

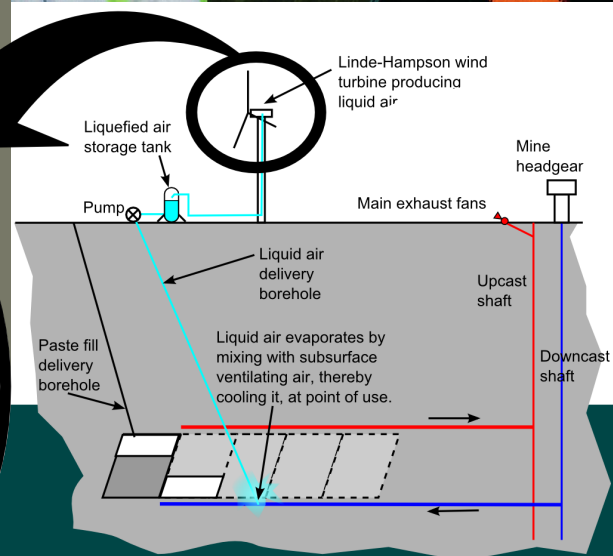
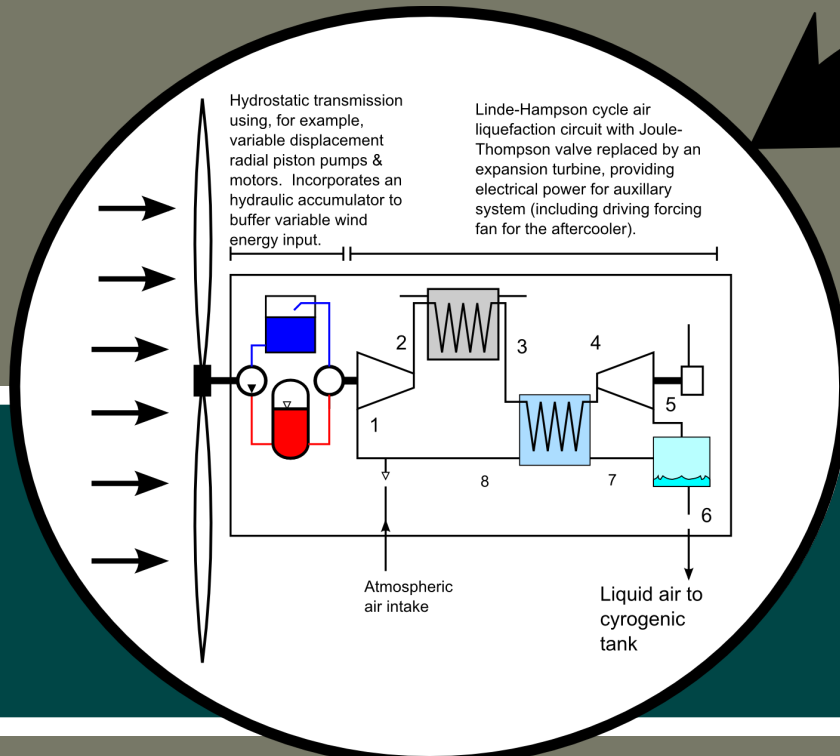
Energy, Renewables and Carbon Management



ERCM In partnership with Laurentian University, MIRARCO has invested in a new Chair of Energy in Mining to lead research in this area. The new chair, Dean Millar has established the Energy, Renewables and Carbon Management team.

It's What We Do...

- Whole and life cycle, power, heat and fuel audits and demand profiling.
- Appraisal and concept development of energy consumption reduction technologies (including energy efficiency) for the minerals sector.
- Integration of renewable energy technologies into the mining sector.
- Renewable heat technology application development including heat recovery and utilization of geothermal energy.
- Investigation of revenue enhancement opportunities via carbon trading and the clean development mechanism.
- Greenhouse gas mitigation and avoidance, development of innovations in carbon capture technology.



Current Projects...

Geometry of Heat Exchange in Broken Rock

Researcher: Sidney Schafrik. This project aims to upgrade heat exchange models applied to heat transfer problems in broken / caved ground. The research generates fractal solid models, ELFEN and particle flow code renderings of broken rock piles that are used with an advanced computational fluid dynamics code as well as a network flow solver to enable for improved design of mine heating and cooling applications as well as enhanced geothermal energy recovery.

Floating Photovoltaics

Researcher: Kim Trapani. MIRARCO Research has indicated that as an offshore renewable energy technology, photovoltaic installations, upwards of 10MW installed capacity, can produce electricity at a lower cost than offshore wind farms – up to latitudes up to 50°N which includes all of the Canadian Great Lakes. The research is motivated by two key factors: i) the food-versus-fuel debate: land based photovoltaic installations preclude the simultaneous use of the land for agricultural activities (unlike wind energy) and ii) the need for large scale, off grid technologies for mining operations in remote environments. This research focuses on yield, reliability, station keeping, and durability of PV installations offshore in comparison to land based installations, and consequently the economics and other benefits relative to other offshore technologies, which include wind power, wave energy and tidal power. This project involves collaborations with the Photovoltaics Applications Research Group at the University of Loughborough, UK and the Peninsula Research Institute for Marine Renewable Energy at the University of Exeter, UK.

Demand side energy conservation

Researcher: Michelle Levesque. Huge (100s of MW scale) volumes of wasted heat are discharged to atmosphere within the mining industry, all with economic and carbon emissions implications. These include, (in approximate order of heat grade) solidifying refining slag, furnace off-gas, static internal combustion engines, static compressed air plant, upcast ventilating air and pumped mine waters. Substantial, but poorly characterized, quantities of thermal energy that are by-products of other heating, drying and cooling processes in smelter / beneficiation plants are also currently simply discharged to the atmosphere or biosphere while representing potentially economic thermal energy sources for other parts of the same mineral production operations. Opportunities to exploit these currently wasted opportunities are being investigated as well as mechanisms and facilities to store or buffer the heat to permit the supply-demand system to be balanced off.

The ERCM Group invites enquiries from individuals and organizations wishing to collaborate with MIRARCO researchers on the following research proposal topics:

- (DROPIT) Quantifying methane content of continuous permafrost
- (CRYOVENT) Production of cryogenic fluids using wind turbines for mine ventilation
- (LOWCARB) Low carbon mine site energy initiatives



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