

Recovering E-metals from Legacy Wastes: Implications for Governance and Industrial Symbiosis

Helen Baxter¹, Pauline Deutz¹ and David Gibbs^{1*}

Introduction

This research is part of a NERC funded study which combines; scientific, engineering and social science research investigating the issues and practicalities of developing and implementing passive remediation and E Tech metal recovery from a major global by-product: Alkali Waste. There are principally two questions associated with alkali waste streams; that of pollution prevention, and the recovery of high-value elements, principally vanadium (V). These issues have implications for industry connected to policy development and the economic repercussions associated with both remediation and recovery of metals and metalloids. Industry has increasingly begun to recognise that the potential benefits of metals recovery from these alkali waste streams, as factors, such as increasing demand and global shortages, increase these metals' economic value. This opens up a space in which to develop new material flows from such residues. Regulation, governance and industry attitudes towards remediation and recovery, will impact upon how successful and widespread is the implementation of the residue remediation and recovery systems developed by this NERC funded project.

Challenge to IS	Example
Environmental/economic benefits not fully quantified	Eco-efficiency (assumption that environmental benefits bring economic benefits) seldom interrogated in detail (Koskela and Vemas, 2012): distribution of costs and benefits between stakeholders poorly understood.
Inter-company collaboration; formation of new relationships	Complex downstream ownership issues for steel by-products and long-standing / locked-in inter-company agreements may be an issue if additional value is perceived in by-product.
Financial volatility of resource / waste stream	Volatility of global resource prices may limit attractiveness for investment or engagement in symbiotic relations.
Waste policy	Complex array of relevant regulation (with implementation varying within the EU) such as definitions of waste; remediation at legacy sites (land ownership, liabilities).
Scale of operations / power relationships	Potential flows occurring between organisations of differing financial structure (from local to multinational), size and likely power.
Geographic constraints to symbiosis	Value of recovered commodity may restrict viable geographic range of re-use. Steel production sites located in broader industrial regions, however.
Evolving stakeholder relationships / views	Potential for obstructive stakeholder views; objections may not arise until late in process.

Objectives

To examine;

- 1) the multi-scalar governance of the extraction and use of material flows, especially historic stocks
- 2) the implications for theorisations of industrial symbiosis

To determine;

- 1) the policy/economic/social barriers to implementation of metal recovery
- 2) stakeholders' perception of barriers to implementation
- 3) the impact of the delay between residue generation and resource recovery

Methodology

- 1) Extensive analysis of policy and industry documents at the UK, EU and international scales
- 2) Semi-structured interviews with key industry and regulatory representatives
- 3) Examination of background information and input from industrial and academic advisory bodies
- 4) Inclusion of developments from scientific and engineering side of the project to inform conclusions

Initial Findings and Conclusions

- 1) The extraction of metals from slag has implications for environmental protection, the economic value of residues, the legal definition of residues as waste or by-products, and could generate new relationships between companies, potentially at a global scale.
- 2) Long term liability for (potentially) hazardous residues and the internalisation of costs of environmental pollution to industry has the potential to shift stakeholders attitudes towards adopting alternative approaches to remediation
- 3) The potential for a new source of revenue increases the likelihood of implementing passive remediation and E Tech metal recovery
- 4) There is a need for multiple geographical scale relationships to develop which encompasses regulatory, economic, social and environmental factors in order to take full advantage of the benefits that this approach can deliver
- 5) There is some resistance to changing current practices and scepticism about the financial viability of taking a longer term approach due to the uncertainty associated with global markets amongst stakeholders



Steel Slag; a common alkali waste stream