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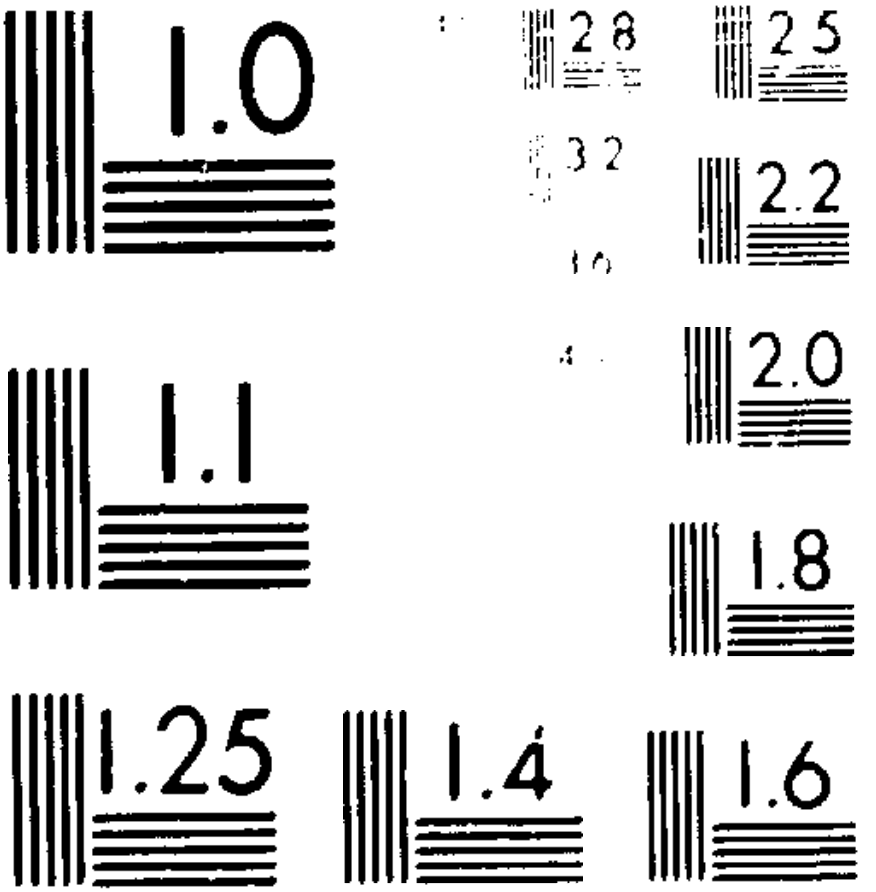
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Joint UNIDO/OLADE/GEPLACEA Workshop on
Rational Energy Utilization in Cane
Sugar Industry

Havana, Cuba, 8-13 September 1980

FINAL REPORT *

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INTRODUCTION

The Latin American Workshop on Rational Energy Utilization in Cane Sugar Industry was held in Havana, Cuba, on 8 to 12 September 1980. The Workshop was organized jointly by the United Nations Industrial Development Organization (UNIDO), Latin American Energy Organization (OLADE) and Group of Latin American and Caribbean Sugar Exporting Countries (GEPLACEA) and hosted by the Government of Cuba.

As the world supply of energy resources continues to dwindle near to the critical point, and the prices of these resources continue to rise, the need has arisen to rationalize and optimize the use of these resources in their various forms and applications.

The Latin American sugar industry has found itself confronted with a number of problems, both external and internal, which require the mounting of a major effort to improve the use of its resources. One of these resources is the energy available, in various forms, at sugar mills and ancillary installations.

The present poorly designed and obsolete transmission systems, the various alternative ways of generating and distributing energy, the competitiveness of sugar-cane bagasse as an energy resource or industrially viable product, the inadequacy or under-utilization of the boilers, etc. - all these factors have prompted us to prepare specific programmes and plans of action to provide solutions to these problems.

When operating efficiently, cane-processing plants produce a bagasse surplus capable of being transformed, at the plant itself, into steam or electricity which can be made available to external users, thereby reducing the need for other costly fuels. The result is an improvement in the economic performance of the plants and the opportunity to develop other branches of industry.

Taking into account the objectives described above and the areas of responsibility of each of the institutions involved, it was decided to deal specifically with these objectives at a Latin American Workshop on Rational Energy Utilization in the Cane Sugar Industry.

ORGANIZATION OF THE WORKSHOP

The Workshop was formally opened by Ms. M.M. Klibansky Delgado, Chief of Section, Cuban Research Institute for Sugar Cane Derivatives (ICIDCA), and the opening speeches were delivered by:

E. Estremadoyro del Campo, Executive Secretary, GEPLACEA

B. Castillo Carroso, Regional and Interregional Co-ordinator, OLADE

E. Aguilar, Chief, Section for Economic Co-operation Among Developing Countries, DPC, UNIDO

R. Guarda, UNDP Resident Representative in Cuba

The Workshop was attended by officially nominated participants from Bolivia, Colombia, Costa Rica, Cuba, Ecuador, Grenada, Mexico, Nicaragua, Panama and Peru. There were observers from Brazil, Cuba, Dominican Republic, Honduras, Mexico, Nicaragua, Panama and Poland. The papers presented were prepared by authors from Belgium, Berlin (West), Brazil, Cuba, F.R. of Germany, Hungary, United Kingdom and USA. Also, UNECLA, UNDP, UNIDO, OLADE, GEPLACEA and the Cuban Organizing Committee were represented. The total number of those who attended the Workshop was more than one hundred. They are listed in the Annexes.

The following were the Workshop officers selected by concensus:

Chairman	L. Galvez Taupier, Vice-Minister, Ministry of Sugar and Director of ICIDCA, Cuba

Vice-Chairman I	E. Dominguez Vargas, Vice-Minister, Ministry of Industry, Costa Rica
Vice-Chairman II	C. de Armas Casanovas, Chief, Engineering Department, ICIDCA, Cuba
Vice-Chairman III	A. Miaja Calvo, Vice-Director of the Sugar Industry, Mexico
Rapporteur	H. Quirch, Vice-Director, ICIDCA Cuba

The Rapporteur was assisted by L. Satizabal Arboleda, Colombia and G.C. Coronado Lizarzaburu, Peru.

The programme consisted of the Opening and Closing Sessions, four Working Sessions and technical visits to sugar mills, a bagasse board plant and a new fodder yeast plant.

The papers presented and discussed at individual sessions were as follows:

Session 1:

- Methodology of Energy Investigations in the Cane Sugar Industry, by T. Baloh
- Methodology for Determination of Material and Energy Balances in Chemical Processing Industries, by P. Siklosi
- Energy Crisis and Thermal Efficiency in Sugar Industry, by H. Quirch et al.

Session 2:

- Reverse Osmosis and Mechanical Vapor Compression as Potential Energy Saving Alternatives in Cane Sugar Processing, by A.A. Teixeira
- Methodology Used in Establishing an Energy Inventory for Hawaiian Sugar Mills, by C.M. Kinoshita and D. Murata
- Marginal Energy in the Production of Cane Sugar, by C. de Armas Cazanova, L. Pérez Garay and P. López Guzmán

Session 3:

- Comparative Analysis of Diffusion and Milling Extraction in Respect to Energy Requirements, by R. Schaer
- Comparative Economics and Energy Aspects of the Production of Ethanol from Sugar Beet and other Feedstocks, by W.J. Bell and S.D. Reynolds

- Heat Economy in Beet Sugar Industry (Experience of Interest to Cane Sugar Industry), by L. Beauduin.

The above papers as well as the discussion which followed, emphasized the following specific aspects of rational energy utilization in cane sugar industry.

1. In order to take any action aimed at reducing energy consumption in sugar mills, one should be able to determine more exactly how much and where the energy is utilized, what are the actual requirements and how big are the losses. In determining energy balance, experience of chemical industry as well as introducing "exergy" calculation seems to be of interest and adequate methodology should be introduced. Hawaiian experience with determination of energy inventory and the methodology used, was considered as an instructive example.

2. There are various possibilities to reduce energy consumption in a sugar mill and various technical and technological modifications were presented. Application of reverse osmosis for juice purification, drying bagasse, high pressure boilers, thermocompressors, modified quintuple evaporation, control of exhaust gases, etc. may all result in considerable energy savings. It was indicated that instead of 4,200 Keal used in old sugar mills, modern plants may be able to reduce consumption to some 2,000 Keal per kg. of sugar.

In order to find some practical solutions, OLADE has formulated a project which should determine: optimal method of bagasse drying, possible use of additives, which would improve combustion property of bagasse, optimal design of boilers for bagasse burning, possibility of improving existing boilers/ generators, optimal design of more efficient evaporators, filters, heaters, etc., possible use of electronic and magnetic devices in the production process, etc.

3. Some modifications of the process technology and equipment design used in modern beet sugar industry seem to be of interest for possible application in cane sugar industry as well.

4. Sugar cane is recognized as an important renewable source of energy and there are great possibilities of obtaining surplus bagasse or produced steam and electricity for other purposes. With the present technical and technological knowledge, it is possible to considerably reduce the energy consumption in sugar mills.

5. Some new developments in the alcohol production technology which is less energy consuming, may make its production more attractive if alcohol plants are attached to the sugar mills. With proper heat economy in both plants, alcohol production may become economically more attractive.

CONCLUSIONS AND RECOMMENDATIONS

(From the Report of the Rapporteur)

During the discussion on different subjects presented during the Workshop and statements made by participants, unanimous conclusions were reached on recommended action to be taken.

Methodologies

1. Establish more complete and efficient measurements of heat balances in order to obtain data that will precisely reflect the technological energetic process of sugar factories.
2. Employ improved methodologies for the measurement of material and energy balances which may be useful for designing more rational and efficient equipment and systems.

Steam Generation

3. Develop adequate furnaces and generators which use bagasse as fuel, bearing in mind, at the same time, the effects produced by mechanical harvesting.
4. Consider the need to raise power generation pressures to such levels that will make it technically and economically easier to produce surplus energ and bagasse.

5. Develop energy co-generation alternatives according to the technological possibilities specific to each case.
6. Introduce insulation so as to reduce energy losses in flue gases.

Improvement of Fuels

7. Develop technologies for drying out bagasse which do not involve the use of fossil fuel.
8. Develop and evaluate the utilization of pith as fuel, and/or for other industrial applications.

Process Control

9. Introduce evaporation schemes employing systems with multiple bleeding and recompression.
10. Establish a strict control of imbibition.

New Technologies

11. Study the possibilities and areas where the concentration by membranes can be applied.
12. Introduce and develop chemical products during the technological process such as anti-scaling, surfactants, etc.
13. Study and develop research on continuous vacuum pans.
14. Develop the production of fuel alcohol according to the specific conditions of each country.

General

15. Ensure at all times that a good thermal insulation of equipment and pipes is carried out.

Based on the aforementioned, it is also recommended:

1. To establish a techno-scientific documentation centre to enable all countries in the area to be kept updated on all energy problems of sugar cane.
2. Disseminate experiences developed by the various countries concerning maintenance methods in the industry and the techno-economic criteria on equipment replacement.

In order to contribute to the fulfillment of these objectives, we recommend that a workshop on maintenance and modernization of the cane sugar industry be held. To this effect, we request the co-operation of GEPLACEA, UNIDO and the active participation of interested countries. This event could be held in 1981.

3. Prepare a project for studying the potentials for using trash and tops as fuel.
4. Promote technical and economical collaboration among cane sugar producing countries, and particularly the exchange of information, training and technical assistance, and get to know the technological capacities of each country.
5. Second the motion by OLADE to establish a research centre for conducting studies aimed at increasing the energy efficiency of the cane sugar industry.
6. Promote an energy saving consciousness among industry workers and the general public.

In order to ensure that the above conclusions are carried out, it is recommended that UNIDO, OLADE, GEPLACEA and UNDP co-ordinate the implementation of programmes of action and allocate the necessary financial means to attain these objectives.

ANNEX I

List of Documents

Title	Authors' Name
How to Improve the Utilization of the Natural Fuel, The Bagasse by Cane Sugar Factories	R. Schaer
Reverse Osmosis and Mechanical Vapor-Recompression as Potential Energy-Saving Alernatives in Cane Sugar Processing	A.A. Teixeira
Alcohol Como Combustible Liquido Alternativo-Experiencia Brasileña	U. de Almeida Lima
Heat Economy in Beet Sugar Industry	L. Beauduin
Methodology Used in Establishing an Energy Inventory for Hawaiian Sugar Mills	C.M. Kinoshita and D. Murata
Comparative Economics and Energy Aspects of the Production of Ethanol from Sugar Beet and Other Feedstocks	W.J. Bell and S.D. Reynolds
Methodology of Energy Investigations in the Cane Sugar Industry	T. Baloh
Methodology for Determination of Material and Energy Balances in Chemical Processing Industries	P. Siklosi
Crisis Energetica y Eficiencia Termica en la Industria Azucarera	Departamento de Investigaciones Termoenergéticas, Instituto Cubano de Investigaciones Azucareras (ICINAZ)
Energia Marginal en la Produccion de Azucar de Caña	C. de Armas Casanova, L. Pérez Caray and P. López Guzmán
Desarrollo de la Potencialidades de Generacion de Energia en la Industria Azucarera	OLADE
Importancia del Esquema Termo-Energetico Empleado en la Industria Azucarera	G. Llerena Montenegro

Title	Authors' Name
La Potencialidad de la Caña de Azucar Como Recurso Energetico Renovable	P. López Guzmán and C. de Armas Casanova
Comparative Analysis of Diffusion and Milling Extraction in Respect to Energy Requirements	R. Schaer

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