



A systems analysis approach to determine the potential of converting waste tyres to power

CAN WASTE TYRES BE USED TO GENERATE ELECTRICITY?

The accumulation of waste tyres present an economic and environmental challenge for South Africa - as the population increases so will the economic need for transportation. South Africa generates over 177 385 tons of waste tyres per year, and only around 25% is recycled, the remaining 75 % accumulates in storage depots and landfills across the country. These landfilled tyres can take the better part of a century to decompose naturally; these tyres will last longer in the environment than we do.

While there is no lasting sustainable solution to address the problem, a study by a team of researchers from the University of South Africa (UNISA) suggests that waste tyres have the potential to contribute to electrical power generation in South Africa.

Using fundamental thermodynamics, the researchers analysed a slurry fed integrated gasification combined cycle (IGCC) system, to identify the optimum target

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for the conversion of waste tyres to power. In addition, thermal efficiency and work efficiency were analysed to assess the performance of the power plants. The results of the NRF part-funded study revealed that:

- The IGCC system is advantageous as it does not require the use of oxygen during gasification, consequently providing savings on capital cost required for air separation.
- This self-sustaining waste tyre IGCC system produces more electrical power than conventional coal IGCC systems (10.5 GJ/ton for tyres vs 9.6 GJ/ton for coal). This demonstrates that waste tyres actually outperform coal as an energy material.

The researchers put forward that power generation should be considered as the practical route for waste tyre management in South Africa. Furthermore, this work should be considered as the theoretical framework to guide decisions on whether to invest in a process to convert waste tyres to power.