

WORKSHOP PROCEEDINGS

State Level Capacity Building Workshop on Clean Development Mechanism

Organised by



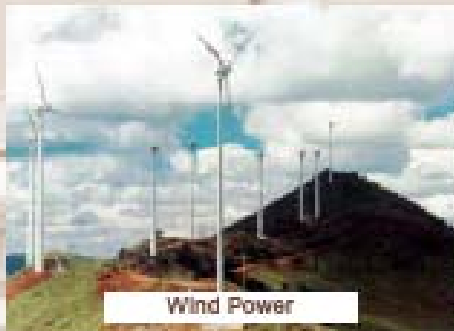
Winrock International India, New Delhi
and
Institute for Global Environmental Strategies, Japan



at
Kolkata (West Bengal, India), March 17-18, 2004
and
Ahmedabad (Gujarat, India), March 23-24, 2004

under the

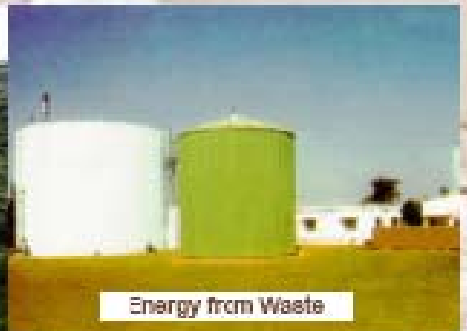
INTEGRATED CAPACITY STRENGTHENING FOR
CLEAN DEVELOPMENT MECHANISM (ICSDM) PROGRAM,
AN INITIATIVE OF IGES



Wind Power



Mini-Hydro



Energy from Waste

PREFACE

Under the Clean Development Mechanism (CDM), introduced in Article 12 of the Kyoto Protocol at the 3rd Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in 1997, a legal entity in a developed country is allowed to invest in a project that reduces greenhouse gas emissions in a developing country. Certified emission reductions can be used to meet the commitments made by the developed country under the Kyoto Protocol. For a developing country it can be seen as an additional source of foreign direct investment to national mitigation projects, which, at the same time, would contribute to sustainable development and decrease in global GHG emission levels. The carbon market is growing and there are several options to sell emission reductions in carbon investment funds, government procurements tenders, and voluntary trading schemes. India is a competitive supplier for cost-effective GHG offset projects. Recognizing the possible benefits derived from such investment flows to India, the Government of India has also placed CDM at the top of its climate change agenda.

In order to create awareness on this emerging subject, IGES in collaboration with WII organized two state level capacity building workshops on CDM in March 2004. The workshops were organized under the aegis of Integrated Capacity Strengthening for Clean Development Mechanism project of IGES, and focused on opportunities to take advantage of the CDM mechanism for renewable energy projects. The present volume is published from the proceedings of these two workshops, one held in Kolkata on March 17-18, 2004, and one in Ahmedabad on March 23-24, 2004. The guidelines and tools introduced in the workshops provided insights on how to develop credible, workable and transparent baselines for quantifying the mitigation effects of CDM projects in the renewable energy sector. The workshops also provided a forum for reviewing the current status of climate change negotiations, national policies and strategies, growth prospects of carbon markets and some key issues in CDM project design.



Kinsuk Mitra
President, WII
April 2004

STATE LEVEL CAPACITY BUILDING WORKSHOP ON CLEAN DEVELOPMENT MECHANISM (CDM)

March 23-24, 2004

Gokul Dwarka Hall, Hotel Taj Ummed Palace, Ahmedabad

PROGRAM

DAY 1: March 23, 2004

Time	Agenda	Speakers
10:00 – 10:45	Inaugural Session	Welcome Address & Introduction: Mr. Somnath Bhattacharjee, <i>Vice President, WII</i> Inaugural Address: Sh. K. V. Bhatnagar, <i>Chairman, Gujarat Pollution Control Board</i> Special Address: Mr. Shinichi Itoaka, <i>CDM Program Manager, Climate Policy Project, IGES (read out in absentia)</i> Vote of Thanks: Dr. Ashish Rana, <i>Senior Program Officer, WII</i>
10:45 – 11:00	Tea Break	
11:00 – 12:30	Technical Session 1: Clean Development Mechanism (CDM) – An Overview Chair: Mr. A C Shroff, <i>Managing Director, Excel Industries</i>	Expectations of participants from the workshop Introduction to Climate Change and Development Issues: Prof. P R Shukla, <i>IIIT Ahmedabad</i> Climate change convention and Kyoto Mechanisms: Dr. Ashish Rana, <i>Senior Program Officer, WII</i> Discussions
12:30 – 13:30	Lunch	
13:30 – 15:30	Technical Session 2: GHG Market Chair: Mr. Somnath Bhattacharjee, <i>Vice President, WII</i>	GHG Market & India's Perspective: Dr. Ajay Mathur, <i>President, Senergy Global</i> Legal issues in CDM projects: Ms. Amee Yagnik, <i>Advocate, Gujarat High Court</i> Discussions
15:30 – 15:45	Tea Break	
15:45 – 17:00	Technical Session 3: CDM & Sustainable Development Chair: Dr. Ajay Mathur, <i>President, Senergy Global</i>	CDM and Biomechanism: Mr. Siddhartha Yadav, <i>Consultant, Ministry of Environment and Forests</i> CDM Benefits from Waste Utilization: Mr. A. C. Shroff, <i>MD, Excel Industries Ltd.</i> Discussions

contd...

DAY 2: March 24, 2004

Time	Agenda	Speakers
09:30 – 10:45	Technical Session 4: CDM Project Development Chair: Prof A.N.Mathur, <i>Dean, College of Technology and Engg., Udaipur</i>	CDM Project Cycle: Ms. Aditi Dass, <i>Senior Program Officer, WII</i> Case Study – Biofuels: Mr. Jai Uppal, <i>Advisor, WII</i> Discussions
10:45 – 11:00	Tea Break	
11:00 – 13:00	Technical Session 4 continued: CDM Project Development Chair: Sh. K.V. Doshi, <i>Dy. Director, Gujarat Energy Development Agency</i>	Case Study – Cogeneration: Mr. Dhirendra Kumar, <i>Program Officer, WII</i> Case Study – Gasifier: Mr. Manoj Gehil, <i>Executive Director, Agrocel Industries</i> Case Study – Solar Dryer: Prof. N. S. Rathore, <i>Head, Renewable Energy Dept., College of Tech. And Engg., Udaipur</i> Discussions
13:00 – 13:45	Lunch	
13:45 – 15:00	Technical Session 5: Financing Issues Chair: Mr. A T Kusre, <i>GM, ICICI Bank</i>	Carbon Finance & CER Purchase: Mr Chintan Shah, <i>GM, Senergy Global</i> Financing of Renewable Energy Projects in India: Mr. Pradip Modi, <i>P.K. Modi & Associates, Chartered Accountants</i> Discussions
15:00 – 15:45	Panel Session	Panel Discussion on “Opportunities and Barriers for States”: Sh. Vijay Ranchal, <i>India Development and Environment Agency</i> Sh. K.V. Doshi, <i>Dy. Director, Gujarat Energy Development Agency</i> Mr. Sandeep Dave, <i>Director, Neptune Automation Pvt. Ltd.</i> Feedback by participants Closing Remarks: WII
15:45 – 16:00	Tea Break & Wrap-up	

TECHNICAL SESSION 4 CDM & SUSTAINABLE DEVELOPMENT

CHAIRPERSON

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Dean, College of Technology and Engineering,
Mahatma Pratap University of Agriculture and Technology Udaipur, Rajasthan

■ CDM PROJECT CYCLE

ADITI DASS

Senior Program Officer, Winrock International India

■ BIOFUELS - A GLOBAL OVERVIEW, BENEFITS AND POTENTIAL CDM OPPORTUNITIES

JAI UPPAL

Advisor - Renewable Energy, Winrock International India

BIOMASS GASIFIER

MANOJ GOHIL

Executive Director, Agrocel Industries

MANOJ GOHIL is Executive Director of Agrocel Industries Ltd, a leading company in Bhuj-Kutch area located in the western most tip of India which has successfully installed a biomass gasifier in their company for captive power consumption. He is also a trustee of Vivekanand Research and Training Institute, a local NGO involved in rural development work. He and his colleagues presented the case study on biomass gasifier that they have been using in the remote area of Kutch for several years for captive power consumption.

1 PRESENTATION BY:

- Dhaval Dave – Agrocel Industries, Kutch.
- Yogesh Indhav – Ankur Scientific, Baroda.
- N. T. Ghelani – Transpek Industry, Baroda.

2 INTRODUCTION

- Experience gained during 2nd World War- when gasifiers were used for mobile applications shows that suitable fuel for the operation of I.C. engine can be easily obtained by Biomass Gasification process.
- The fuel crisis in 1973 and 1979 that led steep price rise of liquid fuels, substantially.
- This has seriously affected the Economy of the world in general and under developing countries in particular.
- This has compelled the world to look for alternative fuel sources that are renewable, reliable and sustainable. Hence, renewable sources of energy like Wind, Solar and Biomass Gasification caught the attention of developed and underdeveloped nations. Use of Bio-mass in the form of wood and other agro waste like, rice husk etc. has attracted attention to provide such source of energy.
- Internal Combustion Engines are widely used in rural areas of developing countries for stationary applications like power generation and lifting of water etc.
- Using producer gas to power I.C. engines through gasifier is a convenient solution.

3 PROSOPIS JULIFLORA (GANDO BAVAL)

- Shri K.C. Shroff ex chairman of Excel Industries

who is working in the area in improving Social Conditions of people in Kutch for last 25 years.

- Sufficient Quantity of Prosopis Juliflora is available in Kutch. Approximately 1.5 Lac Hectares of land is covered by this.
- Shri K.C. Shroff has tried to use this as Fodder for cattle.
- The use of Prosopis Juliflora for Generation of Power will be more gainful and on a larger scale.

4 GROWTH OF PROSOPIS JULIFLORA (GANDO BAVAL) IN KUTCH



5 WHY AGROCEL CHOSE BIOMASS GASIFICATION TECHNOLOGY?

This decision will yield multiple benefits as under:

- Create employment to local population. About 60 persons are being employed by Agrocel in operating their plant of 300 kW.
- In case of 1MW Plant about 150 persons will get employment.
- Gainful utilisation of Prosopis Juliflora (Gando Baval).
- Obtain power from renewable source of energy.
- The cost of Power has reduced.

- The consumption of L.D.O. has been substantially reduced.

6 SALIENT FEATURES OF GASIFIER FOR POWER GENERATION AT AGROCEL

- We are thankful to GEDA and MNES who have granted a subsidy of 4.5 lacs for Gasifier installation.
- Gasifier was procured from M/s Ankur Scientific Energy Technologies Pvt. Ltd. Baroda.
- Low Speed - 500 r.p.m. old marine D.G. Sets were procured from Along Ship breaking Yard and were in use.
- These were converted for Dual Fuel Mode by Hi Tech Consultancy of Baroda.
- The Engines are operated on Dual Fuel Mode using about 30- 40 % L.D.O. and 60 - 70 % Producer Gas.
- The use of Dual Fuel mode gives flexibility of either working with Gas & L.D.O or L.D.O. alone.
- The consumption of L.D.O. has reduced from about 0.33 - 0.4 liter per kWh to 0.11 liter per kWh. There is a scope of further reducing this to about 0.08 liter per kWh.
- Daily consumption of Wood is between 4 - 5 MT.

7 BIOMASS AS A RENEWABLE RESOURCE & ITS KEY ADVANTAGES

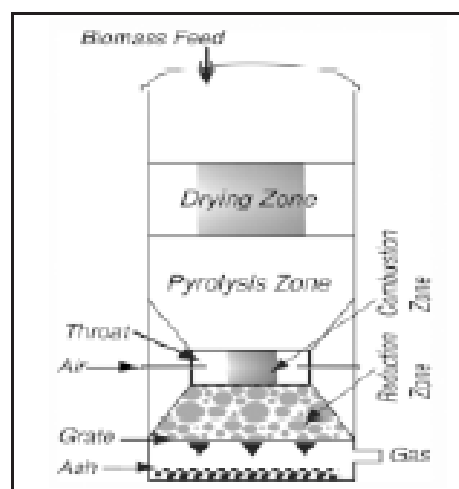
- Age-old largest and most widely used fuel Source.
- This has been in use in Domestic and Industrial Units.
- Inherent & inexpensive storage in stark contrast to Solar Radiation and Wind
- Availability on demand/round-the-clock; hence ideal for captive power generation
- High capacity factor; self-contained system (without the need for a back-up)
- Wide Range of Conversion Technologies with an ability to produce Electricity, Thermal Energy as well as High Quality Fuels
- Low Capital Investments even for Power Generation
- Low cost of power generation (Rs. 3 - 4 per kWh) in Dual Fuel Mode.

- In case of 100 % Gas mode the cost would be around Rs. 2 - 2.5 per kWh.
- Wide range of power ratings (3 kW to 1000 kW or higher) with high conversion efficiencies

8 GASIFICATION - BASIC PROCESS CHEMISTRY

- Conversion of solid fuels into combustible gas mixture called producer gas
- Chemistry of Gasification :
Normal Combustion: $C + O_2 = CO_2$
Gasifier Condition: Hydro Carbon(Wood) + Controlled O_2 (Air) = $CO + H_2 + CH_4 + CO_2 + N_2$
- Involves partial combustion of biomass
- Full Combustion produces carbon dioxide (CO_2) and water vapour (H_2O)
- Partial combustion produces carbon monoxide (CO) and hydrogen (H_2) and some methane (CH_4) - all combustible gases, along with nitrogen (N_2) and carbon dioxide (CO_2)
- Basic four distinct processes in the Gasifier are Drying, Pyrolysis, Combustion and Reduction.
- Fuels must pass through each zone.
- Tars given off in the pyrolysis zone are broken into useful energy when they are through combustion zone.

9 GASIFICATION - BASIC PROCESS CHEMISTRY SCHEMATIC



10 WHY GASIFICATION ?

- Converts a traditional, low quality fuel to a modern day energy carrier i.e. combustible gas
- Such conversion occurs at relatively high efficiencies and results in total convenience and process control
- The process can be applied over a very wide range of output ratings (a few kilowatts to thousand kilowatts) with only a small variation in overall efficiency and investment
- The process is equally applicable for electricity generation and a variety of thermal applications (be it driers, ovens, furnaces, boilers etc.)
- Both initial investment as also the cost of energy/power production are just about the lowest amongst all known alternatives

11 THE OPTIONS IN BIOMASS GASIFICATION

■ Types of Gasifiers:

- Updraught
- Downdraught
- Cross Draught
- Fluidized Bed

■ Feedstock Modes:

Given the current biomass specificity of the technology and the hardware, the following options are available from Ankur Scientific:

- WBG Series for Woody Biomass
- FBG series for fines like Rice Husk
- Combination Model capable of using either woody biomass or rice husk through quick change-over.

■ Power Generation

Power Generation can be in two modes:

- Dual Fuel mode with about 70% energy coming from Biomass and the rest from liquid fuels
- 100% Producer Gas based systems

Systems based totally on producer gas are a recent development with tremendous interest generated because of very low fuel cost of power generation

■ Thermal Application

Thermal applications covering a wide range

- Flame temperature of 1300°C
- Applications requiring upto 1000°C can be totally on producer gas
- Higher temperatures through dual fuelling

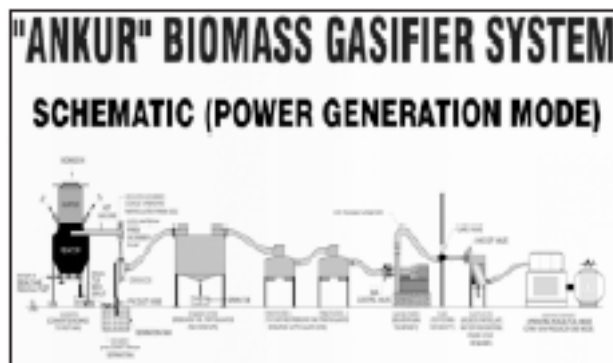
12 ENVIRONMENTAL ASPECTS

- Water-used in re-circulation mode with zero discharge.

- Air-gasifier works in suction mode and hence no gas release to atmosphere. Combustion in user equipments for both thermal and power applications is much cleaner compared to liquid fuel (because of hydrogen content)

- Small quantity of charcoal obtained from the Gasifier can be fed back into the gasifier or can be used as fuel.

- Biomass materials contain negligible sulphur and, in that respect, are better fuels (as compared to fossil fuels)



13 'ANKUR' BIOMASS BASED POWER PLANT FOR ISLAND ELECTRIFICATION

Location : Gosaba Island, Sundarbans (100 km from Kolkata)
Capacity : 500 kW, using 5 x 100 kW AG series Gasifier
Commissioned : June 1997

HIGHLIGHTS



- Catering to about 800 households
 - No disruption to date
 - About 6-8 hours operation daily
 - Operations managed and sustained by Rural Energy Co-operative Operated & maintained by duly trained local technicians; operating supervision for first three years by Ankur Scientific
 - Tremendous boost to education, economic opportunities and social/cultural activities
- Based on the success of the first, a second project installed in nearby island

14 'ANKUR' BIOMASS GASIFIER BASED POWER PACK MODEL GAS-4 FOR A COCONUT PLANTATION IN SRI LANKA



Location : At Dr. Ray Wijewardene's Coconut Plantation Sri Lanka
Capacity : Gross 4 kWe (GAS - 4)
Commissioned : 2008.

HIGHLIGHTS

- First installation of GAS-4 100% Producer Gas system.
- Start - up through battery
- Specific fuel consumption- less than 1.5 kg/kWhr
- Cost of Generation as low as 2 to 3 US cents per kWhr

15 CHLORATE INDUSTRY IN TAMIL NADU



Location : M/s Valli Chlorate, Kovilpatti
Capacity : Gross 200 kWe (GAS - 200)
Commissioned : 2008

HIGHLIGHTS

- First installation of GAS-200 in India.
- Low Start - up power
- Specific fuel consumption- less than 1.5 kg/kWhr
- Low cost of power has enabled the company to restart the production which was stopped due to increased electricity cost.

16 'ANKUR' BIOMASS GASIFIER MODEL WBG-200 COUPLED TO MICROTURBINES FOR POWER GENERATION



Location : EERC, University of North Dakota, USA
Capacity : WBG - 200 in Power Generation Mode
Commissioned : 2003

HIGHLIGHTS

- The whole gasifier system is mounted on a trailer.
- The gasifier is coupled to three turbines of 30 kW
- The order of supply of gasifier to EERC was won against stiff international competition

17 'ANKUR' BIOMASS GASIFIER COUPLED WITH SLOW SPEED MARINE ENGINE



Location : M/s Ashwin Vasanpati, Samlaja
Capacity : WBG - 40
Commissioned : 2003

HIGHLIGHTS

- Generating Power in dual fuel mode with LDO replacement of around 60 -65 %.
- Total Hours of Operation - 1740 Hrs.
- Total LDO saved during these hours- 113100 Litres

18 PARTIAL LIST OF 100% PRODUCER GAS BASED SYSTEMS

Name & Address of the Client	Gas Power Pack Model	Qty.
Lanka Transformers Ltd., 154/11, Railway Station Road, Angulana, Moratuwa, Sri Lanka	GAS-40	1 No.
Vidya Jyothi Dr.Ray Wijewardene 133, Dharmapala Marutha, Colombo 00700, Sri Lanka	GAS-4	1 No.
Muni Seva Ashram Gonj 391 760 Tal: Vaghodia Dist : Baroda, India	GAS-40	1 No.
Valli Chlorate Co. 139, Elayarasamendal Road Kovilpatti 628 502 (Tamilnadu), India	GAS-200	1 No.
District Rural Development Agency Collectorate, Coimbatore - 641 018	GAS-9	2 Nos

19 IMPORTANT RECENT INSTALLATIONS AND EXPORTS

Name & Address of the Client	Gasifier Model	Mode
Ashwin Vasanpati (Gujarat)	WBG-400	Power Generation
Agrocel Industries (Gujarat)	WBG-300	Power Generation
Khaitan Chemicals and Fertilizers Ltd. (U.P.)	WBG-500	Thermal
Lloyd Insulations (Madhya Pradesh)	WBG-200	Thermal
Sai Roofings (Andhra Pradesh)	WBG-200	Thermal
Markus Dallinger, Germany	GAS-133	100% Producer Gas
NERD Centre (UNIDO Project) Sri Lanka	GAS-103	100% Producer Gas

20 PERFORMANCE EVALUATION

■ 300 kW D.G. Set operating on Dual fuel mode was started in Dec. 2003.

Month	Total Working Hrs. (Gasifier)	Units Generated (with/without Gasifier)	LDO Saved Ltrs.
Dec. 2003	284	72790	7296
Jan. 2004	311	89310	9844
Feb. 2004	435	80100	15555
Mar. 2004 (21 Days)	457	83641	16855
Total	1487	325841	49650
Mar. 2004 (Expected)	675	123470	25029

Remarks: There were heavy Floods during Monsoon of 2003 in area around factory. Factory Operation was thrown out of Gear. During Dec. 2003, Jan. 2004, and Feb. 2004 the factory was operating only partially. The load on DG Sets was not adequate. Proper Operation of the Factory has started in March 2004.

ANNEX 4

LIST OF PARTICIPANTS (AHMEDABAD)

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