rutag – iitd news

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From the Editor's Desk

It has been a year since our last RuTAG-IIT Delhi's newsletter was published. During the last one year several projects were not only successfully completed but also transferred to the field for the benefit of the rural people. Amongst these the device for making Tulsi mala beads made news in The Hindu on Sept. 07, 2013 under the heading of "Holy Technology." Similarly, the "Fru-wash" technology of Prof. H.M. Chawla for which the RuTAG-IIT Delhi is making a mechanized device is in the BBC news. Even though our activities are going on at some pace, as an editor of this newsletter, I strongly feel that we must reach to our students and other faculty members in order to convince them to take RuTAG projects more aggressively and give their best hi-tech solutions so that the feeling of "no technology" required or "jugad" is sufficient is removed from the people's mind. Today, including Stanford University in the USA, many internationally top-notch universities are taking up these problems under various names, e.g., Socially Relevant Projects, Inclusive Technology, etc. The World has felt that unless about 80% of the world population who live below the poverty level are getting happy with their daily lives more and more unrest are obvious. Moreover, as a human being it becomes our social responsibility to help other human beings by performing some sort of Researchers' Social Responsibility (RSR) just like the companies take up many social activities as a part of their Corporate Social Responsibility (CSR). From my personal experiences, many times, I found that the research we do as a part of regular academic programme mostly borrowed from the west. Whatever we do today have started at least about 10 years ago there. Hence, whatever contributions we make will have very little or no impact in the world level. On the other hand, if we take up some of the rural projects and treat them as research topic many times, publications may be of the first of its kind in the world. As a result, we can take a lead in those directions for which the 80% populations of the World are eagerly looking forward may get benefitted. The objective of this newsletter is to basically share these thoughts, and the projects the RuTAG cells do, hoping that our attitude will change for better of the society, first for India, and then for the World.

(Prof. S. K. Saha)

Wishing You a Happy New Year 2014!

RuTAG: A decade of exciting experience

Maj. S. Chatterjee, Sr. Project Consultant

The programme of Rural Technology Action Group (RuTAG), initiated from the office of the Principal Scientific Adviser to the Government of India in 2003-04 is about to complete 10 years. Through this programme very conscious attempt has been made to work with S&T NGOs/ NGOs led by scientists and institutions of excellence. Though our partners have mostly been the IITs, many other technology institutions have also been involved in a number of technology development challenges.

The programme has definitely curved out a niche for itself. Perhaps in no other schemes of any government programme, an NGO gets to interact closely with the experts in institutions of the calibre of IITs on a regular basis. RuTAG has formalised an interface between field level NGOs and the S&T community in leading institutions.

Over the last ten years, many success stories have emerged and improved state of the art technologies have been delivered in the field to the complete satisfaction of the user groups. The RuTAG centres at the IITs have been trying very hard to replicate the success stories in larger numbers through a variety of measures. Entrepreneurs, self-help groups, producer companies, etc. are showing increasing interest in the new and improved technologies developed under the programme. While the main objective of RuTAG may remain demand driven technology up- gradation, perhaps time has come to also now simultaneously think of developing business models for ease of technology transfer for large scale replication.

Chairman's Column

Salient Experiences and Learnings

The RuTAG Project at IIT Delhi began 5 years ago and I have had the privilege of being associated with it, as the Chairman of the Core Group, advising and monitoring its activities. It has been quite an enriching and enjoyable experience. When the RuTAG project was initiated at IIT Delhi, we had just completed the MGIRI project at Wardha through which a number of technical R&D interfaces in the area of rural industrialization had been set up at various prominent institutions of the country with the support of KVIC. This experiment had clearly shown the worthwhileness of a socially interactive R&D network.

RuTAG was also intended to provide a similar channel to carry out field-worthy and demand-driven R&D activity which could be of direct relevance to the rural entrepreneurs and the NGOs working in the rural area. The experience with RuTAG project has been beneficial in understanding the real needs and their appropriate solutions for the field-user. It has also provided a good insight about the difficulties in disseminating the improvised technical solutions and the mechanism required for wide-spread dissemination of innovative technologies in this sector.

Such an interactive effort proves quite educative to both the faculty as well as the students and the advantages of networking are also valuable. However, this whole effort is still at a rather marginal level and needs to be amply strengthened. In this regard, a thorough review of RuTAG is presently going on and will surely result in strengthening this activity in future.

As I formally complete my tenure in the above capacity, I wish to express my appreciation for the RuTAG team and gratefulness to PSA's office for promoting such a unique experiment – wishing it growing success.

(Prof. R. R. Gaur)

Figure 1: A user working on the improved device

Figure 2: Device on a table

a. Garlic grader

b. Garlic bulb breaker

Figure 3: Improved machines

A Glance at Projects and Activities of RuTAG, IIT Delhi

Prof. R. Prasad, Project Coordinator

Completed Projects and Activities

1. Improved Device for Making Tulsi Mala Beads

Project Investigator: Prof. S.K. Saha, Mechanical Engineering Deptt., IIT Delhi.

Collaborative Agency: Lupin Human Welfare & Research Foundation, Bharatpur, Rajasthan

In the villages of Brij area some of the women are engaged in making beads from the stem/twigs of Tulsi plant for making Tulsi Mala (Garland) to earn their livelihood. A Bharatpur-based NGO, Lupin Human Welfare & Research Foundation organized such 400 women living in 18 villages of Bharatpur district into Self Help Groups (SHGs). They were using a wooden structure, in which a tailstock was fixed on the right side of the wooden base. A randomly selected DC motor connected to a 12 Volts DC Battery was used in the device. The motor was held in the left hand for forward movement while turning and cutting of beads are performed using a tool in the right hand. A user sits on the ground, bends her body towards the device while working, which cause neck and back pain due to continuous bending of the body. Besides, holding the DC motor along with the stem holder (Chuck) by hand and to stop the movement of the chuck for taking the bead out of the tailstock, the user had to press the chuck by her thumb and other fingers. This causes irritation due to vibration of the DC motor. Besides, the productivity was low. The NGO presented the problem to Rural Technology Action Group (RuTAG), IIT Delhi in a meeting and requested to address the problem and develop an improved device which could overcome the problems. It was indicated to explore possibilities to connect 4-5 workers/users with single power supply.

RuTAG-IIT Delhi studied the problems and developed an improved device for making beads for Tulsi Mala. Earlier the DC motor which was held by hand is now pushed forward and backward on a platform/guide. Users are very happy working on this improved device (Fig. 1). The users told that they operate this device even for about 12 hrs. a day without any tiredness and earn Rs.1100-1200/- per day. The earlier machine was giving only Rs.300-400/- per day. The device was demonstrated in the Vatsalya Mela organised at Delhi Haat on 15-11-2012 by the Ministry of Women and Child Welfare and was highly appreciated. It was also demonstrated in National Fair – India Innovation Initiative, i3 2012 held on 03-12-2012 at Nalanda Ground, IIT Delhi and appreciated by the visitors. One more version has been developed for fixing the device on a table and to be operated sitting on a chair (Fig. 2). A village carpenter in Nadbai village of Bharatpur is manufacturing the improved device and selling.

2. A New Technology Package for Garlic Processing

Project Investigator: Dr. N. K. Jain, CTAE, MPUAT, Udaipur

Collaborative Agency: College of Technology and Engineering (CTAE), Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan

Garlic is the most important foreign exchange earning spicy vegetable crop, commercially grown in India. Garlic is consumed as green as well as dried in the spice form and as ingredient to flavour the various vegetarian and non-vegetarian dishes, and pickles. Garlic is being exported either in the form of dehydrated flakes or dehydrated powder. From India, large amounts of dehydrated products (flakes, Garlic oil, and dehydrated Garlic powder) are exported to Japan, UK, Italy, Turkey, Germany, and France. Since the cost of fresh Garlic is widely fluctuating (Rs. 5 to Rs. 100 per kg in a year), simple processing technology needs to be made available for preparing quality products with long shelf life. Further due to lack of available time for kitchen work, the demand for ready to use product is increasing with increase in the number of working women in urban areas. Moreover, farmers cannot store the Garlic for longer period. So, they sale the Garlic crop at cheaper price just after harvesting since they have no storage facility. There was no technology/machine available in the area for processing of Garlic for value addition.

Simple and low cost Garlic processing machines and technologies for value addition had been developed under All India Coordinated Research Project on Post-Harvest Technology by the Department of Processing & Food Engineering, College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology, Udaipur. These were available with them for about 5 years but had not yet been field tested and proven for their viability.

RuTAG-IIT Delhi was involved in finding out its credentials before finalizing these low cost Garlic processing machines. It conducted live demonstration of Garlic Processing machines such as Garlic Grader, Garlic Bulb Breaker, Garlic Clove Flaker, Dry Garlic De-skinner, other food processing machines for participants at a Regional Workshop in Rajasthan and their commercial testing cum training programme on Garlic processing. Some problems were observed in operation of the machines during commercial testing. These problems were brought to the notice of MPUAT with suggestions for conducting improvements in the machines. Improved model of two Garlic processing machines are shown in Fig. 3.

Figure 4: Improved model of De-husking of Minor Millets, VPKAS, Almora

3. De-husking of Minor Millets – Reducing Drudgery in De-husking

Project Investigator: Dr. J. K. Bisht, VPKAS, Almora, Uttarakhand.

Co-Project Investigator: Er. Sukhbir Singh, VPKAS, Hawalbagh, Almora, Uttarakhand

Collaborative Agency: Vivekananda Parvatiya Krishi Anusandhan Sansthan (ICAR), Hawalbagh, Almora, Uttarakhand

The problem involved in de-husking of minor millets has been raised at the RuTAG meet on 26-03-2010 at Madhya Pradesh Council of Science & Technology (MPCoST), Bhopal. Field visits to Jabalpur and Mahakaushal region revealed that traditional methods were being used which involved hard labour. Good technology was needed to ease their drudgery which should also be economically feasible. The problem was discussed in the Core Group meeting of RuTAG, IIT Delhi.

An objective was made to find a suitable machine to reduce the drudgery involved in de-husking and if not available, it should be developed. An action plan was proposed starting with field visits, market study on current solutions available, followed by development of prototype machine for de-husking.

During preliminary investigations, it was found that Vivek Thresher-cum-Pearler was developed by Dr. K. P. Singh at Vivekananda Parvatiya Krishi Anusandhan Sansthan (VPKAS), Almora, Uttarakhand for de-husking of Finger millet and Barnyard millets. Dr. K. P. Singh indicated that CIAE would take up the work for further development of the machine. When the Director, CIAE Bhopal was contacted, it was indicated that a project on cleaning and de-husking of Minor millets (Kodo and Kutki) was in progress. Simultaneously it has come to notice of RuTAG, IIT Delhi that Vivek Thresher-cum-Pearler machine developed for de-husking of Finger millet and Barnyard millets at VPKAS, can also perform threshing and pearling of Finger millet de-husking, and polishing using separate runs with suitable sieves at a very low operational cost. A team of RuTAG, IIT Delhi also visited M/s Punjab Agricultural Implements Pvt. Ltd., UP and collected information about Vivek Thresher-cum-Pearler millets machine which was being manufactured by this firm. In this visit, the available versions of machine have been inspected and it was found in records that the machines were being used successfully in the field. Following this, a visit to VPKAS, Almora for testing the machine was done.

During testing, a new millet de-husker was found available which could solve the problem of de-husking the millets produced in Mahakaushal region of M.P. Some important suggestions have been made by the team from RuTAG, IIT Delhi and the testing of the machine with modifications was scheduled on 16-08-2012.

During testing, the vibration of sieve was found to be more due to the high RPM of the pulley and it was decided to increase the size of the pulley but due to the unavailability of a bigger size pulley, the replacement had to be made from Delhi and after the final modifications the new version of the machine was field tested and found working satisfactorily. Improved model of De-husking of Minor millets is shown in Fig. 4.

After the final testing, a two-day demonstration workshop was organized by RuTAG, IIT Delhi at VPKAS, Almora for farmers/entrepreneurs and manufactures from UP, MP and Uttarakhand. In the programme, DMT Hydraulics agreed to manufacture the machine and a MoU was executed between the M/s DMT Hydraulics, Agra and VPKAS, Almora. An NGO – Sahajivan Samiti, Shahadol (M.P.) had indicated to provide the machines to the SHGs.

4. Improved Design to Reduce Drudgery in Operation of the Human-operated Treadle Pump

Project Investigator: Prof. S.K. Saha, Mechanical Engineering. Deptt. , IIT Delhi.

Collaborative Agency: Gramodaya Rachnatmak Vikash Sansthan, Chariawaha Khas, Deoria, U.P

Treadle pump is a foot operated device which uses the human power to generate the reciprocating motion of the piston by the use of a slider-crank mechanism to suck water out of the ground. The designs which were presently being used in the field, faces the problem of drudgery and there is a need for improvising the ergonomic design to make the operation less cumbersome for farmers. Further there was a problem of rapid wearing of the piston washers. So RuTAG-IIT Delhi was involved in developing suitable modification in the pump to make it more efficient and user friendly. A treadle pump was installed at the Micro Model Lab. of IIT Delhi for problem identification. After proper testing an MS handle was fixed with the base of the pump to support the operator. An appropriate lever length was decided where feet rest. Three holes were made in the

Figure 5: Improved model of Treadle Pump at Micro Model, IIT Delhi

Figure 6: Test facility of Ultra-micro Hydel Power Package

Figure 7: Paddy Thresher

Figure 8: CAD Model of Fru-wash Washing/Treatment Unit

lever at distances of three inches to make it adjustable. A pair of moveable wooden pedals were also attached for smooth operation of the lever by the operator.

The cylinder made up of MS sheet was replaced with a new cylinder made up of seamless pipes. The inner side of the cylinder was made smooth by machining. The suction valve was fixed in the center of the cylinder for smooth operation in order to avoid rubbing from one side. Bushes made of Brass were also introduced in the holes of levers for continuous working of Treadle Pump and there will be no need to replace levers frequently. If necessary, the bushes may be replaced. Improved model of Treadle Pump is shown in Fig. 5.

Ongoing projects

1. A Testing-cum-training Facility for Ultra-micro (Pico) Hydel Power Packages (at Micro model, IIT Delhi)

Project Investigator: Prof. P.M.V. Subbarao, Mechanical Engineering. Deptt., IIT Delhi

Pico hydro provides a huge potential for power generation from water streams spread across the country, especially in hilly regions. Recent thrust in the country to this sector has brought it into prominence. The focus also has been on innovation and capacity building. The need of having a testing cum training centre has been emphasized and hence this initiative for installing such a facility at IIT Delhi. The facility has been designed by Prof. P. M. V. Subbarao.

An artificial water fall of varying head (height) is the hallmark of this unit (Fig. 6). This variability facilitates testing of turbine wheels of wide capacity and designs in the Pico range and their operating performance can be evaluated. The unit has been flexibly designed for evaluating turbines for different heads and flows which was earlier requiring numerous locations. The water flows back to an underground tank from which it is pumped again to the overhead tank of adjustable height creating the waterfall through a penstock channel. The water of the tank is perpetually used for the water fall.

Once installed, this unit will serve as testing and certification centre for turbines developed by various organizations and innovators. This facility more importantly can also be used for capacity building in the country by training manpower of various skill sets belonging to generation companies, government institution, NGOs, and international agencies. The project is aimed to boost the Pico hydel power generation programme in the country.

2. Animal-driven Prime-mover for Multiple Rural Applications

Project Investigator: Prof. S.K. Saha, Mechanical Engineering. Deptt., IIT Delhi.

Collaborative Agency: M/s. Panchal Pumps and Systems, Kanpur

During the first phase, the design of an animal driven gear box (ADGB) which was initially developed by M/s. Panchal Pumps and Systems, Kanpur was technically validated, improvised and standardized for the use in the field. A RuTAG project on this was completed in July 2011. This gear box was coupled to a screw type water pump, which was field tested for the use by small farmers. The technology was appreciated by the farmers who use bullocks.

In the course of field investigations and interaction with the farmers as well as the manufacturer, it was felt that it would be advantageous to establish the feasibility of using the above ADGB for a variety of other rural applications such as for running the flour mill, chaff cutter, paddy thresher and similar other appliances. A paddy thresher is shown in Fig.7.

3. Facilitating the Use of 'Fru-wash' Technology for Extending Shelf Life of Fruits and Vegetables.

Project Investigator: Prof. H. M. Chawla, Chemistry Deptt., IIT Delhi

Pratapgarh district in Uttar Pradesh is known for Amla production in India. Amla fruit has a short shelf life (about 8-10 days) and is perishable. Farmers are forced to go for distress selling after harvesting. They cannot explore proper markets outside for remunerative prices. The need to extend the shelf life of Amla fruits was emerged in a meeting with a field agency-Swami Adgadanand Adyogik Prashikshan Sansthan, Gobari, Chouboli, Jagesharganj, District - Pratapgarh, Uttar Pradesh.

Prof. H.M. Chawla, Chemistry Department, IIT Delhi had developed a bio-degradable emulsion made from natural oligomer named "Fru-wash". When fruits and vegetables are dipped in this Fru-wash Emulsion, extends their shelf life considerably while keeping their freshness intact even at ambient temperatures without refrigeration or cold storage. For low quantity of fruits and vegetables washing may be done manually while for larger quantity, a machine is required. Shelf life of Amla could be increased from 7-8 days to 20-22 days with application of Fru-wash.

A workshop on demonstration of application of Fru-wash on fruits and vegetables was conducted at Pratapgarh in January, 2013 in which manual application of Fru-wash was demonstrated. There was a demand for mechanical application of Fru-wash for Amla. This project is to develop a small scale unit to demonstrate and facilitate the application of Fru-wash. Figure 8 shows the CAD model of the mechanical arrangement.

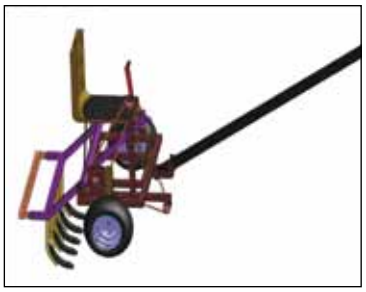

Figure 9: CAD Model of improved Bullock Driven Tractor

4. Bullock Driven Tractors (BDT)

Principal Investigator: Prof. Ajit Kumar, School of Engineering & Technology, IGNOU, Delhi.

Collaborative Agency: Social Centre for Rural Initiative and Advancement (SCRIA), Khori, Rewari, Haryana.

A comparative study of three available models of BDT was done, in which it was found that neither of them is suitable for the farmers for their use nor they are being used even after almost free distribution of some to the farmers. The basic problem found was that the attachments couldn't be lifted without dismantling the BDT setup and it was quite difficult and painful for the animals to turn the BDT while the attachments are inside the soil. The huge torsional resistance of attachments and soil either break the attachments especially in black cotton or clay soil, or the animals would give up. To resolve this problem a new design of BDT was done with the lifting mechanism for the attachments. The design is simple, easy to operate and can be fabricated in any small workshop having cutting, welding and fitting facilities.

The machine has been designed and fabricated at a small workshop in Ladosarai, New Delhi. The CAD drawing is shown in Fig. 9. It is easy to operate and the attachments of around 50 kg can be lifted easily with 1-1.5 kg force, which even a very weak person can operate with his hands. It can lift around 25 to 30 cms in 10-15 seconds and can give drive in both directions. This is capable of doing partial lifting or penetration while moving easily as per the requirements.

(a) Traditional furnace

(b) Typical sitting

Figure 10: Bangles Making

5. Improvement of Furnace for Bangles making and Improving the Working Conditions of Artisans.

Project Investigator: Prof. Sangeeta Kohli, Mechanical Engineering Deptt., IIT Delhi

Co-Project Investigator: Prof. S.K. Saha and Prof. M.R. Ravi, Mechanical Engineering Deptt., IIT Delhi

Collaborative Agency: Lupin Human Welfare & Research Foundation, District – Bharatpur, Rajasthan

Making green and red colour glass bangles is a traditional profession of some families in the villages of Bharatpur district in Rajasthan. Many artisans (220) work on 14 traditional community furnaces. Normally, 15 artisans work around a furnace having diameter of about 5 feet (Fig. 10 a). The mustard straw is used as fuel in the furnace. The straw is thrown continuously by one person through the inlet of the furnace. The raw glass material is melted in the furnace at a temperature of 1000 – 1100°C to obtain semi-molten glass. A small part of the molten glass is drawn from the pot kept in the furnace with the help of a sharp pointed iron rod. After taking required quantity of glass a small hole is made in the soft piece of glass, which is then transferred to the mould (called the Kalbhoot). The mould is rotated such that the glass takes the shape of a bangle of the required size. One artisan can make 1000 bangles in 7 hours during summer while they make 2000 bangles in 12 hours during winter.

The problem of drudgery involved in making glass bangles was raised by the NGO, Lupin Human Welfare & Research Foundation, Bharatpur, Rajasthan. The temperature where the artisans work is about 50-55°C. The problems identified in the furnace are: drudgery involved in continuous use of fuel, inefficient burning of fuel and pollution due to black smoke while the problems in working conditions of the artisans are: sitting posture (Fig. 10 b), no back support, tieing of legs with a belt, bruising of hands due to rotating action of Kalbhoot rod.

6. Workshops Conducted

One of the activities under the RuTAG project is to conduct consultation workshop with the relevant NGOs, field agencies as well as users' groups to identify appropriate projects for investigations in consonance with their actual needs and also to facilitate the dissemination of technological solutions developed. The following workshops have been conducted:

a) Workshop on Demonstration of Fru-wash Technology for Treatment of Amla Fruits and Vegetables for increasing Shelf-Life was held during January 11-12, 2013 at Swami Adgadanand Audyogik Prashikshan Sansthasn, Gobari, Chouboli, Jagesharganj, District Pratapgarh, U.P. The workshop was attended by about 150 persons including farmers, particularly, Amla growers, vegetables and fruit

vendors, local leaders. The workshop was focussed on application of Fru-wash for extending the shelf life of Amla and locally grown fruits and vegetables.

b) Brain Storming Workshop on Rural Technologies Dissemination Strategies was held on May 3, 2013 at NRCVEE Committee Room, No. 401, Block V, IIT Delhi. The workshop was jointly organized by Rural Technology Action Group (RuTAG), Khadi & Village Industries Commission (KVIC) Interface, and Biogas Development & Training Centre (BDTC), IIT Delhi. It was attended by 45 experts from various departments of IIT Delhi and other technical institutions. The theme of the workshop was how to facilitate, promote and disseminate the rural technologies.

c) A Workshop for Demonstration, Testing-cum-Training of Improved De-husking Machine for Minor Millets was held on June 13-14, 2013 at Vivekananda Parvatiya Krishi Anusandhan Sansthan, Hawalbagh, Almora, Uttrakhand for the farmers/entrepreneurs and manufactures. Fifteen Persons from Uttar Pradesh, Madhya Pradesh and Uttrakhand and RuTAG-IIT Delhi team participated in the workshop.

d) RuTAG-IIT Delhi Regional Workshop Haryana was held on November 27, 2013 at Social Centre for Rural Initiative and Advancement (SCRIA), Khori, District Rewari (Haryana). It was attended by 54 participants including NGO representatives, Panchayat functionaries and local farmers of nearby seven districts of Rewari. The need for demonstration about the environment friendly technologies for awareness generation among the target groups, recycling of plastic bags and other such products which create health hazard after use, promoting of the use of solar energy, and biomass based technologies was emphasized. The focus of the workshop was introduction of various Bullock Driven Devices, such as Bullock Driven Gear Box, Bullock Driven Tractor, Multiple Bullock Driven Power System, particularly in the Dahina Village of Rewari district in which most of the operations, earlier being done by tractor are now being done using bullocks. Besides, the need of extending the shelf life of fruits and vegetables were also raised.

Salient Collaborating Organizations

1. *Madhya Pradesh Counci of Science and Technology, Bhopal, Madhya Pradesh.*
2. *Department of Science & Technology, Rajasthan, Jaipur,*
3. *Punjab Technical University, Kapurthala, Punjab.*
4. *College of Technology and Engineering, Maharana Pratap University of Agriculture & Technology, Udaipur, Rajasthan.*
5. *Paryavaran Sanrakshan Avam Adivasi Vikas Kendra, Jabalpur, Madhya Pradesh.*
6. *Sahajiwan Samiti, Shahadol, Madhya Pradesh.*
7. *Vivekanand Parvatiya Krishi Anusandhan Sansthan, Hawalbagh, Almora, Uttrakhand.*
8. *Sarvodaya Shikshan Sansthan, Robertsganj, Sonebhadra, Uttar Pradesh.*
9. *Lok Bharti, Lucknow, Uttar Pradesh.*
10. *Lupin Human Welfare and Research Foundation, Bharatpur, Rajasthan.*
11. *Gramodaya Rachnatmak Vikas Sansthan, Deoria, Uttar Pradesh.*
12. *Panchal Pumps & Systems, Kanpur, Uttar Pradesh.*
13. *Swami Adgadanand Audyogik Prashikshan Sansthan, Gobari, Jagesharganj, Pratapgarh, Uttar Pradesh.*
14. *Akhil Bharatiya Samaj Seva Sansthan, Chitrakoot, Uttar Pradesh.*
15. *Social Centre for Rural Initiative and Advancement (SCRIA), Khori, Rewari (Haryana).*
16. *Avadh Bihari Shriram Lok Vikash Sansthan, Mehdawal, Sant Kabir Nagar, Uttar Pradesh*
17. *M/s Nitin Rubber Industries, Ahmedabad, Gujarat*
18. *Purvanchal Engineering Complex (Structural Engineers), Gorakhpur, Uttar Pradesh*
19. *M/s D. M. T. Hydraulics, Agra, Uttar Pradesh.*
20. *M/s Genius Engineers, Dwarka, New Delhi*
21. *M/s Santosh Brothers (International), Bulandshahar, Uttar Pradesh.*
22. *M/s Bhagwati Engineers,Mohan Nagar, Ghaziabad, Uttar Pradesh.*

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