

 pegasus dragline monitor

 argus shovel monitor

Plan ▶

Section >

Extending existing Dragline Alarm Functionality using Production Monitoring Systems

Andrew Jessett, Stephen Lochner



mineware

INTELLIGENT SOLUTIONS
OPTIMUM SERVICE

Who are we?

We are an award-winning Australian equipment monitoring company established in 2005

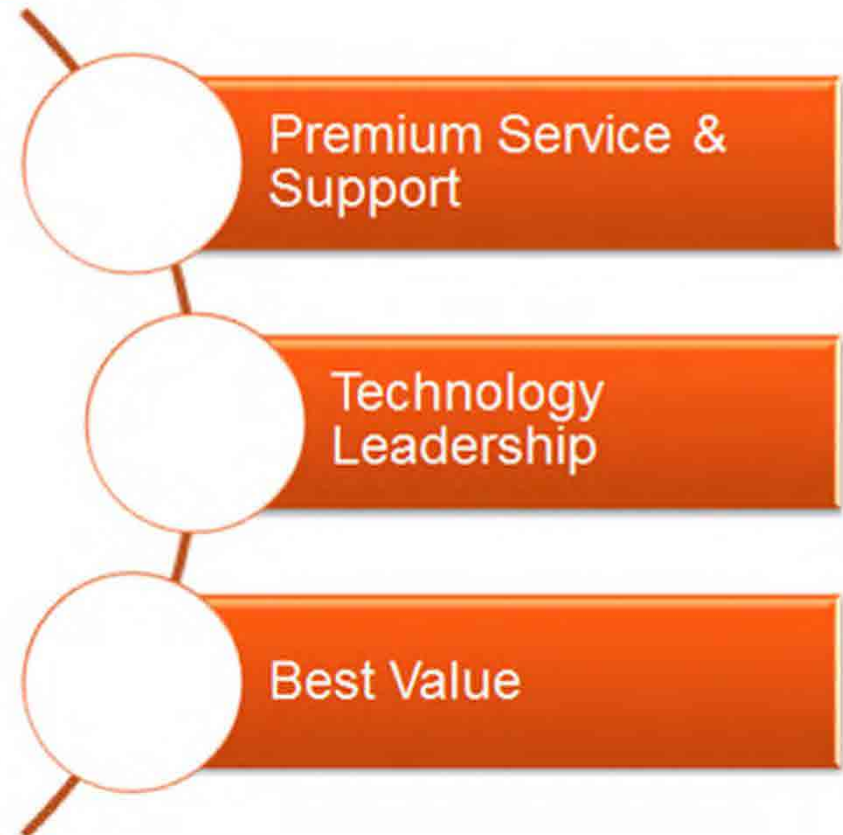
We operate in Australia, South Africa, North America.

We have deployed over 60 dragline and electric shovel monitoring systems.

We assist companies focused on continuous improvement and information assisted mining

Preferred supplier for:

-BMA/BHP -Anglo -Curragh
-BECSA -Xstrata -Peabody Energy



Safety Share – secure your load when driving



ware

Introduction

This presentation summarizes:

1. Recent work done using Pegasys Dragline Monitoring System to augment the way alarms & events are currently managed and used on a dragline
2. How these alarms & events were fitted into a broader remote management framework



How is it currently done?

1. Alarming allows for exception based reporting on events
2. In PLC equipped draglines, alarms are evaluated in a PLC and communicated through an on-board SCADA system to operator/electrician



Drawbacks of current approach...

1. Alarms almost exclusively exist only on the dragline, therefore limited interface or feedback/reporting off-board
2. Alarms can't be added/changed without changing underlying PLC code – this introduces risk!
3. Alarms can't be easily standardized across multiple machines
4. Alarms can only be built on information sets contained in PLC

**We were requested to
try an alternate
approach...**



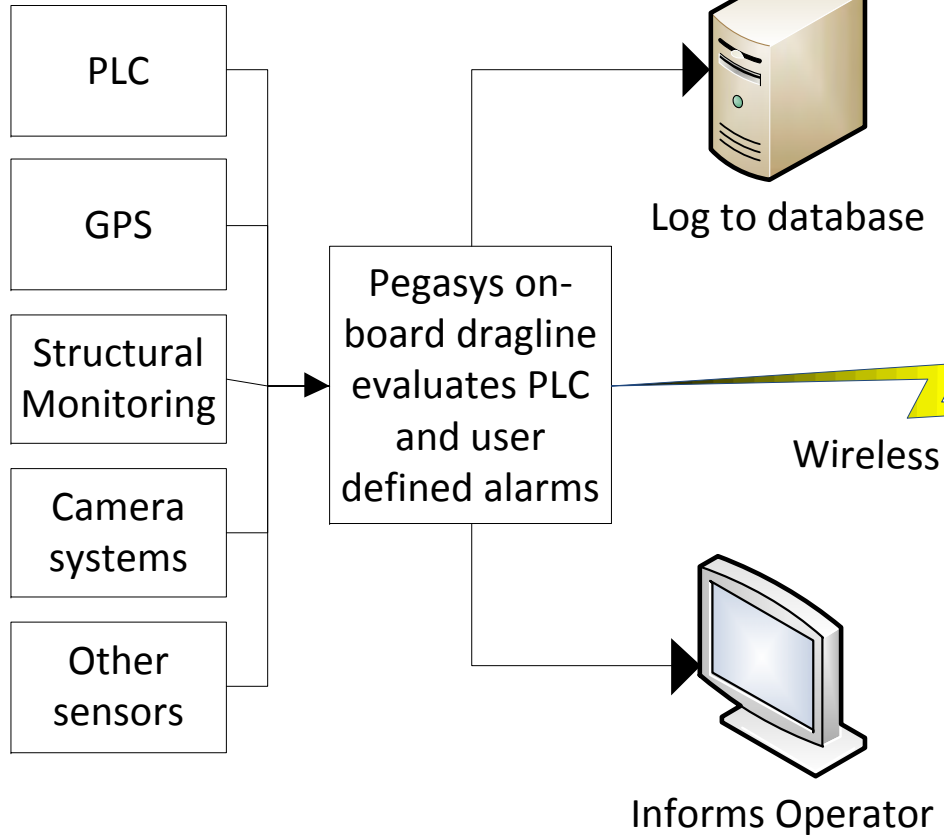
How we have approached it

1. Isolate custom alarming and monitoring from the PLC by delivering through Pegasys
2. Flexibility – custom alarms are created, managed, and reported **from the office** anywhere/anytime
3. Allow for import of alarms from SCADA ensuring full alarm list reporting
4. Allow for alarms to be created using full suite of operational data too: e.g. operator, TSL, location, digging conditions, structural feedbacks, etc.
5. Design so anyone on site can use it



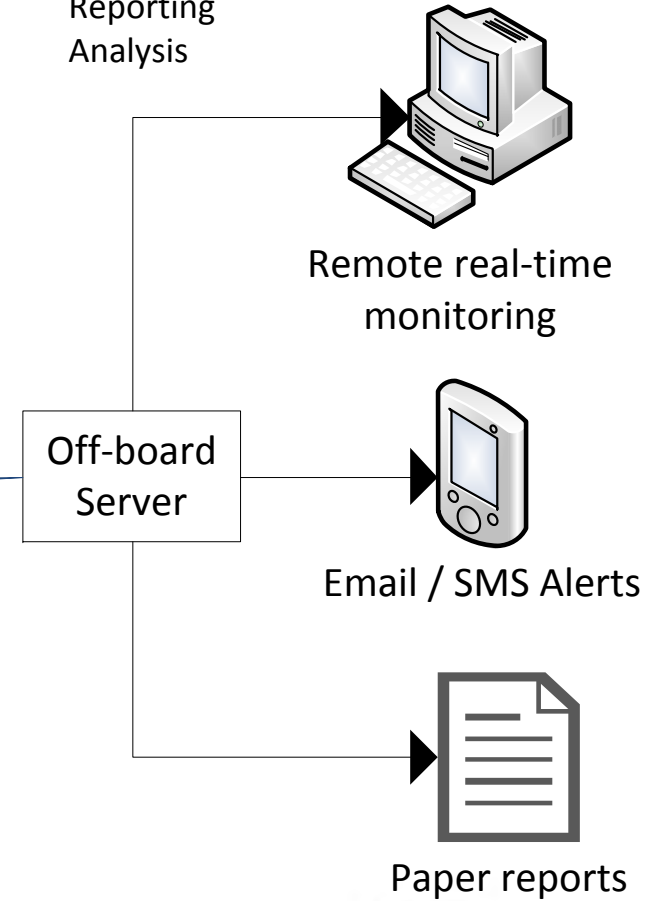
ON DRAGLINE

Gather input data
Evaluate alarms
Store in database
Alert operator



OFF-BOARD

Configure/edit alarms
Real-time monitoring
Reporting
Analysis



Example Screen shot

Draglines Alarms Status

Update Range Scale Down Acknowledge Clear Inactive Alarms

Dragline **Active Alarms: 6** Hoist Motor Field Unbalance Warning - (Waiting On Acknowledgement)

Active Alarms			Top Ten Alarms - 3 Days		
Tag Name	Group	Alarm	Tag Name	Alarm	Count
DRGMCC006	Drag Motor Control Centre	Reserved	PRPPLC007	Shoes Out of Step More Than 10 Degrees and Less Than 15 De...	20
HSTME012	Hoist Motor Exciter Faults	Hoist Motor Field Unbalance Warning	DRGGF012	Drag GF Power Off or Drive Fuse Blown	4
PLCFLT023	General PLC Faults 1	Tristrustructure Head Section Pressure Loss	DRGMCC005	Reserved	3
Reserved	Swing Motor Exciter Faults	Reserved	DRGMCC006	Reserved	3
SWGMC007	Swing Motor Control Faults	Swing ME Transformer Breaker Open	HSTME012	Hoist Motor Field Unbalance Warning	3
DRGMCC005	Drag Motor Control Centre	Reserved	PLCFLT023	Tristrustructure Head Section Pressure Loss	3
			PLCFLT020	Low Air Pressure	3
			HSTPLC013	Hoist Limits Disabled	3

Alarm Log - 3 Days					
Tag Name	Group	Alarm	On Date/Time	Duration	
PLCFLT020	General PLC Faults 1	Low Air Pressure	24/10/2012 10:02:28 AM	00:00:36	
HSTGF011	Hoist Generator Faults	Hoist RLC Card Fault	24/10/2012 8:20:53 AM	01:04:13	
HSTGF012	Hoist Generator Faults	Hoist GF Power Off or Drive Fuse Blown	24/10/2012 8:20:53 AM	01:04:13	
BBGF012	Buck Boost Generator Faults	Buck Boost Power Off or Drive Fuse Blown	24/10/2012 8:20:53 AM	01:04:13	
DRGGF011	Drag Generator Faults 1	Drag GF RLC Card Fault	24/10/2012 8:20:53 AM	01:04:13	
DRGGF012	Drag Generator Faults 1	Drag GF Power Off or Drive Fuse Blown	24/10/2012 8:20:53 AM	01:04:13	
PLCFLT063	General PLC Faults 2	Motion Kirk Key Interlock Open	24/10/2012 8:20:49 AM	01:00:05	
PLCFLT062	General PLC Faults 2	Motion Disable Switch Open	24/10/2012 8:20:35 AM	01:00:19	
PLCFLT045	General PLC Faults 2	Stairway Down	24/10/2012 8:19:53 AM	01:03:13	
HSTPLC013	Hoist Related PLC Faults	Hoist Limits Disabled	24/10/2012 6:49:36 AM	00:00:10	
DRGPLC018	Drag Related PLC Faults	Drag Slack Rope Detection Activated	24/10/2012 6:48:23 AM	00:00:44	
HSTPLC013	Hoist Related PLC Faults	Hoist Limits Disabled	24/10/2012 6:46:35 AM	00:00:08	

Create an alarm from the office

The image shows two overlapping windows from the Mineware software. The 'Edit Alarm Details' window is in the foreground, and the 'Expression Editor' window is behind it.

Edit Alarm Details Window:

- Name: DPT Starter Current Unbalance
- Enabled: Enabled
- Bit Offset: 6
- Bit Value: 1
- Little Endian: Little Endian
- Big Endian: Big Endian
- Description: (empty)
- Tag Name: ACMCC006
- Severity: Information
- Technical Description: (empty)
- Expression: [Dragline 302#ACMCC001_031]
- Threshold (ms): 0
- Log: (circled in red)
- Email: (circled in green)
- Email Subject: DPT Starter Current Unbalance
- Email Address: support@mineware.com.au;trenner@mineware.com.au
- Separate multiple addresses with a semicolon :

Expression Editor Window:

- Update Expression:
#utm_coord_aeri_number_of_sats] < 6
#utm_coord_aeri_gps_fix_quality]< 4
- Datapoint list:
 - Easting
 - Northing
 - Altitude
 - Heading
 - Horizontal Dilution of Position
 - Last DGPS Update Time
 - Number of Sats
 - Fix Quality
 - DGPS Station ID
- Operators: +, -, &, *, /, |, (,)
- Comparators: <, >, <=, ==, >=
- And, !=, Or
- Clear
- Function list: Abs, Acos, Asin, Atan, Atan2, Cos, Cosh, Exp, IIF



Benefits

- Alarms can be created/changed/configured without any changes required to the control PLC on the machine
- Anybody on site can fully interact with the alarm system and receive the benefit of exception reporting – anywhere / anytime / real-time
- Alarms can be built on complex expressions using data-points not generally available in the machine control system, i.e. production information, operator, machine location, etc.
- Off-board reporting of alarm occurrences can be integrated with production reporting so a fuller picture of machine performance can be gained
- Standardised alarms can be easily replicated across multiple machines / sites



Case study 1

1. A dragline was experiencing overheating on its hoist motors and subsequent downtime and repair costs
2. A threshold alarm was quickly created by on site electrical engineers using Pegasys's five minute RMS calculation on armature current to indicate temp.
3. Emails were created from this alarm which then alerted engineers when overheating was occurring. He could then get on to operator to take remedial action – i.e. reduce bucket load.

Case study 2

1. A dragline superintendent was concerned regarding bucket change times
2. He created an alarm in this system based on a bucket change delay exceeding a set time
3. An email was sent to him whenever this occurred so he could be immediately notified and take follow-up action

**We see alarming as a
key component of
remote monitoring...**



Remote Monitoring

Providing full visibility of operations from anywhere at anytime.

Remote monitoring is about resource leveraging – getting the most out of key people



mineware

mRoc Desktop – X-Y Plots



Remote Monitoring

Safety

- **Removes the need for Mechanics/Technicians from:**
 - Having to drive miles to a machine
 - Be exposed to the inherent tough walking surfaces of the pit
 - Stop production and get on machine
 - Plug into PLC and watch performance
 - Stop production again and get off machine
 - Walk & Drive back to office
- And how many times has someone shown up to a machine to find it is down or doing the incorrect digging needed for the analysis?



Remote Monitoring

Performance

- **Being able to remotely access and check out each machine from the office in about 10 minutes means generally in an hour, the site technician can figure out:**
 - Which machine(s) need to be tuned
 - Which loop/motor/generator needs to be tuned
 - When to go down so machine is available for tune up
 - **Prioritize & Schedule tune-ups**



Review:

- Better alarm integration and remote monitoring allows for a fuller, broader picture of machine operation, from anywhere at anytime
- Lowers risk by reducing requirement to change PLC code
- Alarms can also be built off production data allowing for more immediate attention to key issues
- Machine alarm/alerts are available to anyone at anytime



mineware

Thank you!

Stephen Lochner

S.Lochner@mineware.com

(m) +1 720 347 5308