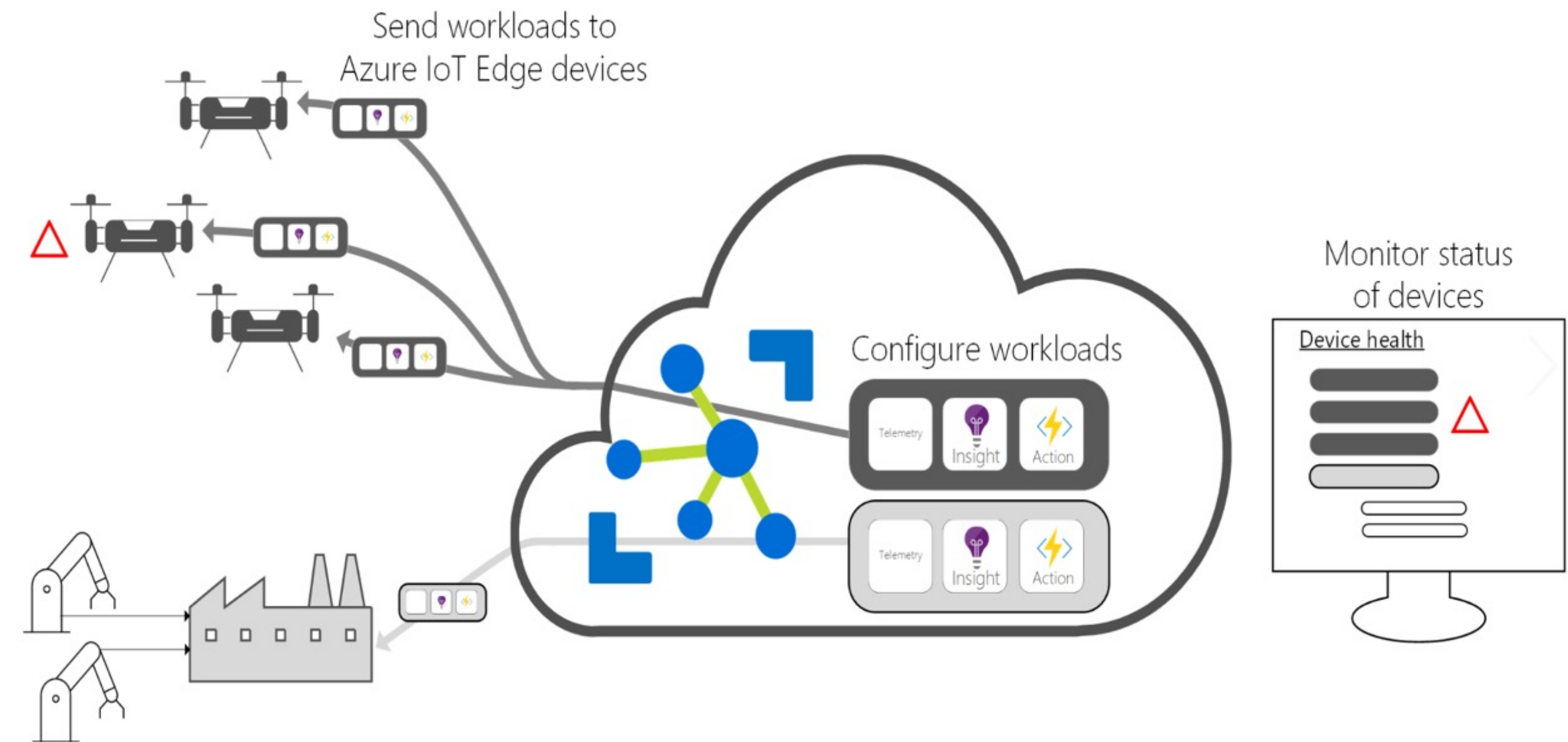
Future proofed with Cloud data

Mining Telemetry

The future of data storage, control and analytics, lies in cloud based systems.

We propose that the platform be redeveloped to support both local and cloud databases.

Taking this step now will prevent costly future redevelopment and bring a major and important upgrade path to your clients.





By clicking on the conveyor image (red coloring shows fault)



Current values of key conveyor tags are displayed

DESCRIPTION	DATA VALUE
Conveyor Current	Value 1
LH Conveyor Max Current [A]	Value 2
RH Conveyor Max Current [A]	Value 3
LH Conveyor Phase A Current	Value 4
LH Conveyor Phase B Current	Value 5
LH Conveyor Phase C Current	Value 6
RH Conveyor Phase A Current	Value 7
RH Conveyor Phase B Current	Value 8
RH Conveyor Phase C Current	Value 9
Conveyor Temperature	Value 10
Conveyor FWD Auxiliary ON	Value 11
Conveyor Motor Water Flow	Value 12

As well as the last 20 faults, with active faults shown in red

FAULT TABLE		
52673	Active	1016-2 No Conv Fwd Feedback
51284	Active	1016-5 R Conveyor Overload
51293	Active	1016-5 L Conveyor Overload
51315	1:50:00 pm	Water Module Valve4 Fault
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53287	1:00:00 pm	Tram Fast Sol OutputFault
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53210	12:50:00 pm	LH e7 FAULT Magnetic Contamination - Spool #1
53211	12:45:00 pm	1030-3 Cutter Ext. Sol OutputFault
53212	12:40:00 pm	HMI REQUESTED PUMP OFF
53213	12:35:00 pm	ModelLight Current Below Threshold
53205	12:30:00 pm	1016-13 No Conveyor Water Flow

Selecting a fault or data element, will bring up an information tab, where previous notes concerning the faults or data can be viewed, and new information can be stored.

ID	DESCRIPTION
52673	1016-2 No Conv Fwd Feedback

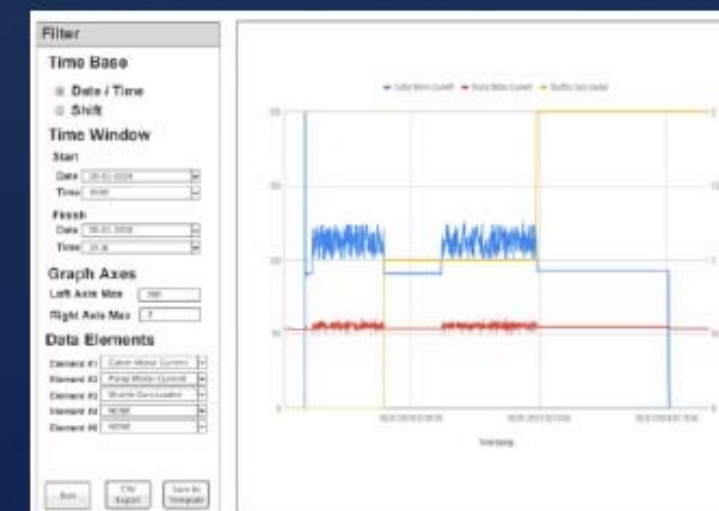
LESSON LEARNT
Check sensor is not loose

We can now select up to 5 data elements or faults

This is an example of how the ROYCE system can seamlessly navigate from general overview, into more detailed analytics and output.

Timestamp	Main Pump Max Current [A]
31 Jan 2020 15:00:00.337	55
31 Jan 2020 15:00:00.540	53
31 Jan 2020 15:00:00.737	47
31 Jan 2020 15:00:00.937	46
31 Jan 2020 15:00:01.500	58
31 Jan 2020 15:00:04.573	55

To generate a graphical output, or simply generate raw data report



Cycle Time Report Event Report **Data Browser** User Configured Report

Time Base
 Date/Time
 Shift

Shift Time
 Date: 31 Jan 2020
 Shift: Shift 24

Data Element

CSV Export Save As Template

Lessons learnt - guide future fault response!

Mining Telemetry

Royce System “Lessons Learnt” Information Feedback

When querying a specific fault, a notes tab will come up displaying information previously stored on the fault.

The user can edit the notes on the fault that can be used to guide a response to a certain fault.

This may have helpful hints from people who previously troubleshooted the issue and allows you to set a breadcrumb trail for people who query the fault after you in order to speedily resolve it!

Event MSG Long Description (Customer Defined) :

“The control system did not detect a 24VDC feedback from the auxiliary contacts of the safety relay SR1. Things to check:

- Relay is correctly installed and wiring is intact
- Check 24VDC power supply to relay coil is OK
- Check 24VDC power supply to aux contact is OK
- Check 24VDC input to module
- Replace Relay”

Royce Cloud “Lessons Learnt”

As more sites come online with the ROYCE system, more information on particular faults can be collected. If permission is granted it, will allow sites to share fault information. Meaning technicians will avoid double work.

Eventually this will develop into a robust troubleshooting library, where any issue will have been seen before, and have some information on the issue stored.

This database will also serve as a means of evaluating machine function and highlight recurring issues, and areas for improvement.

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