

## IMPLEMENTATION OF A 200 kW THERMAL POWER PLANT USING WOOD RESIDUES FROM A SAWMILL INDUSTRY IN BRAZIL'S NORTH REGION

**Suani Teixeira Coelho, Ph. D.**

suani@iee.usp.br

**Sílvia Maria Stortini González Velázquez, Ph. D.**

silvia@iee.usp.br; velazquez@mackenzie.com.br

**Sandra Apolinario dos Santos, M. Sc.**

sandra@iee.usp.br

**Beatriz Acquaro Lora, Biol.**

blora@iee.usp.br

<sup>1</sup>CENBIO – The Brazilian Reference Center on Biomass / USP – University of São Paulo

<sup>2</sup>Universidade Presbiteriana Mackenzie

**Abstract.** This paper will present a pioneer project of electric energy generation from renewable sources “ENERMAD - Implementation of a thermal power plant of 200 kW using wood residues from a sawmill industry in Amazon region”. This project intends to install a thermal power plant based on micro steam turbine system using wood residues from a sawmill industry located at an isolated community, in Pará state. Nowadays, the energy supply in the sawmill is based on a diesel generator. Although the steam turbine system, which will be used in this project, is commercially available in Brazil, until now there isn't a registration of electricity generation with biomass, with less than 200 kW of capacity in operation. With this project, it is expected that suppliers get interested in develop small capacity equipments to confirm the economical viability of the project, as well as the cost reduction and the efficient gains.

**Keywords:** Sustainable use of Biomass, Combined Heat and Power Generation (CHP), Rural Electrification.

## 1. INTRODUCTION

In Brazil's north region, the energy supply (isolated systems) is based on diesel generators, corresponding to a huge consumption of diesel oil, not only for the electricity generation itself, but, also, due to the transportation in the region that is done almost exclusively by boat.

There are nearly 1000 power plants supplying electricity for isolated cities and villages in the north region using, mostly, diesel oil. Over 670 are units with less than 500 kW of capacity. Considering such electricity generation in these isolated communities from these old and inefficient diesel oil engines, with high pollutant emissions, an interesting opportunity could be the replacement of these systems by other ones, mainly using renewable energy, such as biomass.

## 2. ENERMAD PROJECT

The ENERMAD Project "Implementation of a thermal power plant of 200 kW using wood residues from a saw-mill industry in Amazon region", approved by the National Council for Scientific and Technological Development (CNPq) and the Ministry of Mines and Energy (MME), intends to install a thermal power plant based on micro steam turbine system using wood residues from a sawmill industry located at an isolated community, in Pará state, Amazon region (CENBIO, 2004).

The project's execution team is composed by: The Electrotechnical and Energy Institute of the University of São Paulo (IEE/USP), the Biomass National Reference Center (CENBIO), the University of Pará (UFPA) and the University of Rondônia (UNIR).

The micro steam turbine system is composed by: boiler, manufactured by SERMATEC Industry, turbine, manufactured by TGM Turbine, generator, manufactured by WEG Generators, condenser and pump. A greenhouse for wood drying will be added to the steam cycle.



Figure 1 – Boiler produced for TGM Company (CENBIO, 2006)

Nowadays, the energy supply in the sawmill industry is based on diesel generator. This generator works 8 hours per day, 22 days per month. Considering the diesel price as US\$ 1.00 per liter (the ratio Dollar to Real, the Brazilian currency, is roughly 2.3), the implementation of this project would allow the savings of US\$ 2,200.00 per month to the village, which would improve the local infrastructure and the productive activities (CENBIO, 2004).

Besides the main characteristics of the biomass power plant, in this case from dedicated wood plantations, is the no contribution to the greenhouse effect. Other important characteristic of this project is the substantial creation of employment opportunities in rural areas.



Figure 2 – Turbo-generator produced for TGM and WEG Companies (CENBIO, 2006)

### 3. ISOLATED COMMUNITY

The chosen community for the steam cycle installation is Porto Alegre do Curumu village, at the city of Breves, Pará State. The village has about 400 inhabitants, occupying 80 houses approximately. The main economic activities of this community are wood processment, a wooden plant of handles and bases for brooms and a foodstuffs retailing (CENBIO, 2004).



Figure 3 – Porto Alegre do Curumu village (CENBIO, 2006)

The community's demand is supplied by diesel generators groups, with monthly average consumption of 22,000 liters of fuel, which are carried from the city Breves. The total demand of the community is about 200 kW.



Figure 4 – Sawmill at the village (CENBIO, 2006)



Figure 5 – Processed wood at the sawmill (CENBIO, 2006)

Beyond those activities, the community has great potential for fishing and preparation of fruits pulp (*açaí*) and vegetal oil.

This community was selected, therefore it was verified that all the processed wood in the saw-mill is derived from a extrativist reserve that possess a handling plan approved for the IBAMA - Brazilian Institute for the Environment and Natural Renewable Resources.

The residues from the wood processment will be enough to feed the steam cycle during 6 hours per day.

#### 4. CONCLUSIONS

The installation of this system in Porto Alegre do Curumu village will allow the supply of constant good quality electric energy for the inhabitants of the community. Moreover, the wood drying greenhouse will add value to the processed wood, allowing an increase on the income of the community's population.

Although the steam turbine system is commercially available in Brazil, this project will be the first one of electricity generation with biomass, with less than 200 kW of capacity in operation.

With this project, it is expected that suppliers will get interest in the development of small capacity equipments to confirm the economical viability of the project, as well the cost reduction and the efficient gains.

This project is of particular relevance, therefore besides contributing with the research institutions that already work in the area of electric energy generation, it could be replied in other isolated communities of the country, that today congregate more than 11 million Brazilians (IBGE, 2004) without electric energy access, mainly in the Amazon region.

#### REFERENCES

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