OUR VALUES

Act with Integrity

Operate with Excellence

Care for People
Alcoa Corporation – a proud 128 year history

- Inventors of the original aluminium process
- World's largest bauxite mining portfolio and a leading alumina producer
- 2017 sales revenue at $US11.7 billion
- Award-winning sustainability leadership
Three segments across the aluminium value chain

**BAUXITE**
Geographically dispersed mines with a premier low-cost position

**ALUMINA**
Eight refineries on five continents with access to growth markets in Asia, Middle East and Latin America

**ALUMINIUM**
Global aluminum producer with a proven ability to drive technology advancements
Global Strength:
- 14,000 employees
- 25 manufacturing facilities
- 10 countries
Wireless as an enabling technology Vision

Objective
- Provide a engineered, secured, managed & integrated wireless network into Alcoa Alumina refineries process areas.
- Supporting ISA100 Wireless™ instruments and sensors
- Supporting mobile operators using handheld devices
- Allow for wireless connectivity of PCS/EHM equipment that is either remote or mobile
- Enabling IIOT and IOT in the future

Benefits
- Reduce capital expenditure of installing hardwired process/condition monitoring instruments or sensors
- Speed of deployment
- Mobility of sensors and instruments to be moved around to troubleshoot or perform trials as required
- Support mobile operators out in the refinery process areas
- Monitor moving equipment now possible with standard devices
- New opportunities waiting to be found…
The ISA100 Wireless standard

- The ISA100 Wireless standard is an open communications protocol

- The Standard is flexible to supporting a wide range of application layer and sensor layer protocols, i.e. Profibus, HART, Fieldbus Foundation, etc.

- The Standard uses the OSI seven layer model for design basis, leveraging existing standards and interfaces

- The ISA100 Wireless standard incorporates a two-layered security methodology at Link Layer and Transport Layer

- Physical and data link layers use the IEEE 802.15.4 radio standard referencing the 2.4 GHz frequency band for global deployment

- Allows users to define sensor star topology or mesh networks, providing user flexibility of security or battery life
Typical process area heat map coverage
Installation challenges

• Upfront engineering and site survey
  • Perform site survey and engineering study
  • Build in security and robustness upfront for Wi-Fi access and ISA100 network segregation
  • Build in wireless training and awareness with site stakeholders (Wireless means different things to different people)
  • People change management (Wireless is not a plug and play/pray solution)

• Instrument quality 110VAC power supply
  • Limited existing 110VAC circuits available
  • Developed engineering solution to harvest 110VAC from existing field instrumentation
  • Providing power segregation to wireless access point to maintain wireless coverage in the event of a power outage to any single 110VAC circuit
  • Don’t under estimate cost and complexity for powering up field mounted wireless Access Points

• Physical installation
  • Utilised existing lighting break back poles for mounting wireless access points, for easy and safe access during maintenance
  • Access points installed high up on existing building without requiring additional dedicated towers
  • Wireless coverage redundancy was achieved to allow for single access point failure
  • Meshing access points where never more than 1 hop away from a root access point. Installing fibre to every access point in a brown field installation is expensive.
In addition to COTS wireless ISA100 Wireless instruments available, Alcoa is working with ISA100 Wireless instrument vendor to develop:

- Lower cost lightweight wireless pressure transmitter that can be used as wireless pressure gauge
- Wireless safety shower panic button
- Wireless push button that can be used in multiple of installations and applications including pulsed version for operator rounds timestamping
- ISA100 Wireless serial interface that can be used on speciality analysers developed in house based on a small PI

- Actively seeking to find a ISA100 Wireless power transducer to retro fit onto older Motor Control Cubicle
- Seeking lightweight, low cost ISA100 Wireless temperature probe that can be used to quickly assist in fault finding and monitor process upset with minimal installation overhead
- Seeking ISA100 Wireless signal strength dongle to connect via Bluetooth for wireless field survey
Rapid deployment of wireless transmitter for fault-finding (~2 hour implementation time)

Line pressure measurement in an unmonitored line
Using wireless instrument provides more options to solve problems

- Using a standard wireless Differential Pressure transmitter to measure rotating rake height.
  - OEM solution required slip rings and hardwired solution
Rapid deployment of wireless instrument to monitor process conditions

Temporary wireless DP cell measuring pressure drop across a heat exchanger
**Process Automation**

We use our wireless infrastructure to fill data gap rapidly.

**Innovation cycle:** use plant data, identify new opportunities, test ideas and implement.

**Plant-wide process models, rich data, advanced analytics and agility = continuous improvement**

We are continuously defining opportunities for improvement.

**We use our wireless infrastructure to fill data gap rapidly.**

*Plantwide wireless mesh*  
*From installing wireless device on process to having process data: duration one day*
Alcoa wireless journey

Established ISA100 Wireless as global standard
- Installed wireless infrastructure as an enabling technology
- Established engineering standards
- Developed wireless preferred equipment list
- Deployed standard wireless training modules, support process and remote monitoring

Wireless instrument deployment
- Developed wireless instrument selection criteria over conventional wired instruments
- Established Wireless Advisory Board to provide governance over wireless technology implementation
- Worked with vendor to develop specific ISA100 Wireless instruments

Enabling future technology
- IIOT, IOT, Data analytics
- Providing secure reliable wireless infrastructure and sensors
- Rapid deployment of new sensors
- Lower capital intensity
- Maintaining corporate advantage

Future
- More wireless sensors
- Less wired sensors
- Connected work force

Enabled WiFi in process area
- Supporting corporate Connected Worker initiative globally
- Broadcasting corporate Shop Floor SSID seamlessly between corporate IT and Process wireless networks
- Developed generic ISA100 Wireless serial interface for specialty instrument based on small PLC
- Developed wireless instrument policy for use in Advance Process Control Scheme and standard error checking and validation code