

Life Cycle Assessment and Tailings Management Trade-Off Studies - Concepts

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Outline

- Tailings Management Trade-Off Studies
- Life Cycle Assessments (LCA) ISO 14040 and 14044
- Applicability of LCA to Tailings Studies
- Next Steps

Tailings Management Trade-Off Studies

- Develop tailings management options
- Develop conceptual designs for tailings management alternatives
- Perform site evaluation and selection studies
- Select a final site and tailings management approach
- Perform detailed site investigations
- Develop a final design for permitting and construction and
- Finally construct and operate the facility

Tailings Management Trade-Off Studies (2)

- State-of-the-practice:
 - Criteria and approaches that are used are not consistent for all projects
 - Criteria and approaches may depend on project management guidelines for a specific company
 - In most cases it depends on the individuals managing or performing the work

Underlying reason for this presentation: can we use LCA procedures as described in LCA standards for better guidance?

Life Cycle Assessments (LCA) ISO 14040 and 14044

“LCA addresses the environmental aspects and potential environmental impacts) (e.g. use of resources and environmental consequences of releases) throughout a product's life cycle from raw material acquisition through production, use, end-of-life treatment, recycling and final disposal (i.e. cradle-to-grave).”

- Typically include all material and energy flows and can also include costs and other criteria

LCA

“LCA is one of several environmental management techniques (e.g. risk assessment, environmental performance evaluation, environmental auditing, and environmental impact assessment) and might not be the most appropriate technique to use in all situations. LCA typically does not address the economic or social aspects of a product, but the life cycle approach and methodologies described in this International Standard may be applied to these other aspects.”

Four Phases of an LCA

- Goal and scope definition phase, including system boundaries
- Inventory analysis phase – input/output data
- Impact assessment phase
- Interpretation phase

Applicability of LCA to Tailings Studies

- LCA seems to be focused on materials, i.e. the LCA for copper
- In the definitions and details of the LCA standards two specific issues are highlighted which infer that it can also be used for tailings studies:
 - Functional Unit: Quantified performance of a product system for use as a reference unit
 - LCA also applicable to services: tailings management as a “service”

LCA Case Studies

- Life Cycle Inventory (LCI) to evaluate the environmental performance of the minerals processing sector in South Africa and Australia (Stewart and Petrie, 2006)
- Cradle-to-gate LCA for specific mining activities, e.g. mineral extraction, mineral processing, waste handling and remediation and life cycle impact assessment (Durucan, et al, 2006)
- Application of LCA model to evaluate options for an integrated water and wastewater system for Sydney (Lundie, et al, 2004): *“LCA is seen as a tool that is more holistic, quantitative, comparative, and predictive than the few alternatives available for comparing alternative technical systems.”*

Next Steps

- Investigate the implementation of the LCA standards to tailings management trade-off studies
- Evaluate the approach to decide whether it provides a more comprehensive evaluation of tailings management options
- Develop recommendations that can be used on a broader industry basis for tailings and other mining related studies based on ISO 14040, ISO 14044 and others

The ultimate goal is to use the broader context of the ISO standards to develop project related guidance