Seeking Eternal Life - For Metals at Least

CANMET Mineral Technology Branch

Researchers at the CANMET Mining and Mineral Sciences Laboratories (MMSL) of Natural Resources Canada (NRCan) want to change the way everyone on the planet thinks about and uses metals. To understand what they are trying to do, we have to go back to basics.

To start with, metals are elements - fundamental natural substances that cannot be reduced or consumed. It follows that if we use them in the right way, metals are never "used up" the way energy resources are when we burn gasoline, for example. Metals, in fact, have a "life cycle," which typically starts with extraction from the ground, followed by refining and production of useful goods, and then all too often ends with scrapping and disposal. Dr. Alain Dubreuil and his colleagues in CANMET-MMSL want to ensure that, as much as possible, this last step is replaced by "recycled and re-used." Clearly, the more we recycle and re-use metals, the more we benefit from them.

So a major objective of Dr. Dubreuil and his fellow scientists is to help us all understand the implications that this "life-cycle" approach to using metals has for life on the planet, and how we can all help to better manage and conserve these vital resources.

Clearly, the old ways of thinking, the old models, can't contribute much to this new approach to using metals. Not so long ago, most of us acted as if all resources - renewable and non-renewable - would somehow last forever. It seemed inconceivable that we would ever run out of trees, fish, arable and habitable land, fresh water, and even, yes, minerals and metals. But rapid growth in the earth's population, aggressive economic globalization, and other pressures in recent decades have placed mounting strain on the natural environment.

Today, we know that all aspects of life on earth are interconnected and interdependent in often surprising ways. Nothing exists or lives in isolation. To diminish any single part can jeopardize everything else. The old models - the long-standing conventional economic, industrial and scientific theories - left little room for the emerging insights we now have into the dynamic interplay among all the forces affecting our environment and our very existence on the planet.

This still growing environmental understanding emerged from the social revolutions of the 1960s - first in human rights, then in the embryonic ecology movement. They were given focus and international status in the words and challenges of the 1987 Brundtland Report, Our Common Future. Today we speak of "sustainable development," recognizing the need to think and act in ways that integrate social, economic and environmental decision-making, and of our collective obligation to leave as much as possible intact for the future.

The Government of Canada is committed to the sustainable development of Canada's natural resources. Critical to this is the development, support and promotion of science and technology. Consistent with this, fully 75% of Natural Resources Canada's budget is dedicated to science and technology. This focus on sustainable development drives the work of NRCan's scientists and researchers, with the major goal of sharing scientific and technical advances in open and direct support of economic growth, job creation, competitiveness, and public and occupational health and safety for Canadians - all against a background of environmental awareness and protection, which brings us back to the work of Dr.
Dubreuil and his colleagues.

He and his co-workers are increasingly concerned with the development and introduction of environmentally friendly products. The measurement of the overall environmental impact and other benefits of a product or service is achieved through what is known as a Life-Cycle Assessment (LCA). A true child of sustainable development, this highly valued analytical tool assesses the environmental impacts of a service or product from original investment decisions, to exploration and extraction, through development and production, to use, re-use, recycling and disposal.

Dr. Dubreuil spearheads the LCA initiative within CANMET-MMSL, working closely with colleagues to improve the quality and application of impact assessment models. These models in turn enhance the environmental awareness and content in decisions, policies and programs across the department and beyond. Other benefits include improved process and product design, enviro- and eco-labeling opportunities, and improved market access and protection for resources and products.

Progress in this area is steady, but occurs in small steps. Dr. Dubreuil acknowledges the "need to increase the level of understanding regarding the application of LCA to minerals and metals, particularly in two areas: the way we assess the toxicity of emissions of metals; and the way we calculate their life-cycle benefits."

He is addressing the second area, life-cycle calculations, through shared research with fellow scientists in CANMET-MMSL's program on Metals and the Environment. He is pursuing the issue of toxicity through his participation in the NRCan-led effort to develop national sustainable development indicators for minerals and metals in broad collaboration among industry, government and relevant stakeholders. In addition, he is also working to improve the knowledge and application of LCA for metals within the Asia-Pacific Economic Cooperative (APEC) region, as well as within the United Nations Environment Programme (UNEP). Jointly with colleagues in the Mineral and Metal Policy Branch (MMPB), he is working to educate some European officials, industry and the scientific community on the flaws of current LCA models applied to minerals and metals.

NRCan is exploring, with some international organizations, the possibility of organizing a major international workshop on the application of life-cycle assessment in the mining and metals sector. This would be a significant follow-up to LCA workshops held recently in Australia and Japan, a leading promoter of LCA in the APEC region. Among non-governmental bodies, key players include the International Organization for Standardization (ISO) and the Society of Environmental Toxicity and Chemistry (SETAC). Their support is reflected in the increasing adoption of international standards for qualification of emissions and calculation of potential environmental impacts.

All of these are promising hints of the increasing worldwide acceptance of the need to change the way we think about and use metals.