

## Power Recovery from Waste Air of Mine Ventilation Fans Using Wind Turbines

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**Abstract :** The recovery of power from waste air generated by mine ventilation fans presents a promising avenue for enhancing energy efficiency in mining operations. This abstract explores the feasibility and benefits of utilizing turbine generators to capture the kinetic energy present in waste air and convert it into electrical power. By integrating turbine generator systems into mine ventilation infrastructures, the potential to harness and utilize the previously untapped energy within the waste air stream is realized. This study examines the principles underlying turbine generator technology and its application within the context of mine ventilation systems. The process involves directing waste air from ventilation fans through specially designed turbines, where the kinetic energy of the moving air is converted into rotational motion. This mechanical energy is then transferred to connected generators, which convert it into electrical power. The recovered electricity can be employed for various on-site applications, including powering mining equipment, lighting, and control systems. The benefits of power recovery from waste air using turbine generators are manifold. Improved energy efficiency within the mining environment results in reduced dependence on external power sources and associated cost savings. Additionally, this approach contributes to environmental sustainability by utilizing a previously wasted resource for power generation. Resource conservation is further enhanced, aligning with modern principles of sustainable mining practices. However, successful implementation requires careful consideration of factors such as waste air characteristics, turbine design, generator efficiency, and integration into existing mine infrastructure. Maintenance and monitoring protocols are necessary to ensure consistent performance and longevity of the turbine generator systems. While there is an initial investment associated with equipment procurement, installation, and integration, the long-term benefits of reduced energy costs and environmental impact make this approach economically viable. In conclusion, the recovery of power from waste air from mine ventilation fans using turbine generators offers a tangible solution to enhance energy efficiency and sustainability within mining operations. By capturing and converting the kinetic energy of waste air into usable electrical power, mines can optimize resource utilization, reduce operational costs, and contribute to a greener future for the mining industry.

**Keywords :** waste to energy, wind power generation, exhaust air, power recovery

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