

E H – Progress and Challenges

EH 2013



Roy Freeland, President

1. Commercialisation
2. Applications
3. Standards
4. Research and Government support

1. Commercialisation

- Enocean
 - Not \$1.4bn forecast but very high volumes - millions
 - Particularly in Buildings
 - Using switch operation, photovoltaic and thermal
 - Ultra low power radio
 - Simple star networks, short range
- Many Photovoltaic applications
 - Issues with maintenance and lifetime
- 802.15.4 WSN's
 - ISA100.11a, WirelessHART, Zigbee, WIA
 - Progress slow- standards resolution, long field trials
 - Now 100,000 + p.a. industrial (excl. Zigbee)

enocean alliance
No Wires. No Batteries. No Limits.



>250.000 Building Projects Successfully Deployed



**Office Tower Buildings
& Corporate HQs**



Hospitality



Hospitals



Schools, Colleges & Nurseries



Retail



**Historical / Listed
Buildings**



Industrial Plants



Residential

London Buses



PUSHING ALL THE RIGHT BUTTONS

Bell pushes are an essential part of everyday bus operations. However, due to their simple functionality they can be easily overlooked when it comes to designing the next generation of buses.

By Andy Overend, Sales Manager, BMAC Ltd



2. Applications

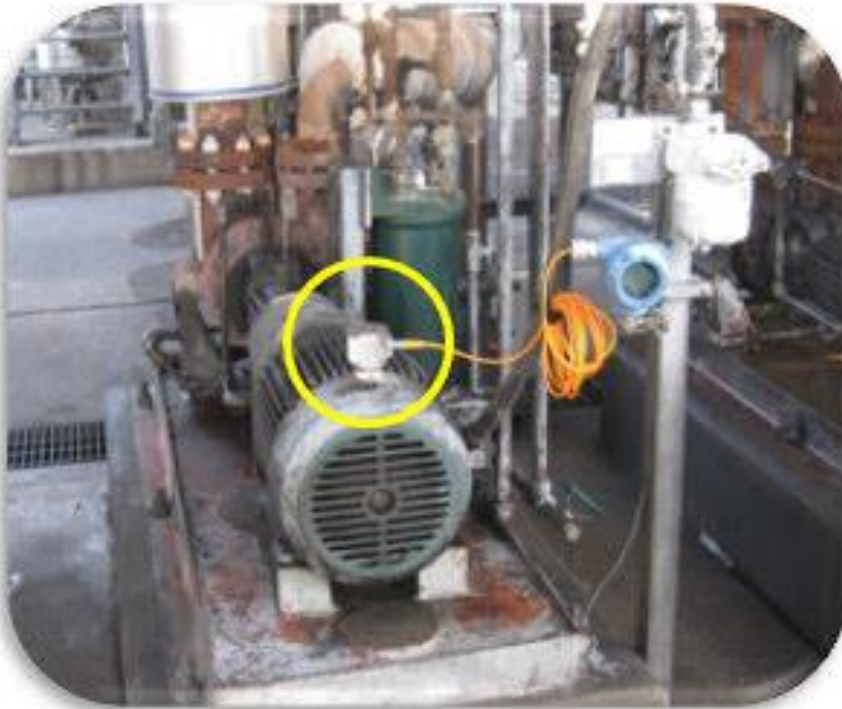
- *My perspective - focussed on 0.1-30mW for WSN's*
- Industrial Machinery Monitoring
 - Power Generation
 - Petrochem
 - Oil and Gas
 - Water treatment
- Process Monitoring
 - Chemical Plants
 - Food, Brewing
- Rail



Machinery/Equipment Health

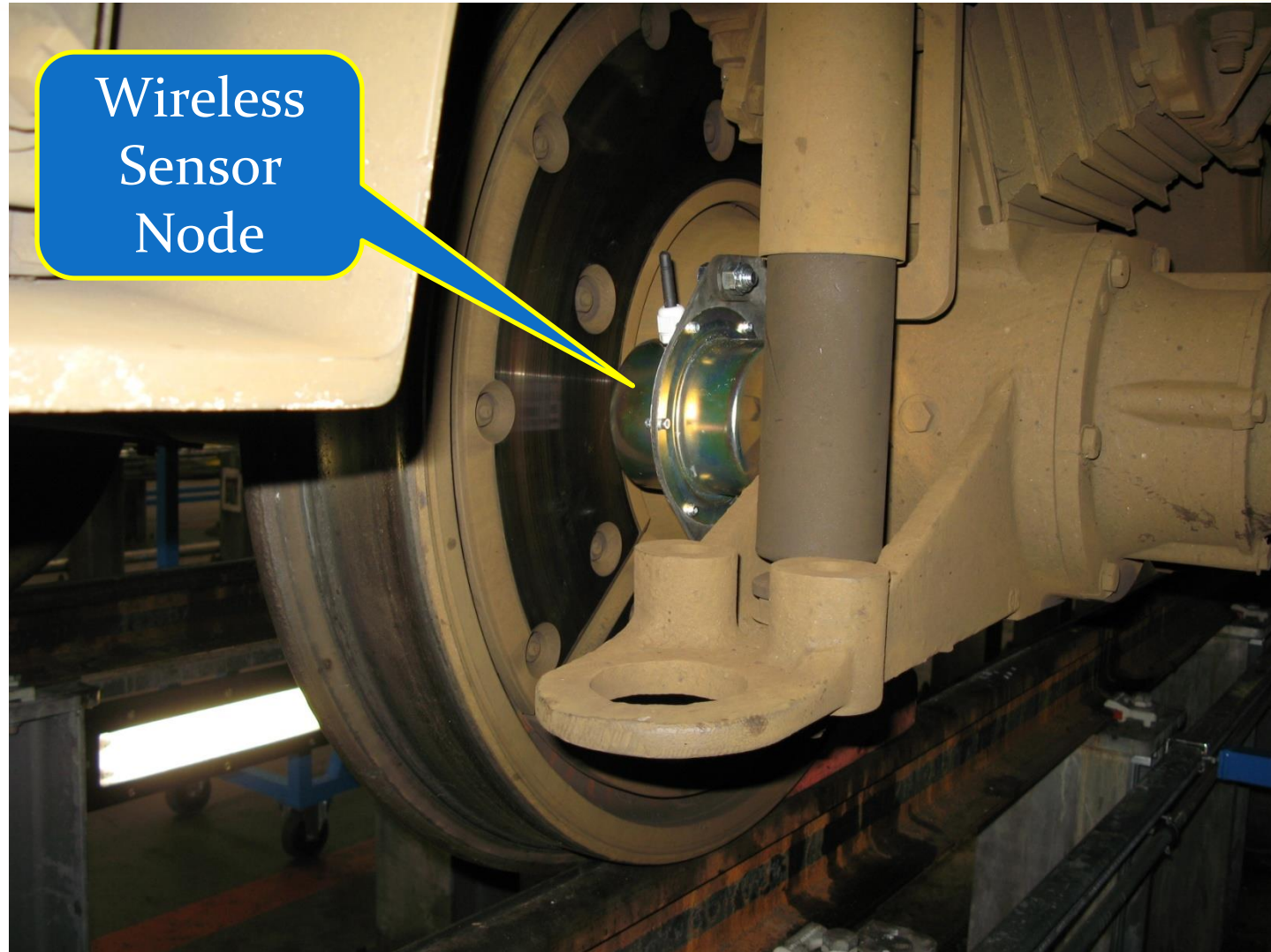


Process monitoring



- Large market potential
- High vibration Levels but NOT fixed frequency
- Applications on passenger trains
 - Wheel bearing monitoring
 - Drive train monitoring
- Freight Wagons
 - Many opportunities – no power available

Example of WSN Installation



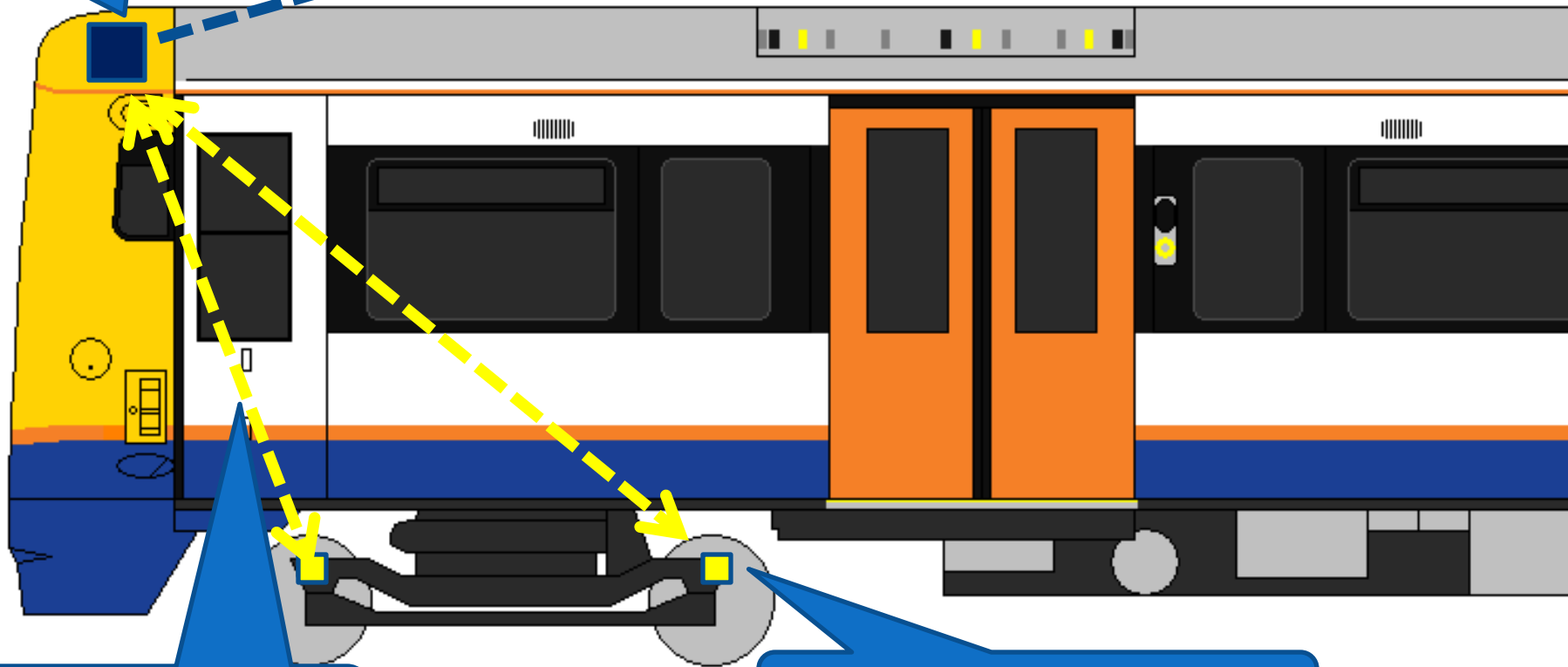
On Board Communications

Data Concentration
Module

Data Download Via
Cellular Network

On Train
Communications

Wireless Sensor Node



Bearing Health Display

Monitryx Bearings - Home / Search

Current Version: 1.3

You are currently looking at data for: London & South Eastern Railway Limited

Colour Coded
Display

Filter / Search:

Show: Bearing Health Index
Unit: All Units
Reported In: All Time
Show BHI: All Categories
Sort By: Worst Unit First
Show Empty: ☐

filter reset

Summary:

Unit	Reported	#Cat 1	#Cat 2	#Cat 3
375821	03/08/12 11:14	5	2	0
375803	02/08/12 19:54	1	1	0
375820	01/08/12 17:28	1	0	0
375810	03/08/12 15:22	2	0	0
375811	03/08/12 07:48	1	0	0
375808	02/08/12 15:28	0	0	0
375816	03/08/12 16:20	0	0	0
375805	02/08/12 12:02	0	0	0
375804	03/08/12 09:11	0	0	0
375801	03/08/12 14:54	0	0	0

Unit Overview:

Unit	Vehicle(s)
375821	 73321  79021  78221  73721
375803	 73303  79003  78203  73703
375820	 73320  79020  78220  73720
375810	 73310  79010  78210  73710
375811	 73311  79011  78211  73711
375808	 73308  79008  78208  73708
375816	 73316  79016  78216  73716
375805	 73305  79005  78205  73705
375804	 73304  79004  78204  73704
375801	 73301  79001  78201  73701

Wheel Loc: DA2
Bearing S/N: E703
Last Reported: 17:28 01/08/2012
BHI: 1.516
Av Temp [oC]: 28
Max Temp [oC]: 28
[View Graph](#) | [Close](#)

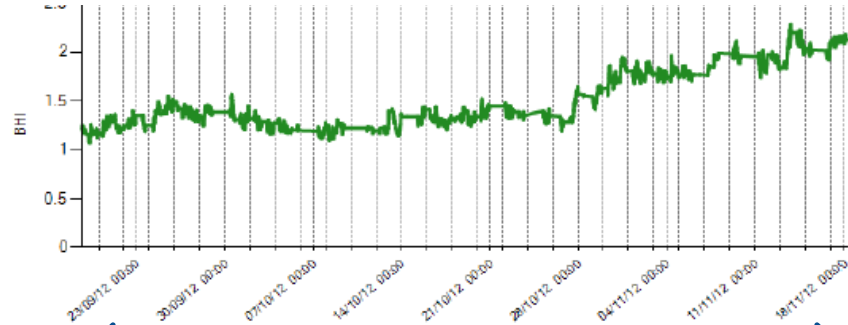
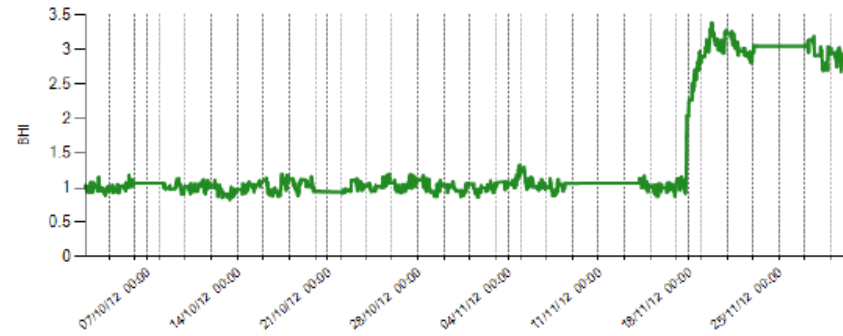
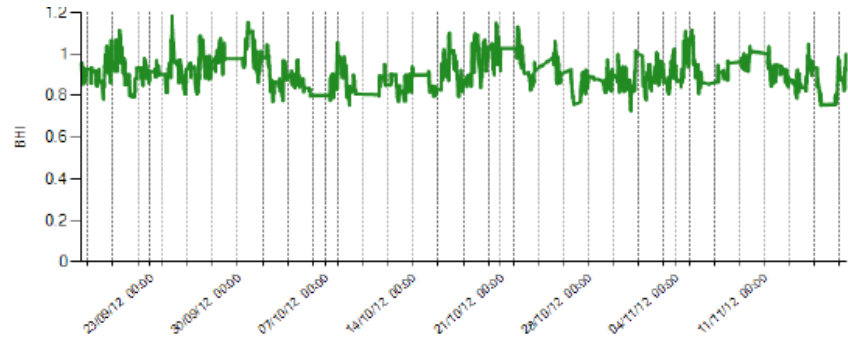
Summary
Data for that
node

Vibration Data

Good Bearing

Onset of Flat

Degrading Bearing



2 Months

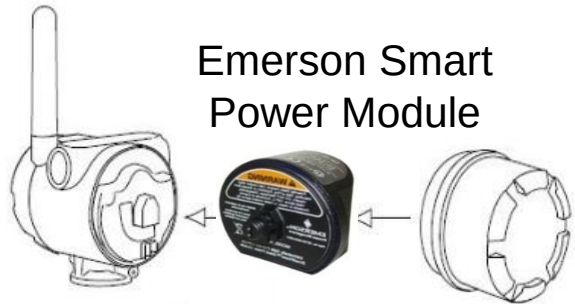
3. Standards

- Standards give end users confidence
- ISA100.18 Power Sources Working Group
 - Standards for interchangeability
 - Finalising draft
 - New Emerson Intelligent Power Module
 - 8V DC and 1mW plus



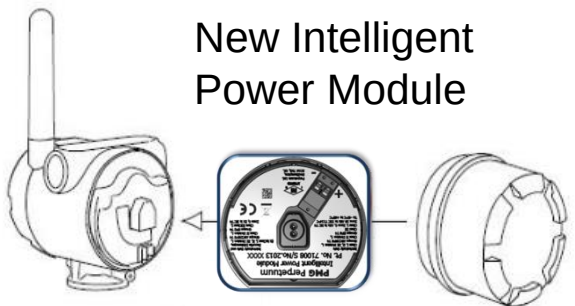
GEHAM

Today vs. Tomorrow



Emerson Smart
Power Module

Limited Battery Life-cycle



New Intelligent
Power Module

Maximized Battery Life-cycle



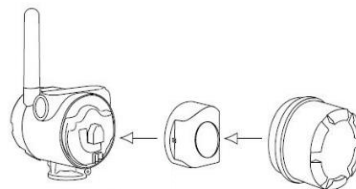


perpetuum

Intelligent Power Module (IPM)

Interchangeable

Same form, function & fit as existing
Emerson Smart Power Module



Capable

Intrinsically Safe

- Can be changed in Hazardous areas
- No need to remove from process
- Failsafe / Keyed connection
- Short circuit protection
- Easy to replace –
No special training required



- Add external power anytime

Vibration, Thermal (Micropelt, Perpetua)
or 24VDC inputs

- Maximum life at fast update rates
- Minimized maintenance
logistics

Robust

- Designed for Harsh Environments
- Hazardous / Remote / Safety Restricted Areas



4. Research & Govt. Support

- Very large numbers of research projects – it's fun!
- Technology Strategy Board
 - Energy Harvesting one of 8 priority initiatives
 - Energy Harvesting Special interest Group
 - EPSRC funded EH Network
- Many sources of funding available for Energy Harvesting
 - TSB Energy Harvesting **applications** competition
 - EU Funded
 - Triade
 - Zeropower
 - Materials solutions for durable energy-harvesters
 - WiBRATE – next step



Wireless, Self-Powered Vibration Monitoring & Control for Complex Industrial Systems



University of Twente
Pervasive Systems | Applied Mechanics
www.utwente.nl



Inertia Technology B.V.
www.inertia-technology.com



Centro Ricerche FIAT S.C.p.A.
www.crf.it



Honeywell Technology Solutions Lab Pvt. Ltd.
www.honeywell.com



LMS International NV
www.lmsintl.com



Università della Svizzera italiana - ALaRI
www.alari.ch



Perpetuum Ltd.
www.perpetuum.com

- Harvesters
 - Enough Power from available energy sources
 - Lifetime/reliability
 - Interchangeability
 - Certification and specification etc for application
- Energy storage
- Credibility
- Low power data transmission
 - Excellent progress reducing power for sensors and microprocessors
 - Data transmission is now limiting factor
 - Limited by physics?
- Turn all the investment and funding into real applications

- Real progress with rapidly growing volumes of Energy Harvesting
 - Applications with clear benefits
- New applications
 - Process monitoring
 - Rail
- Challenges
 - Get out of the lab into real world
 - Data transmission
 - Innovate