Sunrise Dam invests in wind power

Sunrise Dam Gold Mine in Western Australia operates a 3.8 million tonne per annum processing plant from which it produces over 450,000 ounces of gold per year. The tailings (or waste material) generated from the processing plant is stored in a Centrally Thickened Discharge Tailing Storage Facility (TSF). The TSF covers approximately 320 hectares with a current holding capacity of 33 million tonnes. Sunrise Dam's energy policy is to use renewable energy whenever possible, as exemplified by the solar-powered pumps which operate in the trench system. In 2006, Sunrise Dam investigated and introduced another renewable energy source – wind power – and its implementation could lead to further alternative energy developments at Sunrise Dam and other remote mine sites in the future.

The continuous monitoring of the ground water levels, and the flora and fauna surrounding the TSF, forms an essential part of Sunrise Dam's environmental management programme. The hyper-saline ground water at Sunrise Dam means that water levels must be actively managed and constantly kept at a minimum level of 5 metres below ground level. This minimises salt migration to the surface and the consequent deterioration of the surface vegetation. The TSF is surrounded by a network of about 3.2 kilometres of trenches through which water is pumped to maintain the underground water table levels. The trenches slope towards the pumping stations and recovered groundwater is pumped by the solar-powered pumps to the processing plant. The system of trenches covers more than half the diameter of the TSF, with the remaining area containing a number of dewatering bores that activate when the water table rises.

In 2005 a study was undertaken to evaluate the effectiveness of using wind power generation to supply power to a bore pump with a design capacity of 360 kilolitres per day. Although solar panels are used to power a portion of the pump system, they only pump small volumes of water. The power needed for the remaining area would have required a large number of solar panels and hence the decision to investigate an alternative method. The technology required to directly power the bore pump from a wind turbine did not exist in Australia. Sunrise Dam, in conjunction with Westwind, a company that manufactures wind turbines and has a direct alliance with Murdoch University in Perth, developed a control system to operate a 5.5kW pump. This is the first time in Australia that a stand-alone control system has been successfully developed, installed and operated. The system has been in operation for the past year.

The economic viability of the wind electric system is one of its key strengths – it compares favourably in cost effectiveness with a traditional diesel power generator. Theoretically, a 5.5kW pump would require a 30KVA generator, which would consume approximately 42,000 litres of fuel per year and would incur additional costs in maintenance. In contrast, a wind turbine power system has no operational costs and has minimal maintenance costs in comparison to traditional power sources.

The design of the wind electric power system was developed with potential further application in similar circumstances as a driving factor. The mining industry in Western Australia operates in remote areas, where good quality water is a scarce commodity and is often pumped over long distances to meet mine site requirements. The positive impact that has been achieved through this project demonstrates that this technology can be applied in other water scarce remote areas which have an adequate wind source. The independent electric control system brings a low maintenance, high capacity pumping solution to any remote site with sufficient wind source that does not have a developed electricity supply. Although the technology was developed for this mine, its potential for broader applications in industries that require a renewable and clean power source is vast.