

**GENERATION OF ELECTRICITY FROM AIR DISCHARGED TO THE  
ATMOSPHERE BY SURFACE EXHAUST FAN(S) AT KAREBE GOLD MINE**

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**ABSTRACT**

This project focuses on the wasted or exhausted air flow from underground mine. Basically, exhaust fans of the mine ventilation system expel air at high velocities out of the bounded area at one or more locations. It is found out that the force of the wind from the exhaust fan is capable of driving a small wind turbine, that is, the Vertical Axis Wind Turbine (VAWT), which is suitably positioned in front of the exhaust fan. The supporting structure to hold the VAWT can be moved vertically and horizontally to study the performance in various configurations. Moreover, wind from the discharge outlet is generated by a fan which is not in a uniform profile. According to VAWT performance evaluation, it is found that the preferred system configuration when the fan is at a speed of 708 rpm is when the HAWT is horizontally placed at 250mm and vertically positioned 350mm. In this case, the power that is generated is transmuted into AC through an inverter then supplied to the load. The wasted power from exhaust fans can therefore be diligently utilized in other energy demands within the mining areas. Furthermore, the recovered energy reduces the cost of operating the ventilation system. The idea improves energy security of the company as well.

The project was conducted at Karebe Gold Mine Limited where exhaust air from an auxiliary fan near the shaft outlet is utilized in generation of electricity. A three-blade turbine was installed at the roof of the outlet of the main up cast shaft; at a distance of 3m away from the main exhaust fan. The setup is capable of generating electric energy of 34, 810 W. Also, as the exhaust wind hits the turbine, it transfers some of its momentum to the turbine blades, which makes them to rotate (Donev et al. 2016). This transfer implies that the momentum of contaminated air decreases, such that it will not cause much environmental contamination. Furthermore, the extracted energy can charge small apparatus such as headlamps; therefore, the cost of operating the ventilation system is cut down.