

The mining industry got pasted

writes Daniel Bedell, Bedell Engineering, USA



Authors celebrating the launch of the "Paste and Thickened Tailings – A Guide (Third Edition)" at Paste 2015, Cairns

Getting pasted is a street term of when one gets punched in the face or beaten up. Such was the case for mining 25+ years ago, following a number of tailings dam failures and the terrible conditions of abandoned mining sites around the world. The public and environmental outcry was building and the mining industry had to step up and resolve these serious and real problems. I can still remember flying over a number of global sites and seeing ribbons of tailings winding their way to rivers and to the ocean. I must admit I am still haunted by those sights and of being glad when it became mandatory, in most countries, to impound the tailings. This did not solve the problem but only changed the dynamics of it.

This was a topic being discussed in many circles both inside and outside the industry. The criticality of the situation was reaching a boiling point from those who wanted to close all mining activity to the more rational that recognised that something had to be done urgently to address and, more importantly, solve these problems. As is often the case, great ideas and inspiration frequently arise out of casual discussion. Such was the case for Richard Jewell, Australian Centre for Geomechanics, and a number of mining and processing people who discussed the gravity of the challenges confronting the mining industry with its vast quantities of tailings. There had been several tailings dam failures that had caused much

damage and mayhem in the surrounding communities and in the industry as a whole. The political and social impacts of these were real and increasing in intensity. These prompted additional investigations highlighting the need to reduce the amount of tailings through better or new ways of thickening. There is a definite need to properly close out a project with reclamation and not to just walk away as had been the case for a very long time. Taking a serious look at the overall problem from beginning to end seemed an almost unsurmountable task. The urgency of this setting became very apparent. The time was then fertile for real cooperation globally across industry, academia and suppliers. Not only was it right but it was critical for the mining industry. Dr Andy Robertson, InfoMine Inc., succinctly stated this continuing problem in his well-written treatise in the December 2012, Vol. 39, ACG Newsletter, entitled, 'Tailings: dammed, damned or damless'.

As a follow-up to this discussion, Jewell invited world experts in the fields of thickening, transportation and tailings management to explore the concept of producing a tailings product with as little water as possible. This meeting of experts took place in Canada at the University of Alberta and from that began the concerted effort to deal with this serious problem head-on. As everyone began to seriously examine the current technology, it became readily apparent that there would have to

be major shifts in all aspects of the mining, processing, transportation, storage/containment and, finally, the closure of the mines and processing facilities. This turned out to be a monumental task in all areas, as changes in each area would impact others.

The tailings problem was broken down into categories. The following were some key areas to be dealt with:

- The increasing demand for metals and minerals by an ever-increasing world population.
- Diminishing ore grades requiring improved processing methods.
- Competition for water by mining with domestic users, farming etc.
- Increasing social and governmental pressures on the mining industry.
- Closing of several mining and technical institutions, such as the USA Bureau of Mines, leaving a need for new avenues of research.

Following this initial meeting, we started holding international seminars under the guidance of Jewell, Professor Andy Fourie, and Ted Lord, with the support of the ACG. The ACG began to proactively address mining industry's needs (ACG Newsletter, vol. 38, July 2012). Initiated in 1999, the International Seminars on Paste and Thickened Tailings recognised a key need in the overall education and science of tailings generation, processing, transportation and disposal which resulted in workshops accompanying the annual seminars. Over

the years, these workshops have been very successful in transferring the knowledge and hands-on experiences to help elevate the understanding and to promote increased awareness of the challenges and the needs in tailings. It became apparent to the management team of these seminars that there was a need to produce a paste and thickened tailings (P&TT) guide to capture as much of the technology in the various areas as possible, in a written and usable form. This became reality in 2002 when the first edition of the guide was published. In 2006 the second edition of the guide was published after the first edition had initially sold out. Nine years (2015) and many process and technological advancements later, the third edition of the guide was launched at Paste 2015, Cairns, Queensland to provide a concise helpful reference for readers to avoid potential pitfalls and obtain a quick understanding of the elements of generating and dealing with paste and thickened tailings.

The efforts over the past 25–30 years have wrought great changes in tailings management, disposal and water conservation. It may not be viewed as rocket science but the quiet, effectual impact on society around the world has been real. The lives of so many have been impacted in the form of health, jobs, safer communities, overall safety and environment having markedly improved. Are we there? No, but the progress is significant with continuing improvements, experience and with additional knowledge. The third edition of the guide should become another good tool in your battle and efforts to improve our industry.

It has been a signal honour to have been part of these changes and to associate with so many fine and talented men and women in this field. May we be forever young of heart and embrace these challenges and changes with inspiration and diligence, or as my wife has said, "You are just overgrown boys still playing in the mud!" Let us have fun and contribute positive changes that will show that we do care and can impact the world in a significant way.



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ACG Publication: Paste and Thickened Tailings – A Guide (Third Edition)

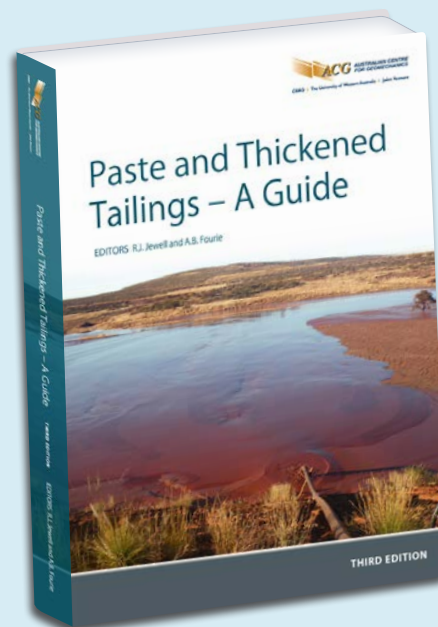
The third edition of the ACG 'Paste and Thickened Tailings – A Guide' is structured as a guidance and advice manual and aims to provide industry personnel with the information that will assist them in gauging the benefits of using the P&TT technique for their operations.

It includes new chapters on evolving technologies, such as filtering and post thickener polymer injection, as well as different thickening techniques. This is in addition to the fundamental chapters of the previous editions, which have been substantially revised and updated with new information and advancements in technology.

The aim of this guide is to outline the technologies available for thickening tailings to a higher concentration or density than that achieved as underflow from conventional plant thickeners, the advantages and disadvantages of doing so, and to provide a technical resource about the application of thickening technology prior to deposition for surface disposal. The ultimate objective has been to provide guidance and advice to those in the industry interested in finding out what is meant by thickened tailings and high-density slurry or paste tailings, and in determining whether the effort of thickening tailings to a density higher than that achieved in the underflow of normal plant thickeners can add value to their own operations.

The guidelines have a broad authorship and are laid out as a series of self-contained chapters that have been prepared by authors, including operators, consultants and regulators, with expertise in each specific area, and have a global representation of the mining industry. The chapter lead authors are Dan Bedell; Mark Coghill, Rio Tinto; Phillip Fawell, CSIRO Mineral Resources Flagship; Tim Fitton, Fitton Tailings Consultants; Andy Fourie, The University of Western Australia; Richard Jewell; the late Hugh Jones, independent consultant; Christian Kujawa, Paterson & Cooke; Ted Lord, tailings consultant; Gordon McPhail, SLR Consulting Australia Pty Ltd; Angus Paterson, Paterson & Cooke; Fiona Sofrà, Rheological Consulting Services Pty Ltd; Matthew Treinen, Paterson & Cooke; Andrew Vietti, Vietti Slurrytec (Pty) Ltd; and Patrick Sean Wells, Suncor Energy Inc.

Dr Andrew Robertson wrote in his foreword that, "The authors have succeeded in producing a comprehensive and authoritative documentation of the technology, provided the design basis



relevant to these technologies, and infused a vast amount of valuable insight and guidance reflective of their diverse backgrounds in theory, design, field trials, construction and operation of tailings storage facilities." Dr Robertson further states that, "This is a 'must have' guide for this field of rapidly advancing Best Available Technology for tailings deposits design, construction, operation and closure."

This guide aims to raise awareness of emerging technology. Co-editor Professor Andy Fourie has outlined an issue facing the industry — when mines store their tailings in large mounds also holding water, occasionally the structure fails and discharges toxic slurries that can have a negative impact on local communities and the environment. An emerging solution involves thickening tailings, even to the extent of making them a semi-paste, a process that can decrease water loss resulting from evaporation and also reduce operating costs. Professor Fourie says that, "It also has the advantage of reducing the risks of these catastrophic failures. As communities become more concerned about mining impacts, this issue will become greater and greater."

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