

“BIOMASS GASIFICATION TECHNOLOGY NATIONALIZATION AND HUMAN RESOURCES FORMATION IN THE NORTH REGION – GASEIBRAS PROJECT”

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Abstract-- Gasification systems already developed in Brazil are not adjusted to the electricity production at isolated communities, because this models that supply a gas with satisfactory properties to this end, are projected to operate with coal and not with biomass *in natura*, what implies in the biomass transformation in coal with all the environmental impacts and loss of thermodynamic income associates to this practical.

These problems had been surpassed with the GASEIFAMAZ Project development, realized by CENBIO in partnership with BUN, IPT and UFAM in the last two years. The project, that it aimed to make possible the electricity supply expansion in communities without energy access in the country north region, consisted of two gasification systems importation from the Indian Institute of Science, tests accomplishment and its transference to an isolated community.

Thus, the GASEIBRAS Project proposal it is to use the previously acquired experience to develop and construct a 20 kW gasification system with national technology, of easy operation and maintenance, to be fed with local available biomass residues *in natura*.

In this scope, it considers the biomass use as a solution to the energy supply, while sustainable source capable to stimulate local economic activities, as well as the reduction of the fossil fuels use and dependence. Also to serve as instrument for the local agroindustry development, guaranteeing an agricultural production that can defray the system operation and maintenance and to improve the communities population quality of life, beyond to supply the residues to be used in the gasification system.

Index Terms-- Agricultural Residues, Biomass Gasification, Rural Eletrification.

I. INTRODUCTION

The solid fuel gasification is a sufficiently old process and is carried through with the objective to produce a gaseous fuel with better transport characteristics, better

combustion efficiency and also that it can be used as raw material for other processes.

There are some gasification systems that had been developed in Brazil until the moment, that had not adjusted to the electric energy production in isolated communities. The models that supply a gas with satisfactory properties to this end are projected to operate with coal and not with biomass *in natura*, what implies in the biomass transformation in coal with all the environment impacts and loss of thermodynamic income associates to this practical. However, there are already institutions working with biomass gasification in the country, but there are gaps that prevent its commercialisation, mainly at gas cleaning procedure in order to feed the engine and simplified operation and maintenance procedures.

These problems had been surpassed with the GASEIFAMAZ project development, accord FINEP/CT-ENERG 23.01.0695.00, realized by the National Reference Center Biomass – CENBIO, in a partnership with Biomass Users Network of Brazil - BUN, Technological Research Institute - IPT and the University of Amazon, between the years of 2002 and 2005. The GASEIFAMAZ project aimed to make possible the electricity supply expansion in communities without energy access, in the north of the country.

Ahead of this, the GASEIBRAS Project proposal is to use the experience acquired during the GASEIFAMAZ Project accomplishment to develop and to construct in the country, a 20 kW gasification system with national technology and also to propose the system's large scale manufacture, to the national industry.

II. GASEIBRAS PROJECT

The GASEIBRAS Project has as main objective to develop, project and construct an *in natura* 20 kW biomass gasification system, developed with entirely national technology, of easy operation and maintenance, adapted to the Amazon region community's reality.

The project also foresees the installation of this system in an isolated community in the Amazon state, local inhabitants' qualification to operate and maintain and the management

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models study to cover its costs [1]. This project is financed by the National Council for Scientific and Technological Development (CNPq) and the Mines and Energy Ministry (MME).

Description of the operation: biomass is fed by the gasifier top. The burning process is accomplished in the reactor, with little oxygen (understoichiometric), the gas then formed passes through the humid way clean systems and then follows to the engine, where it is burned. In the diesel cycle engine, the gas substitutes up to 80% the diesel consumption. The complete substitution of diesel is not possible, since it would cause overheating in the injector tips of the engine.

The improvements made in the gasification systems developed by the gaseibras project are: feeding system with greater capacity, improvements in the gas cleaning system - sand filter and washing tips of greater efficiency, water treatment system with half-activated coal and a more efficient system of discharge of coal and ashes, like Figure 1 and Figure 1 2

The main challenges to be faced are the development of a system of dry cleaning of the gases and a technology of easier operation and maintenance, able to be used in isolated communities.

The project's execution team is composed by: The Electrotechnical and Energy Institute of the University of São Paulo (IEE/USP), Biomass National Reference Center (CENBIO), Federal University of Amazon (UFAM), Technological Research Institute (IPT), Colonization and Land Reform National Institute (INCRA), Energy Company of Amazon (CEAM), MWM Diesel Engines and WEG Generators.

The GASEIBRAS project was finished in september, 2007.

III. JUSTIFICATION

Between years 2002 and 2005, the Brazilian Reference Center on Biomass (CENBIO) in a partnership with BUN - Biomass Users Network of Brazil, the Technological Research Institute – IPT and the University of Amazon - UFAM developed GASEIFAMAZ Project "*Comparison between Existing Biomass Gasification Technologies in Brazil and Abroad and Formation of Human resources in the Region North*", accord FINEP/ CT-ENERG 23.01.0695.00.

The project aims were to test the Indian biomass small-scale fixed bed gasification technology and lead this to Aquidabam village in Amazon, providing electric energy in a sustainable way to isolated communities, offering an alternative to replace fossil fuel which was them way of energy provide. GASEIFAMAZ also intended to evaluate the operation conditions of the gasification system: Gas cleaning, electric energy generation also allowing the capacity building in the Amazon region and to replicate the system in other villages.

Considering that India already makes use of gaseification systems over ten years, running at isolated communities similar to those in Brazil, this project allowed to enjoy the outcome of the Indian experience to improve the technology for energy

generation in the Amazon's isolated communities. Thus, a 20 kW biomass gasification system was imported from the Indian Institute of Science – IISc [2].

To accomplish the project, it was imported two gasification systems (20 and 5 kW), from the Indian Institute of Science - IISc, and it consisted of the gasification system readiness / gases cleanness evaluation and electric energy generation potential, and the gasification system transference to isolated communities in the Amazon region.

After the tests phase, the gasification system was installed at Aquidabam village, Manacapuru, Amazon State. In this community live about 180 families, 700 people. They possess approximately 100 hectares destined to the cupuaçu production.

The Aquidabam community commercializes the cupuaçu fruit *in natura*, without any improvement. With the implantation of GASEIFAMAZ Project, the community counts now with constant energy supply, wich allowed the production of *cupuaçu* pulp, a product with higher added value, and will propitiate the local agroindustry development.



Fig. 1. Generation System [5]



Fig. 2. Generation System [5]

IV. GASIFICATION TECHNOLOGY

In all gasification processes, the organic substance, total or partially, is transformed into gases whose main components are: Carbon monoxide, Carbon dioxide, Hydrogen and, depending on the conditions, Methane, light hydro-carbons, Nitrogen and water vapor in different ratios [3].

The gasifier to be developed in GASEIBRAS project is down draft stratified, or either, the solid fuel draining follows the same felt direction of the gas. Both chains, of biomass and air, enter by the gasifier top, that it is opened to the atmosphere ("open top") and follow to the base. The biomass when passing through the reactor suffers an incomplete burning (with little oxygen) and is changed into a combustible gas. This gas passes for the cleaning system, though withdrawal of the impurities, and follows to the flare or engine-generator.

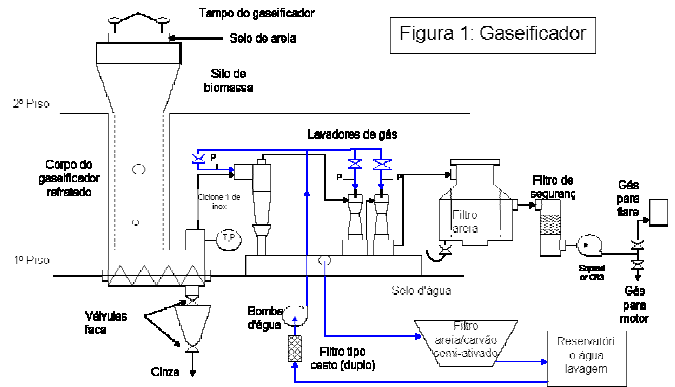


Fig.3. Gasification system under construction [4].

V. CONCLUSIONS

GASEIBRAS Project considers the biomass use as solution to the energy question, while sustainable source capable to stimulate local economic activities, and as a way for reduction of the fossil fuels dependence.

The biomass exploitation as primary energy source for electricity generation is an alternative completely suitable with today's reality, mainly when it is about isolated communities. It presents global null carbonic gas balance, only 1% of leached ashes generation that can be reused or recycled, almost null sulphur dioxide emission, as well as the other oxides proceeding from the combustion.

A national program of wide scale will be carried through, aiming at the production of these systems for the national industry. Thus, we'll have a complete study on biomass gasification total developed in Brazil: gasification technology development for electric energy generation, involved costs in the system construction and the problems faced in its use in isolated communities.

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 replicated in other isolated communities of the country, wich congregate more than 11 million Brazilians (IBGE, 2004) without electric energy access, mainly in the Amazon region.

VI. REFERENCES

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