Metals: supremely recyclable

Re-use and recycling can help minimise fresh raw material inputs, waste outputs, and the manufacturing energy demands for most materials. Researchers at CSIRO Minerals, Mr Terry Norgate and Dr John Rankin, say that metals are proving prime candidates for reprocessing.

With population growth and rising wealth pushing resource consumption up, the need for greater efficiency in the use of resources and major reductions in waste and emissions – to break the link between economic progress and resource consumption – is almost self evident.

'The unique properties of metals will see them play an important role in society's transition to sustainable development,' say the researchers in a paper in the CSIRO Sustainability Network Update. 'Apart from reserves in the ground, the largest stocks of metals are "metals in use". These amount to a virtually permanent recyclable asset for society because, unlike energy and degradable materials, metals are not consumed during production and use. The best example is gold – some 80% of all the gold ever produced is still in use.'

Metals, in principle, can be recycled indefinitely, but in practice, metal quality, durability and product recovery issues limit the number of recycles achieved. When metal prices drop, recycling rates also drop, suggesting the need to devise 'economic drivers' to encourage recycling even when prices fall. We can expect that advances in technology and product design will further improve recycling efficiency and economics.

Recycling metals gives significant energy savings, hence also less greenhouse gas emissions, compared to the primary (original) metal production. Energy savings through recycling for aluminium, especially, are enormous at 95% (see page 27) while figures estimated for other metals are also significant: nickel 90%, copper 84%, zinc 75%, lead 65% and steel 60%. A few years ago, recycling rates in Australia were only 22% for aluminium and 36% for iron and steel (data for other metals were not available).

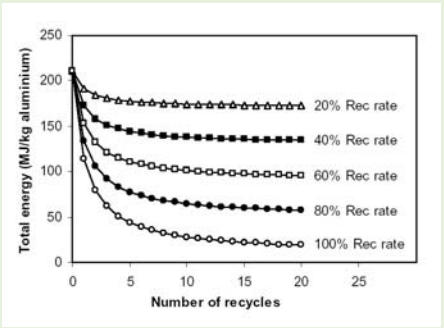
Taking aluminium as a typical example, total energy used in its production changes over the life of the metal, with the energy consumption decreasing with the number of recycles. A similar benefit emerges for the metal's global warming potential due to emissions during production – higher recycling rates and more recyclings mean less pollution.

'Increased energy consumption, associated with declining ore grades, and the likely introduction of carbon or energy taxes will see more emphasis on use of recycled materials,' says Norgate. 'We will also probably see low-energy intensive metals like steel replacing high-energy metals like aluminium where special properties like light weight are not critical.'

The CSIRO researchers conclude that the challenge ahead is to devise tools, policies and actions to optimise the efficient use of metal resources, while, at the same time, minimising their environmental impacts.

● **Steve Davidson**

Matthew Richards, from the CSIRO Minerals team, with titanium piping. He works to balance wealth generation and the environment. Christian Pearson



The total energy consumption, and, therefore, global warming potential (GWP) for secondary aluminium production at various recycling rates, assuming a closed-loop recycling system. From CSIRO Sustainability Network Update 30, 2003.

More information:
Norgate, T. and Rankin, J. (2003) Tops at recycling: Metals in sustainable development, CSIRO Sustainability Network Update, 30, 2003. See www.bml.csiro.au/susnetnl/ netwl30E.pdf

Contact: Mr Terry Norgate (03) 9545 8574