Engineering asset management for large infrastructure in the resources sector

Tomorrow’s technology today
AOG AUSTRALASIAN OIL & GAS CONFERENCE

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Today’s asset management industry

• 4\textsuperscript{th} industrial revolution is bringing together digital and physical systems
• Highly integrated and situation-awareness systems with a significant portion of embedded intelligence
Vision of tomorrow's asset management

- Smart
- Highly dynamic
- Customized
- Resource-friendly industry
Proposal on ARC Industry Training Centre for Smart Asset Management in Resource Sectors

- Develop strong smart asset management capacities
- Track records to improve the operation and maintenance productivity
- Reduce the cost of long-term and near-term maintenance in the resources sector
Industry-driven innovative research

The Centre will develop and validate new approaches towards a new era of smart asset management to enable life cycle operation and maintenance management in the resource sectors.
New approaches

- Engineering asset modeling and performance management
- Predictive planning
- A collaborative supply chain ecosystem
- Automated site execution
Asset management

Includes the care and maintenance of major, large and critical equipment, is a major determinant of productivity in mining, oil and gas industries
Knowledge on the asset performance

• Gives critical context for engineering models to determine asset performance, state-of-health, and the needs for proactive maintenance

• Without accurate and well-profiled asset data, it is very challenging to recognize, predict, and appropriately act on issues that otherwise affect production

• Affected industries need to close the gap across the associated processes
Benefits of the Training Centre

With the support of ARC Industrial Training Centre program, Curtin University will work with an array of selected industrial partners who form a representative value chain, to create smart asset management through developing intelligent asset management and automated onsite executions.
Research Themes

1. Engineering Asset Modelling and Performance Management
   • Topic 1.1 Asset Digitalisation
   • Topic 1.2 Asset Performance Monitoring
   • Topic 1.3 Real-time Data Analytics

2. Predictive Planning for Strategic Asset Maintenance
   • Topic 2.1 Life Cycle Optimal Maintenance Strategy
   • Topic 2.2 Predictive Maintenance Planning
   • Topic 2.3 Intelligent Planning with Real Time Production Data

3. Eco-System of Collaborative Supply Chain
   • Topic 3.1 Virtual Supply Chain Alliance
   • Topic 3.2 Collaborative Supply Chain Modelling
   • Topic 3.3 Supply Chain Decision Making

4. Automated Site Execution
   • Topic 4.1 Onsite Workflow Improvement
   • Topic 4.2 Dynamic Site Control
   • Topic 4.3 Health and Safety Alert

Curtin University
Theme 1: Engineering asset modelling and performance management

• To develop an Internet of Things (IoE) integrated digital asset (e.g., a virtual plant, or a 3D mine site) where real-time performance of major assets is monitored

• All the status data in the digital asset can be readily and effectively translated into maintenance planning decisions

• Real-time data will allow us to know the state and location of every piece of equipment in a production line at every second
Theme 2: Predictive planning for strategic asset maintenance

• To develop a suite of innovative approaches and processes of predictive planning for long-term and near-term maintenance

• The prediction is not only based on historical performance data but also real time changing data

• Determining the probability of failure of specific components—rather than using a traditional time-based approach—could help reduce maintenance expenses and prevent unplanned interruptions
Theme 3: Ecosystem of collaborative supply chain

• To establish an ecosystem of collaborative supply chain to improve their procurement productivity of daily operation and maintenance
• Some suppliers are charging less in one field than another; some crews have fewer failures than others; one supplier has lowered the cost of an entire class of suitable products
• Advanced analytics methods will be developed to execute a massive analysis of all the available suppliers’ data, normalize them, and identify opportunities for cost savings that can be leveraged for future operations
Theme 4: Automated site executions

• To implement highest automation in the site execution stage so that the efficiency of on-site implementations of the operation and maintenance strategies can be improved and the health and safety of on-site employees can be warranted
• Comprehensive optimization strategies, such as resource dispatching, heavy equipment movements, or logistic planning for operation automation will be investigated as a potential solution
• Despite significant investments in operational technologies, industry is particularly struggling in using remote and real-time operation
Conceptual Framework and Industry Partners

- Training Input:
  - PhDs and RFs
  - Research team & supervisors
  - Site visit & test bed provided by partner industry
  - Expert consultation
  - Internship funded through partner industry
  - Partner investigator mentors

- Expert Output:
  - Novel and effective training paradigm
  - Quality research advancing asset management
  - Agile industry adoption
  - Academic industry and society bonding
  - Mentoring skills development

- Industry Benefits:
  - Highly trained staff from university
  - Long term university & industry partnerships
  - Staff professional development
  - An industry-supported PhD and RF pipeline

Programs:
1. Engineering Asset Modelling and Performance Management
2. Predictive Planning for Strategic Asset Maintenance
3. Collaborative Supply Chain Ecosystem
4. Automated Site Execution

Partners:
- Curtin University
- Queensland University of Technology
- University of South Australia
- University of Texas at Austin, USA
- Hong Kong Polytechnic University
- Sandvik
- Barmac Limited
- Mining3
- Asset Institute (CRC for Infrastructure and Engineering Asset Management)
- UGL
- Huawei
- Curtin University
Research Team

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Significance

**Smart Asset Management** adopts a unique and innovative approach to bring operators and contractors together to develop more efficient life-cycle approaches to asset management. This is achieved by:

- applying disruptive technologies, dynamic maintenance planning, collaborative supply chain and automated site executions and
- creating a highly skilled workforce to implement these integrally designed solutions
Outcomes

- Innovative integration between information modelling technologies for supply chain tracking
- Collaborative supply chain organization and new models for the industry
- Advanced workflow of asset maintenance at site to minimize redundant processes and guarantee process
- Automated processes and notification system for dynamic site control
Impact

- The centre will provide **multi-disciplinary research training opportunities** for research staff, students, industry partners, and peak industry bodies in information modelling, advanced sensory technologies, optimisation, and data analysis approaches and in emerging areas such as automation in maintenance, supply chain management and lean workflow improvement.

- Through extensive industry networks and direct engagement with six companies from mining, oil and gas sectors, this centre will create **an open engagement model** and provide a focal point for **innovative asset management** organisations to cluster and engage Australia's hidden innovation champions.
Finally
Thank you and for other details of the bid please contact
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Questions?