Bulk Solids Handling
Storage, Feeding, Transfer, Belt Conveying

FEES
Delegate Registration: $2800 - + GST
5 or more delegates receive a 10% discount.
All fees must be paid prior to the event.
Fees include program notes, laboratory sessions (where applicable), lunches and refreshments.

VENUE
Novotel Perth Langley
221 Adelaide Terrace, Perth, WA 6000
Tel: +61 8 9221 1200
www.novotelperthlangley.com.au

ACCOMMODATION
Delegates are invited to arrange their own accommodation. Accommodation is available at the Course Venue.

CANCELLATIONS
If you are unable to attend the event a substitute delegate is welcomed at no extra charge. If notification of withdrawal is received no less than 14 days prior to the event, 80% of the fee will be refunded. No refunds will be made if notification of cancellation is received less than 13 days prior to the date of the event. The organisers reserve the right to alter or cancel the program due to unforeseen circumstances. In the event of cancellation, a full refund of fees will be made.

This registration form should be forwarded together with payment to:
TUNRA Bulk Solids Handling
Newcastle Institute for Energy and Resources,
The University of Newcastle, Callaghan NSW 2308, Australia
Tel: +61 2 4033 9055, Fax:+61 2 4033 9044
Email: danielle.harris@newcastle.edu.au

Presented at
Novotel Perth Langley, WA
## COURSE PRESENTERS

**ALAN ROBERTS**  
Emeritus Professor Alan Roberts AM is the Founding Director of TUNRA Bulk Solids. He is an Honorary Fellow of Engineers Australia, Member of the I Mech E. (U.K.) and Fellow of the Australian Academy of Technological Sciences and Engineering. He has received several awards including: Institution, Sir George Julius and A.G.M. Michell Medals from Engineers Australia, Solids Handling Award, Institution of Mechanical Engineers U.K.; Lifetime Achievement Award of British Materials Handling Board, Member of the Order of Australia and Centenary Medal. His research and consulting in the field of bulk solids handling spans a period of 50 years. He has published 5 design manuals and over 350 research papers.

**CRAIG WHEELER**  
Associate Professor Craig Wheeler is the Associate Director of TUNRA Bulk Solids and Senior Lecturer in Mechanical Engineering at the University of Newcastle, Australia. He worked for 10 years with BHP Billiton in Australia in a variety of engineering positions, including maintenance, production and design. Since joining the University he has worked as a consultant for TUNRA Bulk Solids for over 10 years. His particular interests include belt conveying, transfer chute design and mechanical conveying.

**TOBIAS KRULL**  
Dr Tobias Krull is the General Manager of TUNRA Bulk Solids in Newcastle, Australia. He graduated with a Dipl-ing (ME equivalent) from the Technical University of Braunschweig, Germany in 2000 and completed an Engineering Doctorate with a focus on bulk solids handling in 2005. In his more than 10 years of research and consultancy experience he has been involved in over 500 projects in bulk solids handling, involving contract R&D, troubleshooting, conceptual equipment design, design and plant audits for most major mining and engineering companies in Australia and internationally.

**TIM DONOHUE**  
Dr Tim Donohue is an Engineering Manager with TUNRA Bulk Solids. During this time he has completed a number of projects in the materials handling field, with transfer chute design and passive dust control research being particularly important and his current areas of expertise. Through both research and consulting projects he has become proficient with Discrete Element Modelling (DEM) as well as Computational Fluid Dynamics (CFD) software, and he utilises them in solving industrial problems.

*Course presenters are subject to change*

## 3 DAY COURSE OUTLINE

### INTRODUCTION

- Brief historical review
- Gravity discharge – Modes of flow
- Mass flow, Funnel flow, Expanded flow, Intermediate flow
- Typical storage bin shapes – Industrial case studies
- Influence of bin discharge flow patterns on wall loads and structural integrity

### FLOW PROPERTIES

- Gravity reclaim stockpiles
- Description of test equipment and procedures
- Influence of storage time and environmental factors such as temperature and moisture
- Evaluation of hopper and chute lining materials for friction and wear

### MASS FLOW & FUNNEL FLOW

- Mass-flow and funnel-flow limits
- Basic bin shapes
- Interpretation of flow property reports in relation to bin and stockpile design
- Case study examples to illustrate operational problems and how they were overcome
- Dynamic modelling of bulk solids systems

### STOCKPILE DESIGN

- Influence of consolidation stresses on rathole geometry, draw-down and live capacity
- Selection and positioning of reclaim hoppers and feeders for optimising gravity reclaim
- Stockpile base pressures and loads on reclaim tunnels, hoppers and feeders

### WALL LOADS

- Symmetric, Eccentric Discharge
- Silo Quaking and Shock Loads
- Loads on Buried Structural Elements

### FEEDERS

- Importance of hopper and feeder interfacing
- Review of basic feeder types – belt, apron, vibratory, screw, plough, tube
- Determination of optimum hopper and feeder interfacing for uniform draw-down
- Determination of feeder loads, torque and power initial and running conditions
- Controlling feeder loads and start-up torque
- Modelling of large ROM feeders

### TRANSFER CHUTES

- Basic principles of chute design
- Application of flow properties in the design process
- Chute flow problems due to adhesion and wear
- Dynamic modelling of hood and spoon for optimum accelerated flow
- Optimising chute profile for feeding and transfer
- Optimising chute geometry for controlled wear in the flow zone and at belt feed point
- Dust control in transfer chutes
- Application of DEM and CFD in chute design and performance evaluation

### BELT CONVEYING

- Overview of open and closed systems. Special belt conveyors and conveyor selection recommendations
- Review of basic design procedures
- Economic and technical considerations in optimising conveyor design
- Analysis of main resistances – idler identeration, idler spacing, bearings and seals, stress states in bulk solids and contribution to drag.

## OUTCOMES

### LEARNING OUTCOMES

- Basic principles of handling plant design
- Bulk solid flow properties and application to design
- Loads on bin walls – symmetric, eccentric discharge – shock loads and silo quaking
- Stockpile design incorporating draw-down, live capacity, base loads and locations of reclaim hoppers, feeders and tunnels
- Loads on buried structures in bins and stockpiles
- Chute design for feeding and transfer
- Belt conveying – overview of various types of conveyors – bulk solids and conveyor belt interactions – review of basic design procedures and future developments

### ABOUT TUNRA

**TUNRA Bulk Solids Handling Research Associates (TBS)** is built upon the strong foundations of education, research and consultancy in Bulk Solids Technology, which have been in place at Newcastle, Australia for 40 years. TBS provides contract research, professional consultancy and education to the resource and process industries, having completed over 4000 research and consultancy projects for approximately 1000 companies in Australia and 40 other countries. The group is averaging over 250 industrial projects per year.

**FURTHER INFORMATION**

Should you require any further information regarding the course, please contact:  
**TUNRA Bulk Solids**  
Newcastle Institute for Energy and Resources (NIER)  
University of Newcastle, Callaghan NSW 2308  
Australia  
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