Retrofitting Retiring Coal Fired Power Plants To Burn Rubber Tire Scraps

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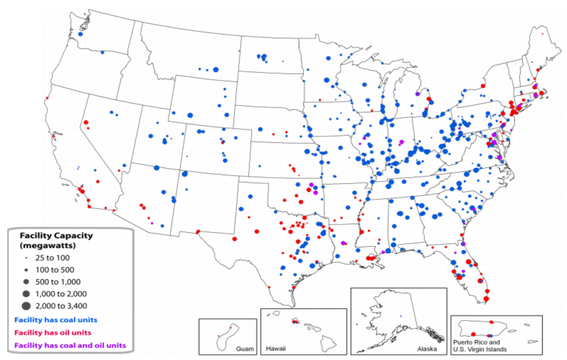
Objectives

- 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 then its coal counterparts. USEPA claims tires produce 25% more energy than coal.

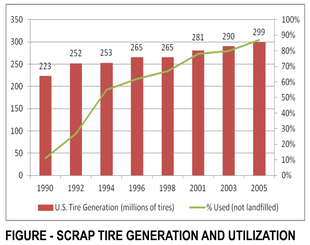


FIGURE - SCRAP TIRE GENERATION AND UTILIZATION FROM 1990 TO 2005

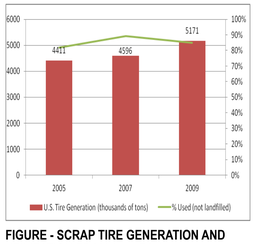
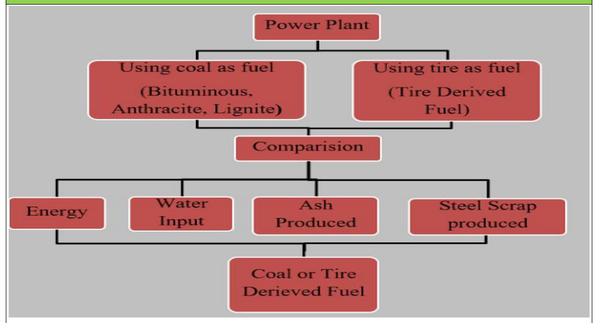


FIGURE - SCRAP TIRE GENERATION AND UTILIZATION FROM 2005 TO 2009

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

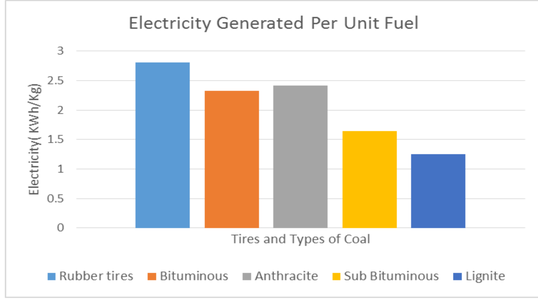
- The Picway coal-fired EGU in Lockbourne, OH with an electric capacity of 95 MW
- In this study, a combustion heat to electricity generation efficiency of 28% is obtained.
- Tire combustion was compared with different types of coal.

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.