

CONSOLIDATED REPORT ON THE PROJECT

**“DISSEMINATION OF SOLAR DRYING
TECHNOLOGY FOR INDUSTRIAL SECTOR
INCLUDING AGRO-INDUSTRIES IN THE COUNTRY”**

SUBMITTED TO

**Ministry of New and Renewable Energy
New Delhi**

BY

**PLANTERS ENERGY NETWORK,
5 Power House Street
N.R.T.Nagar
Theni - 625531.**

CONTENTS

- 1) FORWARD
- 2) PROJECT OBJECTIVES
- 3) ACTIVITIES UNDERTAKEN
- 4) CONCLUSION

Planters Energy Network

FORWARD

Planters Energy Network (PEN) is involved in the past 20 years in the development, promotion and applications of solar air heating system. The detailed work done by PEN in this field are briefly explained in the article “Status and Potential of Solar Air Heating in India” (refer appendix).

Ministry of New and Renewable Energy (MNRE) vide its letter dt. 16th October 2007 and letter No: 15/12/2000 ST has sanctioned a project of title “Dissemination of Solar Drying Technology for Industrial Sector including Agro-industries in the country”.

The main objective of this project is to create awareness on the potential of solar drying technology for both agro processing and industrial sector. The keystones of the project, duration 3 years, are: organising 12 business meets; 6 training programmes for technicians, as well as preparation of literature, study tours & success stories.

This is the final consolidated report of the project covering the period.

C Palaniappan

Project Leader

Planters Energy Network

Theni Tamilnadu.

Objectives of the Project Titled “Dissemination of Solar Drying Technology for Industrial Sector including Agro-industries in the country”

The amended objectives of the project are as follows:

- To make survey to collect information from various user industries to identify areas / products for solar drying application.
- To identify potential beneficiaries through business meets and assist them in preparing project proposals for solar drying systems.
- To develop suitable literature, data bank and success stories for use in dissemination in the technology.
- To develop a few groups in different states for design, installation and techno economic evaluation of the technology.
- To conduct training programmes for technicians of the beneficiaries in operation and maintenance of the solar drying systems installed under MNRE programmes.
- To collect feedback from various field installations and suggest optimum designs of solar dryers for various applications.

As per earlier sanction, the project was to be implemented in six states in the country. Five states have already been identified which are Andrapradesh, Maharashtra, Madhyapradesh, Haryana and Gujarat in this regard. The sixth state for implementation of the project will be Puducherry.

The outputs of the project are amended as follows:

- A minimum of 12 project proposals (upgraded from 6). at least one each in six states, developed and submitted to the Ministry for consideration of support for installation
- A minimum of two groups developed for disseminating the solar drying technology.

- A consolidated report on the result of survey identifying areas / products for solar drying applications and a list of identified potential beneficiaries.
- A report on optimum designs of solar dryers for various applications based on the feedback collected from field installations including data regarding moisture contents, temperature required, air flow rates, etc.
- A compilation of success stories containing project details and photographs for use in dissemination of the technology.

Planters Energy Network

ACTIVITIES UNDER TAKEN DURING 2003 – 2004

1. After the approval of the project, appointments as per the project norms were made for following posts
 - One Project In-charge (PI)
 - Two engineers and one consulting engineer.

2. Addresses of different industrial sectors like chemical, pharmaceutical, agro-processing, spices powder, leather, fish were obtained by web browsing. Nearly 500 correspondences containing information explaining the benefits of solar drying were sent to the concern industries.

3. The following equipments were purchased through a purchase committee.
 - Pentium 4 PC computer – One number.
 - A CD writer - One number.
 - Printer cum copier – One number.
 - A lab-top computer purchase.

4. To organise business meet, PI had to make personal callings to the chief executives of state nodal agency like Non-Renewable Energy Development Corporation of Andhra Pradesh (NEDCAP), Hyderabad, Maharashtra Energy Development Agency (MEDA), Pune and Haryana State Energy Development Agency (HAREDA), Chandigarh.

5. A business meet to cover Andhra Pradesh was conducted at Dolphin, a hotel in Vishakapatnam in which 40 numbers of registered participants and 40 numbers of dignitaries participated. The Project In-charge and the two project engineers made the presentations on various aspects of solar drying. MNES representative and IREDA representative had also provided information on the government incentives for solar air heating project. At the end of the meeting PEN conducted one to one conference

to identify technology need. The following types of industries have shown interest on adapting solar drying technology.

1. Hatcheries – to provide hot air to the incubator so as to replace the electrical heating.
 2. Industrial drying of tobacco at Annaparti – ITC factory.
 3. Textiles drying near Hyderabad.
 4. Wet yarn drying at a factory near Srikakulam.
 5. Drying of agro fuel and the fats for a company near Tadepelligudem.
 6. Organic coffee drying for a group in Hyderabad.
 7. For a few heating applications in the Hindustan Zinc Ltd. at Vishakapatnam.
 8. A NRI group based in Vishakapatnam for drying of mango pulp into fruit bar and dehydration of vegetables.
 9. Drying of bio fuels in Vijayanagaram district.
 10. A number of enquiries on setting up of fish drying units many by NGO and one by an exporter.
- 07) After of the business meet the following industries invited PEN for survey and prepare project report for the demonstration project.
- a) M/s.Indian Tobacco Company, Annaparti.
 - b) M/s.Foods, Fats and Fertilisers Ltd, Tadepallikudam.
 - c) M/s.Semio-chemicals etc, Secundarabad.
 - d) M/s.Genova Biotechniques, Hyderabad.
- 08) The project in-charge made a preliminary visit to Pune to meet the director general of Maharashtra Energy Development Agency with a presentation.
- 09) A business meet for Maharashtra region was conducted at Chamber of Commerce and Industries hall at Pune in which 90 numbers of registered participants and 10 dignitaries participated. Project In-charge and the project engineer made the presentation on solar drying. MNES

representative Mr. Padam Singh has also provided information on the government incentives for solar drying. The following types of industries have shown interest on adapting solar drying technology during one to one conference at the end of the meet.

- i) Mrs.Michelle Chowla
Sgoves Products,
1, Sapote Building,
Irani road, Dhanu – 401602,
Maharashtra.
- ii) M/s.Biani Impex (P) Ltd.,
C-1/2B, M.I.D.C. Area,
Jalgaon – 425 003.
- iii) M/s.S.S. Industries,
E-63, M.I.D.C. Area,
Jalgaon – 425 003.(MS)
- iv) M/s.Behede Udyog,
F-73, M.I.D.C. Area,
Jalgaon – 425 003.
- v) Mr.Babasaheb Suryawanshi,
General Manager,
Baramati Agro Limited
Pimpali, Baramati – 413102
Maharashtra.
Ph: (02112)21001/2/4/5.
- vi) Mr.Vikram Warma
Production Manager,
Enzo Chem Ltd
P.O box no:28,Yeola
Nasik-423401
Tel:02559-65123/65072.
- vii) Mr.Anil S.Desai
Factory Manager,
BDH Industries Ltd,
Nair Baug, Akurli Road,
Kandiveli (E), Mumbai – 400001
- viii) Mr.Vishal Chordia,
Pravin Masalewale,
44 Hadapsar Industrial Estate
Pune – 411013
Ph: 6872095

- ix) M/s.FDC Limited,
142-48, S.V road,
Jogeshwari, (w).
Mumbai – 400102.
- x) M/s.Ichalkaranji Co-opTextile ltd,
K-23 – 33 Kolhapur.
- xi) M/s.Tef –S-Koatings,
840/2, Behind Basiravnath temple,
Pune.
- xii) Turakhia Textile
Chintupada, Palghiar.
Maharashtra.
- xiii) Ajantha Pharma
Aurangabad.
Maharashtra.

The following companies were visited and proposals were given,

- a) M/s.Biani Impex (P) Ltd.
- b) M/s.S.S. Industries.
- c) M/s.Behede Udyog.
- d) M/s.Baramati Agro Limited.
- e) M/s. Enzo Chem Ltd.
- f) M/s. Ajantha Pharma

A business meet was conducted in Jalgoan for the pulses manufacturers association on 5th October. The Jalgaon Pulses Manufacture's associaton had organised this meeting with nearly 70 participants from Jalgoan and nearby arrears. Dr.Palaniappan and PEN engineers had presented the various aspects of solar dal drying.

10). Preliminary work to conduct business meet at Haryana was done by a visit of PI to Chandigarh. Data sheets were widely circulated to collect information through Haryana Energy Development Agency. Industries like Pharma, leather, plywood, rice mills etc have shown interest.

- 11). Regarding the business meet at Gujarat, preliminary discussions were held with salt commissioner (ref annexure II - potential of solar air heating in India) and Gandhidham Chamber of Commerce and industry. The Chamber insisted to hold the business meet after proving at least in a small way the usage of solar drying for the salt industry. In this connection Planters Energy Network is executing a project for Annapoorna Salt franchised by Hindustan Lever Ltd. A 110 sq.m. solar air heating system of high temperature generation has been installed near Tuticorin, Tamilnadu. The system commissioned recently is showing an average fuel savings of 7 l/h or 30% fuel savings.
- 12) A visit to Europe by PI for 5 weeks for a stay in Ancona University, Italy and a one week personal stay at London during Oct-Nov.2004.
- 13) A preliminary visit was made to Bhopal during 3rd week of December and discussion were held with MNES regional office, Nodel agencies and other agencies, so that a business meet could be organised in February or March.

Commercialisation of technology

The 11 months study have identified many new areas where solar air heating could be successfully commercialised, of course by overcoming many unique problem like the absence of the optional roof orientation, requirement of storage facility for night operation etc. PEN is hopeful of starting a number of commercial projects in Dal industry, food industry and pharmaceutical industries.

Study tours were made by the following groups mainly to PEN installation near Theni, Tamil Nadu.

- a) M/s. Biani Impex (P) Ltd.
- b) M/s. S.S. Industries.
- c) M/s. Enzo Chem Ltd.
- d) M/s Genova Biotechniques, Hyderabad.

For literature preparation a video C.D's containing a few success stories were made for wide circulation (refer sample copy).

ACTIVITIES UNDER TAKEN DURING 2004 – 2005

The following activities were carried out during 2004-2005.

A total of 52 numbers of solar air heating systems covering around 1378.5 m² was installed as described below:

- A 113 m² solar collector with copper absorber and partial double glass was installed to pre-heat the air needed for drying crystal salt at a salt factory in Tuticorin which has a contract with Hindustan lever limited for marketing the salt under the brand name of “Annapoorna” salt. The system was able to demonstrate fuel savings of around 8000 litres of furnace oil when it was run for a period 180 days (refer fuel savings data).
- Paddy Processing and Research Centre, Tanjore, Tamilnadu working under the Ministry of Food Processing Industries, Govt. Of India, New Delhi has placed an order for installing a 113 m² Solar Air heating System for drying 2 tonnes of Paddy per batch. The system was installed and demonstrated to dry 2 tonnes of Paddy.
- Agricultural Marketing and Agri Business, Govt. of Tamilnadu has placed order for installing a 91 m² Solar Air Heating System for drying 0.7 tonne of chillies and other fruits at Surandai near Thenkasi. The system was installed and demonstrated to dry 0.7 tonne of chillies.
- Agricultural marketing and Agri Business, Govt. of Tamilnadu has placed order for installing a 91 m² Solar Air Heating System for drying 0.7 tonne of vegetables and spices at Neduvayal near Thenkasi. The system was installed and demonstrated to dry 0.7 tonne of spices.

- A 81 m² Solar collector was installed to heat the air needed for drying 400kg of apricot and other fruits and vegetables at Nimoo, Ladhakh district, Jammu and Kashmir State for M/s Sham fruit & vegetable Growers Co- operative Marketing Society Ltd. The system was able to demonstrate to dry around 400 kg of Apricot and other fruits and vegetables.
- M/s E.I.D. Parry India Ltd, Alwar, Rajasthan has placed an order for installing a 230 m² Solar Air Heating System for ceramic Mould ware drying. The system was installed and testing is going on.
- A 55 m² Solar collector with copper absorber and partial double glass was installed to heat the air needed for drying 15kg of wet cloths within half an hour.
- Installation 300 kg capacity fruit and vegetable dehydrating units at Kargil supported by Kargil Hill development council.
- A 70 kg capacity fruits and vegetables solar drying unit for Chief horticulture office ,Leh, Ladakh.
- An herbal drying unit for Irula tribal welfare society near Chennai.
- A solar fish drying unit. for Assistant Director of Fisheries Cuddalore
- Installation of 40 units for fish drying through NGO organisations
- One Solar fish drying unit of 500 kg capacity supported by Marine Products Export Development Agency-MPEDA at Paradwip port near vizag of Orissa.

Business meets:

- A business meet at Leh, Ladakh organised with Ladakh Hill Development Council with IREDA's support was held on 29th Oct, 2004(refer invitation).

- Pen, organised a Business meet for Solar Air Heating for agro processin in collaboration with Agro Marketing and TEDA held on 17th Feb, 2005 at Erode.
- PEN's Engineers actively participated in Business meet organised by ANERT supported by Ministry of Non Conventional Energy Sources at Cochin was held on Feb-14th, 2005 with presentation and compiled data sheet from potential solar air heating users.
- In Business Meets held at Cuddalore, Chennai, Karur of Tamilnadu organised by Tamilnadu Energy Development Agency active involvement was given by PEN and its engineers.

Data Collection visits by Principle Investigator:

Principle investigator with project Engineer have visited in following locations for survey and solar heating study

- 01) Tenzing Match Works, Virudhu Nagar, Tamilnadu.
- 02) Hind Matches Pvt. Ltd., Sivakasi, Tamilnadu.
- 03) Ayyan Matches, Sivakasi
- 04) Victoria Dyeings and Bleechings, Tirupur, Tamilnadu.
- 05) Krishna Squeezers and dryers, Tirupur, Tamilnadu.
- 06) Orchid chemicals, Alanthur, Chennai
- 07) Aravind-A-Traders, Karur, Tamilnadu.

- Testing and Monitoring of installed units at Tuticorin, Surandai, Neduvayal, Alwar (Rajasthan), Paddy Processing and research Centre, Tanjore Of Tamilnadu, K.H.Appolo hospital , Ranipet.
- Project Investigator has visited International Centre for Theoritical Physics (ICTP), Italy as a senior visiting fellow for review of literatures. Project Investigator also visited Tinox of Munich and Prof. Bux of Tropical Research Institute, HohenHeim University, Germany.

ACTIVITIES UNDER TAKEN DURING 2007 – 2008

- 1) After the approval of the project, a project advisory committee has been formed as per the directives of Executive Committee of Planters Energy Network(PEN) and appointments as per the project norms were made .
- 2) Addresses of different industrial sectors like chemical, pharmaceutical, agro-processing, spices powder, leather, marine products were obtained by web browsing. Nearly 500 correspondences containing information explaining the benefits of solar drying with data sheet were send to identify potential users - [Refer Annexure – I]
- 3) A database containing more than one lakh Indian industries has been obtained. A HTML letter to suitable industries are being sent so that maximum electronic mail dissemination will be done.
- 4) The following equipments were purchased through the project advisory committee.
 - i. Wireless Netgear Router – One number.
 - ii. Pentium 4 PC computer – One number.
 - iii. Printer (HP Laser jet 1020Plus)-One number.
- 5) Primary discussions with the targeted state nodal agencies were made and the PI had visited GEDA to get assistance to promote solar air heating technology in Gujarat.
- 6) The PI had visited the Salt commissioner to organize a business meet at Gandhidham, Gujarat, in order to disseminate the solar air heating in salt refineries.
- 7) The PI had visited the Project Director, REAP to organize a business meet at Puducherry.

8) To disseminate the technology in handmade paper industry, steps were taken in collaboration with Kumarappa National Handmade Paper Institute, Jaipur.

9) Circulars by Director MNRE were distributed to Directors of Tea board, MPEDA, Economic Zones at Mumbai, Visakhapatnam, Gandhidham, Surat, Spices board, Rubber board, Tobacco Board, and National Horticulture Board to disseminate the technology in their respective sectors.

10) A business meet to cover Puducherry was conducted on 30th Jan. 2008 at a hotel in Puducherry in which 46 industries [Refer Annexure – II] were participated. The meeting was inaugurated by Dr.T.C.Tripathi, Advisor of MNRE and the technical session was Chaired by Prof.C.L.Gupta. The Project Leader and project engineers made the presentations on various aspects of solar drying. At the end of the meeting one to one conferences were conducted to identify technology need. A number of recommendations were made in the meet. The following types of industries have shown interest on adapting solar drying technology

- Chemical industries
- Textiles
- Condom Manufacturing company
- Hotels

11) After the business meet the following industries invited PEN for survey and to prepare project reports:

1. M/s.Pentagon Inorganics Pvt Ltd.
2. M/s.Aditya Better Container
3. M/s. Anglo French Textiles
4. M/s.TTK- LIG Ltd

12) The Project Leader made a preliminary visit to Gandhidam, Gujarat to coordinate with Gandhidam chamber of commerce and GEDA.

13) A National Workshop on Solar Air Heating In Salt Refineries and other Industries was conducted on 5th Feb.2008 at a Gandhidham Chamber of Commerce Building in which 70 numbers of registered participants participated (Refer Annexure III). The meeting was inaugurated by Shri S.Sundaresan of Salt Commissioner and the technical session was Chaired by Mr.Srinivasan of IFCO. The Project Leader made the presentations on various aspects of solar drying in Salt Industries. The number of salt refineries have shown interest on adapting solar drying technology.

The following companies were visited for data collection and proposals were given,

- g) M/s.Indobrine Industries Limited
- h) M/s.Chirai Salt [India] Pvt Ltd
- i) M/s.IPCA Laboratories Ltd
- j) M/s.Ankur Chemfood products
- k) M/s. Cee Pee Veener Ltd

14]. A motivation training for the solar air heating users of M/s. TTK LIG Ltd, Puducherry and M/s. TTT LIG Ltd, Chennai was held at TTK LIG Ltd, Virudhunagar on June 16th 2008. Nearly 14 Senior Level Managers and technical persons were participated in the one day program. The Project Leader and the Project Engineers presented the working principle, trouble shooting, maintenance schedule and related information on solar air heating for tumble driers.

15). Preliminary work to conduct business meet at Andra Pradesh was done by the PI after a meeting with Mr. Papi Reddy, MD of NEDCAP. Data sheets were requested to be circulated to collect information through NEDCAP for industries in Andra Pradesh.

16]. A Business meet for promoting solar air heating for Dal industry and other Agro processing industries was held at Lattur on July 24th 2008. The Project Leader explained with a solar dal video to many important dal mill owners [9 numbers who hold each 3 – 4 dal mills in the region] and a few other agro

processing industry owners. Mr.Madhavan Nadar translated the speech of Dr.C.Palaniappan in to the local language. Basing on this meeting one dal mill - M/s. Dhamayanthi Agro Industries has come forward to install solar air heating in its dal mill.

17]. A business meet to cover Andhra Pradesh was conducted on August 14th 2008 at Surana Udyog Auditorium, Federation House of Federation of Andhra Pradesh Chamber of Commerce and Industry(FAPCCI) in which 46 industries [Refer Annexure – III] of participated. The meeting was inaugurated by **Sri M. Papi Reddy** of NEDCAP and the technical session was Chaired by **Dr.E.V.R. Sastry, former Advisor MNRE**. The Project Leader made the presentations on various aspects of solar drying. At the end of the meeting PEN conducted one to one discussions with participant industries to identify technology need. A number of recommendations were made in the meet. The following types of industries have shown interest on adapting solar drying technology

- I. Chemical industries.
- II. Textiles.
- III. Condom Manufacturing company.
- IV. Hotels.
- V. Laundry drying for Garment manufacturer, Star Hotels and Hospitals.

The follow industries shown keen interest in adopting solar air heating technology:

- Sangi Polysters Ltd.
- Bhagyanagar India Ltd.
- Vijayalakshmi Agro Services.
- Tropical Flavours (P) Ltd.
- Indus Medicare Ltd.

18]. Basing upon the invitation of UNDP Orissa, three commercial projects to demonstrate hygienic solar fish drying for fisher men and fisher women in the coastal belt of Orissa is installed. A solar drier with 11.5 m² Solar heating

collector area and three solar driers of 70kg capacity were installed at the following places.

1. Nuagan adia,
Basudebpur, Bhadrak (District)
2. Arakhakhuda, Brahamgiri,
Puri (District)
3. Sanaargipalli,
Ganjam (District)

These units are furnished with improvements basing up on earlier feedbacks the solar heating panels are covered by polycarbonate cover instead of tempered glasses this prevents the non operation of the unit due to accidental breaking of glass. To avoid rusting of the unit all nuts and bolts are stainless steel more over aluminium is used in the interior and exterior of the drier. The solar photovoltaic panels which are being robbed generally were fixed near chimney at a height. The working of the three units were excellent with a quality product [refer UNDP Letter]. The state government of Orissa has planed many such units at different parts of Orissa.

19] M/s. Eastern Mattresses factory ,Puthuperiyaram (PO) ,Thodupuzha Kerala, is manufacturing rubberised coir mattresses from coir and latex rubber. The factory has a 6 Lakhs kilocalories thermal burner which uses around 450 – 600 kg fire wood per hour to heat thermic fluid for transferring heat to different thermal applications mainly at 4 stages namely:

- Drying out moisture in coir coil by placing them in an enclosure heated to 70^o C.
- Sheet forming machine in which air is heated to 70 – 80^o C
- Vulcanizing machine where air is heated to 120^o C.
- Calendar pressing sheet by contact heat at 150^o C.

There is a potential to use solar heat so that the fuel cost could be reduced. Presently the factory consumes around Rs.50 lakhs worth of fuel per annum (at Rs.1300 per ton). Solar heating could be adopted to reduce fuel consumption.

A 284 m² area solar collector panel was installed on the south side asbestos roof of the factory. The solar collector is formed by 75mm thick rock wool insulation aluminum V-corrugated absorbers 4mm thick tempered glass (Partial double glazing). The total area of the solar collector was divided into 6 basis units. Each unit has number of glass panels. The fresh air is heated by passing below the absorber and it is made up of 3 passes in the collector. All the hot air outlets are connected together through an insulated metal duct. A 3.7Kw blower draws the solar hot air and delivers it at 3 points in the coil sheet making machine one more duct takes the hot air to fresh coil drying room. The unit was commissioned in March 2008. It saves 1.3 tones of fire wood per day of Rs 2000 worth fuel cost.

20] TI Cycles of India, Chennai is manufacturing bicycles in its factory. All bicycle components undergo many process steps. The factory is keen to introduce renewable energy to reduce fuel consumption. For introduction of solar heated air three process steps are identified namely Preheating oven fresh air for painting plant, heating combustion primary air, and preheating component before entering into the oven. Apart from the above three, the hot air is required in cabinet drier. After the above study extending of the solar heating to other process will be considered. Therefore it is proposed to install one 297 m² area solar air heating system to preheat the air required for oven, combustion and component preheating. The payback of the system will be less than 2 years. Since the company uses Super Kerosene for hot air production, it is possible to reduce 10,000 liters of Super Kerosene per annum of worth Rs.4,43,000.

21]. More commercial contacts are being received basing on PEN website. One company (Alsons Aquaculture Corporation) is involved in the fish processing industry with offices in US, Japan and Europe has shown interest to adapt solar fish drying techniques developed by PEN. During January two engineers from the company visited India to inspect the PEN installed projects. The CEO of PEN Dr. Palaniappan visited General Santos city in Philippines for site inspection and project cost finalization. The company has placed order for one number of 500Kg per batch capacity solar drying system with 60 m² solar panel along with a recirculation drier, SS trolleys, perforated trays and electrical back up unit. After

completing the fabrication in India, shipment of the solar drier has been done in the end of July 2008. Basing on the successes of this project the company is planning to install another 3 similar units. Similarly (M/S International Marine Edibles LLC) of Fujjarah, UAE has placed order for similar capacity fish solar drier.

22] M/s.TTK LIG is manufacturing male contraceptive condom in three factories at Chennai, Virudhunagar and Pondicherry. Each factory has a number of production lines in which the condoms are produced from the raw material latex rubber. A 38 kW IR lamps with 12 Kw heaters are used for drying the molded pieces. Then it is placed in a Tumble Drier so as to bring down its moisture from 8% to nil by using hot air of temperature of around 110⁰ C obtained through 18kW electrical coils. The fresh air at the room temperature is taken into the Tumble Drier and the Drier has sensitive controls to regulate the temperature to any required value. By using solar pre heated air at 60⁰ to 90⁰ C (depending upon the solar radiation), the electrical consumption for the Tumble Drier could be reduced. A pilot unit of area 55.6 m² solar hot air panel with a special V corrugated absorber and partial double glazing had been installed to provide preheated air for 2 tumble driers at their Chennai factory. The pilot unit saves around 10 units of electricity per hour. The Co has installed another unit of area 113 m² for 4 tumble dries at its Pondichery unit. Basing upon the success of all these units, the Co proposes a total of 574 m² in all its 3 factories and it is expected that through Solar preheating system the company could reduce around 0.2 million electrical units per annum used for heating purpose. There are many similar industries in the country where these technologies could be successfully employed.

23. A business meet to cover Maharashtra was conducted on at September 19th 2008 at Indian Merchants' Chamber [IMC] in which 49 industries [Refer Annexure – IV] of participated. The meeting was inaugurated by **Shri Mahesh Zagade**, of MEDA and the technical session was Chaired by **Dr T C Tripathi, Advisor MNRE**. The Project Leader made the presentations on various aspects of solar drying. At the end of the meeting PEN conducted one to one discussions with participant industries to identify technology need. A number of recommendations

were made in the meet. The following types of industries have shown interest on adapting solar drying technology

- I. Chemical industries.
- II. Textiles.
- III. Condom Manufacturing company.
- IV. Hotels.
- V. Laundry drying for Garment manufacturer, Star Hotels and Hospitals.

The follow industries shown keen interest in adopting solar air heating technology:

- VST Industries Limited
- Sun up Botanics Pvt Ltd
- Grasim industries ltd
- Vijay Latex Products Pvt Ltd
- Premson plastics Pvt ltd

Recommendations:

1. IMC Mumbai was interested to hold solar air heating seminar every year with a financial support from MEDA and MNRE every year.
2. M/s. Kontak Comforts Pvt Ltd – manufactures of rubberized coir mattresses is very much instated and request PEN's Engineer to conduct a detailed study
3. Similar interested was also shown by TI Cycles Nasik
4. It is requested to address the problem of electric shutdown to compensate the same through solar energy.

“Workshop Cum Training Program On Solar Drying Of Food Products”

Prof.M.Lakshamanan, [Former Vice Chancellor – Madurai Kamaraj University], President – PEN had welcomed the gathering and indicated that solar energy’s need to combat climate change. The program was inaugurated by Dr.R.Christodas Gandhi IAS, Chairman and Managing Director, Tamil Nadu Energy Development Agency. He had also briefed the different renewable energy technology and he also informed government support for solar air heating and solar drying. Dr.Saroja Prabhakaran, Vice Chancellor, Avinashilingam University For Women, Coimbatore has delivered a special keynote address on the solar drying of food products.

Mr. S.V.Subramanian, President, Cardamom Planters' Association had expressed a hope that government will support a large introduction of solar driers at a reduced cost to the Planters. Mr.Jeyakaran, Vice President – PEN had proposed a vote of thanks. Nearly 60 participants attended the inaugural program.

Nine papers as given below were presented and the technical program was chaired by Prof.M.Lakshamanan, Former Vice Chancellor of Madurai Kamarai University.

Emerging Technologies in Food processing	Dr.Shakila Banu Avinashilingam University For Women
Solar Fruits Drying	Mr.Jeyakaran Managing Director Kurunji Organics
Solar Fish Drying	Dr.Jalajakumar
Successes stories on solar dal drying	Mr.T.Kathiresan, Balasanga Dal Mill
Successes stories on solar spices drying	Mr.Harilal, Eastern Foods
Successes stories on solar fish drying	Mr. Arjilli Dasu, Visakhapatnam
Solar drying technology perspectives	Dr.C.Palaniappan CEO and General Secretary PEN
Case studies	Mr.Rajesh PEN
Solar fish drying experiences	Mr.William Senior Manager, ESAF

On 18th September a training program was given using four solar driers installed at the factory. PowerPoint presentation on the maintenance of solar drying were explained by PEN engineers. The Director Fisheries, Lakshadweep had also participated in the training program and he also inspects the different types of drying facilities.

On 19th September a demonstration was organized at a fishermen village near Trivandrum

PROCEEDINGS OF BHOPAL BUSINESS MEET

A business meet to cover Madhya Pradesh was conducted on at September 19th 2008 at Hotel Jahan Numa Palace, in which 32 industries were participated. The meeting was inaugurated by **Sri Dr. Santram, Director, Ministry of new and Renewable Energy** and the technical session was Chaired by **Sri Bhuwanesh Patel, Chief Engineer - MP Urja Vikas Nigam Ltd.** Dr.C.Palanaippan made the presentations on various aspects of solar drying. The panel discussion was chaired by Sri.Swaminathan, Parryware Roca, Dewas. At the end of the meeting PEN conducted one to one discussions with participant industries to identify technology need. A number of recommendations were made in the meet.

Recommendations:

1. PHD Chamber of Commerce and Industry, Bhopal requested PEN to demonstrate the solar air heating at Bhopal so that more industries could adopt for the same.
2. A higher rate of subsidy was requested by Parryware Roca Ltd and requested the government to provide 50% capital subsidy.
3. It is requested to organize a visit to the successful solar air heating installation.
4. It is resolved a undertake a R & D project for post agriculture harvesting
5. Tata International invited PEN engineer to conduct a detailed solar thermal study and the same is accepted.
6. It is requested to conduct awareness meetings regularly to promote the technology.

Proceedings of Puducherry business meet

Date: February 19, 2010

Venue: Anandha Inn

A business meet to cover **Puducherry** was conducted on at February 19, 2010 at Anandha Inn in which 25 industries [Refer Annexure] of participated. The meeting was inaugurated by **Mr.Prem Chand**, of MNRE. The Project Leader made the presentations on various aspects of solar drying. At the end of the meeting PEN conducted one to one discussions with participant industries to identify technology need. A number of recommendations were made in the meet. The following types of industries have shown interest on adapting solar drying technology

- I. Chemical industries.
- II. Textiles.
- III. Condom Manufacturing company.
- IV. Hotels.
- V. Laundry drying for Garment manufacturer, Star Hotels and Hospitals.

Recommendations:

1. REAP was interested to hold solar air heating seminar every year with a financial support from MNRE every year.

2. M/s. Larson and Toubro Form Factory– manufactures of Scaffoldings is very much instated and request PEN's Engineer to conduct a detailed study and subsequently a project proposal and subsidy application were submitted to REAP and MNRE.
3. It is requested to address the problem of electric shutdown to compensate the same through solar energy.

CONCLUSION:

The following are outputs of the project.

s.no	Description	Details
1	A minimum of 12 project proposals (upgraded from 6). at least one each in six states, developed and submitted to the Ministry for consideration of support for installation	<ul style="list-style-type: none"> • Larson and Toubro Form Factory– Pondicherry • TTK LIG Ltd, Puducherry • TTK LIG Ltd, Puducherry • Pentagaun Inorganics (P) LTD, Pondichery • Dhamayanthi Agro Industries, Latur, Maharastra • Kontak Comforts Pvt Ltd., Pune, Maharastra • M/s. Indus Medicare, Hyderabad, AP • Eastern Mattress, Tada, AP • Godavari Enterprise, Gandhidham, Gujarat • TI Cycles, Nasik, MP • M/s.TTK LIG, Virudhunagar • M/s.TTK LIG, Chennai, • TI Cycles of India, Chennai • M/s. Eastern Mattresses Thodupuzha Kerala • HLL Lifecare Limited, Thiruvananthapuram, Kerala, • M/s. Roca Bathroom Products Private Limited, Alwar, Rajasthan • M/s.Glendele Estate, Nilgiris • Tractors and Farm Equipment Limited,(TAFE), Dindigul, TN • Golden Hills Estates Private Limited, Coonoor

2	A minimum of two groups developed for disseminating the solar drying technology	The following groups were M/s. Sun Best, M/s. Pentahex M/s. LEDEG
3	A consolidated report on the result of survey identifying areas / products for solar drying applications and a list of identified potential beneficiaries	Refer report 2
4	A report on optimum designs of solar dryers for various applications based on the feedback collected from field installations including data regarding moisture contents, temperature required, air flow rates, etc	Refer report 3
5	A compilation of success stories containing project details and photographs for use in dissemination of the technology.	A handbook has been prepared

Planters Energy Network