Retrofitting Retiring Coal Fired Power Plants to Burn Rubber Tire Scraps

Abijitth Guruprasad  
*University of Dayton, stander@udayton.edu*

Naga Bhavya Kancheti  
*University of Dayton, stander@udayton.edu*

Abhinandan Ravikumar  
*University of Dayton, stander@udayton.edu*

Follow this and additional works at: [http://ecommons.udayton.edu/stander_posters](http://ecommons.udayton.edu/stander_posters)

Part of the [Arts and Humanities Commons](http://ecommons.udayton.edu/stander_posters), [Business Commons](http://ecommons.udayton.edu/stander_posters), [Education Commons](http://ecommons.udayton.edu/stander_posters), [Engineering Commons](http://ecommons.udayton.edu/stander_posters), [Life Sciences Commons](http://ecommons.udayton.edu/stander_posters), [Medicine and Health Sciences Commons](http://ecommons.udayton.edu/stander_posters), [Physical Sciences and Mathematics Commons](http://ecommons.udayton.edu/stander_posters), and the [Social and Behavioral Sciences Commons](http://ecommons.udayton.edu/stander_posters)

**Recommended Citation**

[http://ecommons.udayton.edu/stander_posters/595](http://ecommons.udayton.edu/stander_posters/595)

This Book is brought to you for free and open access by the Stander Symposium at eCommons. It has been accepted for inclusion in Stander Symposium Posters by an authorized administrator of eCommons. For more information, please contact frice1@udayton.edu, mschlangen1@udayton.edu.
Retrofitting Retiring Coal Fired Power Plants To Burn Rubber Tire Scraps

Abijith Guruprasad¹, Abhinandan Ravikumar¹, Naga Bhavya Kancheti¹
Department of Mechanical and Aerospace Engineering, Renewable and Clean Energy
Advisor: Dr. Jun-Ki Choi¹, Ph.D.

Objectives
• To be able to produce electricity economically on retired picway power plants, using Tire Derived Fuel (TDF) rather than constructing a new power plant.
• To reduce the environmental impact caused from picway power plants.
• Comparison of environmental impact caused from electricity generation from different types of fuels like coal and TDF.

Introduction
• According to an Environmental Protection Agency (EPA) estimate, 1100 coal fired Electricity Generation Units (EGU) are currently active in the United States.
• EPA uses Integrated Planning Model (IPM), for determining the cost, fuel consumption and emission impacts.
• Tire fired electricity generation unit would require less material input and less scrubbing than coal fired plant.
• The picway power plants which choose to retire in the near future are used to produce electricity from using TDF.
• Using retired picway power plants to produce electricity using TDF, the investment cost for the equipment can be reduced.

Trends – Over the Years

Map: Electricity Generation Facilities in United States of America

• Collection facilities are not required to pay for the scrap tires, they are disposed of by the consumers for free.
• One of the main recycling EOL uses for scrap tires are TDF.
• TDF accounts for 40.3% of all scrap tires produces in USA.
• In 2009 about 326000 tons of scrap tires were used in electric utilities and 203000 tons of scrap tires in dedicated tires-to-energy facilities.
• Dedicated tires-to-energy facilities have shown to produce less emissions than its coal counterparts. USEPA claims tires produce 25% more energy than coal.

Methodology

- Picway power plants which does not comply with EPA norms are forced to either invest in scrubbing technology or retire the plant.
- The emission of toxic gasses from combustion of rubber is less when compared to coal. Therefore the investment, for high quality scrubber is not required in TDF plants.
- The four factors are the comparison of Energy, Water input, Ash produced and Steel scrap produced.

Case Study

- The Picway coal-fired EGU in Lockbourne, OH with an electric capacity of 95 MW
- In this study, a combustion heat to electricity generation efficiency of 28% is obtained.
- Tire combustion was compared with different types of coal.

Data for Calculations

- Heating value of tire = 36053 KJ/Kg.
- Equivalent BTU content of electricity = 3412 Btu/KWh.
- Efficiency of power plant is 0.28.
- Heat rate of the picway power plant = 12185 Btu/KWh.

Result

- Electrical energy generated per weight of TDF = 2.8 KWh/Kg_tires.
- Weight of input fuel = 44,502,339 Kg_tires.
- The electricity input needed to shred tires = 107,828,000 KWh.
- Water input needed to shred tires = 744,273 Kg.
- Ash produced during combustion of tire as waste product = 3,968,865 Kg.
- Scrap steel produced during combustion of tire as waste product = 9,810,679 Kg.
- Graph: Comparison between types of coal and tires to generate electricity per year.

Conclusion

- Retrofitting of tires in Picway power plants is more efficient as inferred from the results.